Matthew Pierce: Publications

matt@pierce-engineering.com; +1-612-201-7560; www.pierce-engineering.com

2020-2022

Lavoie, T., Eberhardt, E., & Pierce, M. E. (2022). Numerical modelling of rock mass bulking and geometric dilation using a bonded block modelling approach to assist in support design for deep mining pillars. International Journal of Rock Mechanics and Mining Sciences, 156, 105145.

Fuenzalida, M. A., Orrego, C., Ghazvinian, E., & Pierce, M. E. (2022, August). Application of rock mass strength scale effect at Cadia East mine. In Caving 2022: Fifth International Conference on Block and Sublevel Caving (pp. 951-962). Australian Centre for Geomechanics.

Pierce, M. E., Stonestreet, P., Orrego, C., Tennant, D., Garza-Cruz, T. V., Furtney, J., & Thielsen, C. (2022). Development of rock mass strength block models at Cadia East mine.

Thielsen, C., Furtney, J. K., Valencia, M. E., Pierce, M., Orrego, C., Stonestreet, P., & Tennant, D. (2022, June). Application of Machine Learning to the Estimation of Intact Rock Strength from Core Logging Data: A Case Study at the Newcrest Cadia East Mine. In 56th US Rock Mechanics/Geomechanics Symposium. OnePetro.

Kwok, C. Y., Duan, K., & Pierce, M. (2020). Modeling hydraulic fracturing in jointed shale formation with the use of fully coupled discrete element method. Acta Geotechnica, 15, 245-264.

Castro, R., Gómez, R., Pierce, M., & Canales, J. (2020). Experimental quantification of vertical stresses during gravity flow in block caving. International Journal of Rock Mechanics and Mining Sciences, 127, 104237.

Bouzeran, L., Pierce, M., Andrieux, P., & Williams, E. (2020). The role of rock mass heterogeneity and buckling mechanisms in excavation performance in foliated ground at Westwood Mine, Quebec. Journal of the Southern African Institute of Mining and Metallurgy, 120(1), 41-48.

Pierce, M. E., Campbell, R., Llewelyn, K., Fuenzalida, M., Simanjuntak, K., Kurniawan, A., ... & Rogers, S. (2020, December). Cave propagation factor for caving rate and drawpoint productivity forecasting at PTFI. In MassMin 2020: Proceedings of the Eighth International Conference & Exhibition on Mass Mining (pp. 519-534). University of Chile.

Ghazvinian, E., Fuenzalida, M., Orrego, C., & Pierce, M. (2020, December). Back analysis of cave propagation and subsidence at Cadia East Mine. In MassMin 2020: Proceedings of the Eighth International Conference & Exhibition on Mass Mining (pp. 535-550). University of Chile.

2017-2019

Pierce, M. (2017). An introduction to random disk discrete fracture network (DFN) for civil and mining engineering applications. ARMA e-Newslatter, 20, 3-8.

Garza-Cruz, T., Bouzeran, L., Pierce, M., Jalbout, A., & Ruest, M. (2019). Evaluation of ground support design at Eleonore Mine via Bonded Block Modelling. In Proceedings of the Ninth International

Symposium on Ground Support in Mining and Underground Construction (pp. 341-356). Australian Centre for Geomechanics.

Edelbro, C., Brummer, R., Pierce, M., Sandstrom, D., & Sjoberg, J. (2019). Raiseboring in difficult rock conditions. In Proceedings of the Ninth International Symposium on Ground Support in Mining and Underground Construction (pp. 185-198). Australian Centre for Geomechanics.

Bouzeran, L., Pierce, M., Andrieux, P., & Williams, E. (2019). Accounting for rock mass heterogeneity and buckling mechanisms in the study of excavation performance in foliated ground at Westwood mine. In Proceedings of the Ninth International Conference on Deep and High Stress Mining (pp. 29-44). The Southern Africa Institute of Mining and Metallurgy.

Bouzeran, L., Pierce, M., Jalbout, A., & Ruest, M. (2019). Stoping sequence optimisation at Eleonore Mine based on stress analysis through horizon scale numerical modelling. In Proceedings of the Ninth International Conference on Deep and High Stress Mining (pp. 253-266). The Southern Africa Institute of Mining and Metallurgy.

Pierce, M. E. (2019). Forecasting vulnerability of deep extraction level excavations to draw-induced cave loads. Journal of Rock Mechanics and Geotechnical Engineering, 11(3), 527-534.

Garza-Cruz, T., Pierce, M., & Board, M. (2019). Effect of Shear Stresses on Pillar Stability: A Back Analysis of the Troy Mine Experience to Predict Pillar Performance at Montanore Mine. Rock Mechanics and Rock Engineering, 1-18.

Bewick, R. P., Campbell, R., Brzovic, A., Schwarz, A., & Pierce, M. (2019). Incorporating Veined Rock Mass Characteristics into Engineering Design and Caving.

Karampinos, E., Hadjigeorgiou, J., & Pierce, M. (2018). Explicit representation of rock reinforcement in 3D DEM models for foliated ground. Journal of the Southern African Institute of Mining and Metallurgy, 118(12), 1243-1250.

Pierce, M., Hadjigeorgiou, J., & Furtney, J. (2018). Standalone Rock Reinforcement Models as an Aid to Advanced Ground Support Analysis. In 52nd US Rock Mechanics/Geomechanics Symposium. American Rock Mechanics Association.

Fuenzalida, MA, Pierce, ME & Katsaga, T (2018), 'Caving 2018, Vancouver, Canada 297 REBOP–FLAC3D hybrid approach to cave modelling', in Y Potvin & J Jakubec (eds), Proceedings of the Fourth International Symposium on Block and Sublevel Caving, Australian Centre for Geomechanics, Perth, pp. 297-312

Cumming-Potvin, D., Wesseloo, J., Pierce, M., Garza-Cruz, T., Bouzeran, L., Jacobsz, S. W., & Kearsley, E. (2018). Numerical simulations of a centrifuge model of caving. In 4th International Symposium on Block and Sublevel Caving: 4th International Symposium on Block and Sublevel Caving (pp. 191-206). Australian Centre for Geomechanics.

Bouzeran, L., Furtney, J., Pierce, M., Hazzard, J., & Lemos, J. V. (2017). Simulation of ground support performance in highly fractured and bulked rock masses with advanced 3DEC bolt model. In Proceedings of the Eighth International Conference on Deep and High Stress Mining (pp. 667-680). Australian Centre for Geomechanics.

2014-2016

Le Goc, R., Darcel, C., Davy, P., Pierce, M., & Brossault, M. A. (2014, October). Effective elastic properties of 3D fractured systems. In Proceedings of the 1st international conference on discrete fracture network engineering, Vancouver, Canada (p. 142).

Damjanac, B., Pierce, M., & Board, M. (2014, June). Methodology for stability analysis of large room-andpillar panels. In 48th US Rock Mechanics/Geomechanics Symposium. OnePetro.

Garza-Cruz, T. V., Pierce, M., & Kaiser, P. K. (2014, September). Use of 3DEC to study spalling and deformation associated with tunnelling at depth. In Deep Mining 2014: Proceedings of the Seventh International Conference on Deep and High Stress Mining (pp. 421-434). Australian Centre for Geomechanics.

Fuenzalida, M., Pierce, M., Gresham, J., & Loring, D. (2016). Case Study: Mechanisms of Dilution at Henderson Mine. In 50th US Rock Mechanics/Geomechanics Symposium. American Rock Mechanics Association.

Garza-Cruz, T., & Pierce, M. E. (2016). Impact of rock mass strength variability on caving. In Proceedings of the Seventh International Conference and Exhibition on Mass Mining, The Australasian Institute of Mining and Metallurgy, Melbourne (pp. 359-368).

Duan, K., C.Y. Kwok and M. Pierce. (2015) "Discrete Element Method Modeling of Inherently Anisotropic Rocks under Uniaxial Compression Loading," Numerical and Analytical Methods in Geomechanics, doi: 10.1002/nag.2476.

Garza-Cruz, T., and M. Pierce. (2014) "A 3DEC Model for Heavily Veined Massive Rock Masses," in Proceedings, ARMA 48th U.S. Rock Mechanics/Geomechanics Symposium (Minneapolis, June 2014). Paper No. ARMA-2014-7660. J. F. Labuz, Ed. Alexandria, VA: ARMA.

Abbasi, B., M. Pierce, E. Dzik and Y.P. Chugh. (2014) "Barton Approach for Predicting Hoek-Brown Residual Parameters," in Proceedings, ARMA 48th U.S. Rock Mechanics/Geomechanics Symposium (Minneapolis, June 2014). Paper No. ARMA-2014-7634. J. F. Labuz, Ed. Alexandria, VA: ARMA.

Kim, B.-H., M. Pierce and E. Dzik. (2014) "Numerical Investigation of Rock Mass Behavior Associated with Confinement-Dependent Strength in Brittle Failing Rocks," in Proceedings, ARMA 48th U.S. Rock Mechanics/Geomechanics Symposium (Minneapolis, June 2014). Paper No. ARMA-2014-7093. J. F. Labuz, Ed. Alexandria, VA: ARMA.

Varun, M. Pierce and C. Fairhurst. (2014) "Underground Nuclear Power Plants: The Seismic Advantage," in Proceedings, ISRM International Symposium—8th Asian Rock Mechanics Symposium (Sapporo, Japan, October 2014). Paper No. ISRM-ARMS8-2014-328. N. Shimizu, K. Kaneko, J.-I. Kodama, Eds. Lisbon: ISRM.

Kim, B.-H., R. L. Peterson Katsaga and M. E. Pierce. (2014) "Estimation of Rock Block Size Distribution for Determination of Geological Strength Index (GSI) Using Discrete Fracture Networks (DFNs)," in DFNE 2014 (Proceedings, International Discrete-Fracture Network Engineering Conference, Vancouver, Canada). Paper No. DFNE 2014-124. CARMA, ARMA.

2011-2013

Dzik, E., Taghavi, R., & Pierce, M. (2013, October). Interactive high quality grid generation for FLAC 3D in a CAD environment. In Continuum and Distinct Element Numerical Modeling in Geo-Engineering, Proceedings of the 3rd International FLAC/DEM Symposium (pp. 22-24).

Pierce, M. (2013). Numerical modeling of rock mass weakening, bulking and softening associated with cave mining. American Rock Mechanics Association E-newsletter, (9).

Bahrani, N., Valley, B., Kaiser, P. K., & Pierce, M. (2011, June). Evaluation of PFC2D grain-based model for simulation of confinement-dependent rock strength degradation and failure processes. In 45th US Rock Mechanics/Geomechanics Symposium. OnePetro.

Katsaga, T., and M. Pierce. (2013) "Continuous Monitoring of Synthetic Seismicity: Slip on Joints," in Proceedings, ARMA 47th U.S. Rock Mechanics/Geomechanics Symposium (San Francisco, June 2013). Paper No. ARMA-2013-572. L.J. Pyrak-Nolte, Ed. Alexandria, VA: ARMA.

Bahrani, N., D. Potyondy and M. Pierce. (2012) "Simulation of Brazilian Test Using PFC2D Grain-Based Model," in 21st Canadian Rock Mechanics Symposium: RockEng12 — Rock Engineering for Natural Resources (Proceedings, CARMA, Edmonton, Canada, May 2012), pp. 485-493, C. Hawkes, Ed. Westmount, Quebec: CARMA, CIMICM. 2012.

Jakubec, J., M. Board, R. Campbell, M. Pierce, D.Z.O. De Zarate. "Rock Mass Strength Estimate — Chuquicamata Case Study," in 6th International Conference & Exhibition on Mass Mining (Proceedings, MassMin2012, Sudbury, Canada, June 2012). CIMMP. 2012.

Pierce, M. E., and C. Fairhurst. "Synthetic Rock Mass Applications in Mass Mining," in Harmonising Rock Engineering and the Environment (Proceedings, 12th ISRM Int. Congress, Beijing, October 2011), pp. 109-114, Q. Qian and Y. Zhou, Eds. London: CRC Press, 2012.

Pettitt, W. S., J. F. Hazzard, B. Damjanac, Y. H. Han, M. Pierce, T. Katsaga and P. A. Cundall. "Microseismic Imaging and Hydrofracture Numerical Simulations," in 21st Canadian Rock Mechanics Symposium: RockEng12 — Rock Engineering for Natural Resources (Proceedings, CARMA, Edmonton, Canada, May 2012), pp. 549-560, C. Hawkes, Ed. Westmount, Quebec: CARMA, CIMICM. 2012.

Pettitt, W. S., M. Pierce, B. Damjanac, J. Hazzard, L. Lorig, C. Fairhurst, M. Sanchez-Nagel, N. Nagel, J. M. Reyes-Montes, J. Andrew and R. P. Young. "Fracture Network Engineering: Combining Microseismic Imaging and Hyrofracture Numerical Simulations," in 46th US Rock Mechanics / Geomechanics Symposium (Proceedings, ARMA, Chicago, June 2012). Paper No. 12-554. Alexandria, Virginia: ARMA. 2012.

Bahrani, N., B. Valley, P. K. Kaiser and M. Pierce. "Evaluation of PFC2D Grain-Based Model for Simulation of Confinement — Dependent Rock Strength Degradation and Failure Process," in CD Proceedings, ARMA 45th U.S. Rock Mechanics / Geomechanics Symposium (San Francisco, June 2011), Paper No. ARMA 11-156. A. Iannacchione et al., Eds. Alexandria, Virginia: ARMA, 2011.

Kwok, C. Y., and M. Pierce. "Time-Dependent Compaction in Caving Rock," in CD Proceedings, ARMA 45th U.S. Rock Mechanics / Geomechanics Symposium (San Francisco, June 2011), Paper No. 11-501. A. Iannacchione et al., Eds. Alexandria, Virginia: ARMA, 2011.

Mas Ivars, D., M. E. Pierce, C. Darcel, J. Reyes-Montes, D. O. Potyondy, R. P. Young and P. A. Cundall. "The Synthetic Rock Mass Approach for Jointed Rock Mass Modelling," Int. J. Rock Mech. Min. Sci., 48, 219-244 (2011).

Pettitt, W., M. Pierce, B. Damjanac, J. Hazzard, L. Lorig, C. Fairhurst, I. Gil, M. Sanchez, N. Nagel, J. Reyes-Montes and R. P. Young. "Fracture Network Engineering for Hydraulic Fracturing," The Leading Edge, 30(8), 844-853, doi: 10.1190/1.3626490 (2011).

Sainsbury, B. L., D. P. Sainsbury and M. E. Pierce. "A Historical Review of the Development of Numerical Cave Propagation Simulations," in Continuum and Distinct Element Modeling in Geomechanics — 2011 (Proceedings, 2nd International FLAC / DEM Symposium, Melbourne, February 2011), Paper No. 02-01, pp. 23-36. D. Sainsbury et al. Eds. Minneapolis: Itasca International Inc., 2011.

Taghavi, R., and M. Pierce. "Modeling Flow of Fragmented Rock with 3DEC: A Polyhedral DEM Approach," in Continuum and Distinct Element Modeling in Geomechanics — 2011 (Proceedings, 2nd International FLAC / DEM Symposium, Melbourne, February 2011), Paper No. 14-03, pp. 799-808. D. Sainsbury et al., Eds. Minneapolis: Itasca International Inc., 2011.

2008-2010

Tawadrous, A. S., DeGagné, D., Pierce, M., & Mas Ivars, D. (2009). Prediction of uniaxial compression PFC3D model micro-properties using artificial neural networks. International journal for numerical and analytical methods in geomechanics, 33(18), 1953-1962.

Cundall, P. A., Pierce, M. E., & Mas Ivars, D. (2008, September). Quantifying the size effect of rock mass strength. In SHIRMS 2008: Proceedings of the First Southern Hemisphere International Rock Mechanics Symposium (pp. 3-15). Australian Centre for Geomechanics.

Sainsbury, B., Pierce, M. E., & Mas Ivars, D. (2008, September). Analysis of Caving Behaviour Using a Synthetic Rock Mass ,Äî Ubiquitous Joint Rock Mass Modelling Technique. In SHIRMS 2008: Proceedings of the First Southern Hemisphere International Rock Mechanics Symposium (pp. 243-253). Australian Centre for Geomechanics.

Sainsbury, B., Pierce, M., & Mas Ivars, D. (2008, August). Simulation of rock mass strength anisotropy and scale effects using a Ubiquitous Joint Rock Mass (UJRM) model. In Proceedings first international FLAC/DEM symposium on numerical modelling (pp. 25-27).

Deisman, N., Mas Ivars, D., & Pierce, M. (2008). PFC2D smooth joint contact model numerical experiments. Proceedings of the GeoEdmonton, 8.

Ivars, D. M., Pierce, M., DeGagné, D., & Darcel, C. (2008). Anisotropy and scale dependency in jointed rockmass strength—A synthetic rock mass study. Proceedings of the 1st International FLAC/DEM Aymposium on Numerical Modeling, 231-239.

Mas Ivars, D., Potyondy, D. O., Pierce, M., & Cundall, P. A. (2008). The smooth-joint contact model. Proceedings of WCCM8-ECCOMAS, 2008, 8th.

Pierce, M. (2010) A Model for Gravity Flow of Fragmented Rock in Block Caving Mines, PH.D. Thesis, University of Queensland.

Damjanac, B., I. Gil, M. Pierce, M. Sanchez, A. Van As and J. McLennan. "A New Approach to Hydraulic Fracturing Modeling in Naturally Fractured Reservoirs," in Proceedings, 44th U.S. / 5th U.S.-Canada Rock Mechanics Symposium (Salt Lake City, June 2010), Paper No. ARMA 10-400. Alexandria, Virginia: ARMA, 2010.

Pettitt, W., M. Pierce, B. Damjanac, L. Lorig and C. Fairhurst. "Fracture Network Engineering and Enhanced Geothermal Systems," Geoth. Res. T., 34, 419-426 (2010).

Pierce, M., D. K. Weatherley and T. Kojovic. "A Hybrid Methodology for Secondary Fragmentation Prediction in Cave Mines," in Caving 2010 (Proceedings, Second International Symposium on Block and Sublevel Caving, Perth, Australia, April 2010), pp. 567-581. Y. Potvin, Ed. Perth: Australian Centre for Geomechanics (2010).

Reyes-Montes, J. M., W. S. Pettitt, M. E. Pierce and R. P. Young. "Geomechanical Evaluation of Solids Injection," in Proceedings, 44th U.S. / 5th U.S.-Canada Rock Mechanics Symposium (Salt Lake City, June 2010), Paper No. ARMA 10-273. Alexandria, Virginia: ARMA 2010.

Reyes-Montes, J. M., W. S. Pettitt, M. E. Pierce and R. P. Young. "Microseismic Validation of Jointed Rock Models in Cave Mining," in Proceedings, 44th U.S. / 5th U.S.-Canada Rock Mechanics Symposium (Salt Lake City, Utah, June 2010), Paper No. 10-273. Alexandria, Virginia: ARMA, 2010.

Reyes-Montes, J. M., B. Sainsbury, W. S. Pettitt, M. Pierce and R. P. Young. "Microseismic Tools for the Analysis of the Interaction Between Open Pit and Underground Developments," in Caving 2010 (Proceedings, Second International Symposium on Block and Sublevel Caving, Perth, Australia, April 2010), pp. 119-132. Y. Potvin, Ed. Perth: Australian Centre for Geomechanics (2010).

Pierce, M. "The Mechanics of Caving in Jointed Rock," presented at the Lassonde Institute Colloquium, University of Toronto, Canada, January 20, 2009.

Board, M., and M. E. Pierce. "A Review of Recent Experience in Modeling of Caving," presented at the International Workshop on Numerical Modeling for Underground Mine Excavation Design, National Institute for Occupational Safety and Health (NIOSH) Pittsburgh Research Laboratory, 43rd U.S. Rock Mechanics Symposium, (Asheville, June 2009).

Pierce, M., M. Gaida and D. DeGagné. (2009) "Estimation of Rock Block Strength," in ROCKENG09 (Proceedings, 3rd CANUS Rock Mechanics Symposium, Toronto, May 2009), Paper No. 4360. M. Diederichs and G. Grasselli, Eds.

Pierce, M., D. Mas Ivars and B. Sainsbury. "Use of Synthetic Rock Masses (SRM) to Investigate Jointed Rock Mass Strength and Deformation Behavior," in CD Proceedings, International Conference on Rock Joints and Jointed Rock Masses (Tucson, January 2009), Paper No. 1091. P. H. S. W. Kulatilake, Ed. Tucson: Kulatilake & Associates, 2009.

1997-2007

Pierce, M., Cundall, P., Potyondy, D., & Ivars, D. M. (2007). A synthetic rock mass model for jointed rock. In 1st Canada-US Rock Mechanics Symposium. OnePetro.

Board, M., Damjanac, B., & Pierce, M. (2007, November). Development of a methodology for analysis of instability in room and pillar mines. In Deep Mining 2007: Proceedings of the Fourth International Seminar on Deep and High Stress Mining (pp. 273-282). Australian Centre for Geomechanics.

Pierce, M. E., Detournay, C., & Lagger, H. (2005, June). Numerical modeling of ground freezing for subsurface construction. In Alaska Rocks 2005, The 40th US Symposium on Rock Mechanics (USRMS). OnePetro.

Pierce, M. E. (2004). PFC3D modeling of inter-particle percolation in caved rock under draw. Numerical Modeling in Micromechanics via Particle Methods, 149-156.

Selldén, H., & Pierce, M. (2004). PFC3D modelling of flow behaviour in sublevel caving. MassMin 2004—Proceedings, 22-25.

Sainsbury, D. P., Pierce, M. E., & Lorig, L. J. (2003, November). Two-and three-dimensional numerical analysis of the interaction between open-pit slope stability and remnant underground voids. In Proceedings of the 5th Large open pit conference, Western Australia, November (pp. 251-257).

Trueman, R., Pierce, M., & Wattimena, R. (2002). Quantifying stresses and support requirements in the undercut and production level drifts of block and panel caving mines. International Journal of Rock Mechanics and Mining Sciences, 39(5), 617-632.

Pierce, M.; Cundall, P.; Van Hout, G.; Lorig, L. PFC3D modeling of caved rock under draw. In Proceedings of the 1st International PFC Symposium, Gelsenkirchen, Germany, 6–8 November 2002; pp. 211–217.

Pierce, M., Brandshaug, T., & Ward, M. (2001). Slope stability assessment at the Main Cresson Mine. Slope stability in surface mining, 239-250.

Pierce, ME 2001, 'Stability analysis of paste back fill exposes at Brunswick Mine', Proceedings of the 2nd International FLAC Symposium, Swets & Zeitlinger Publishers, Lisse, pp. 147–156

Pierce, M. E. (1999). Laboratory and numerical analysis of the strength and deformation behaviour of paste backfill. MSc Thesis. Queen's University at Kingston.

Pierce, M. E., Bawden, W. F., & Paynter, J. T. (1998). Laboratory testing and stability analysis of paste backfill at the Golden Giant Mine. In Minefill'98: Proceedings of the 6th International Symposium on Mining with Backfill, Brisbane, Australia (pp. 14-16).