UNIVERSITAS
GADJAH MADA
Simulasi Pengaruh Material Rangka Jendela dan Window-to-Wall Ratio terhadap Energi Pendinginan Bangunan Pada 38 Provinsi Indonesia
AALIYAH CALISTA ADLI, Dr. Eng. Ir. Mohammad Kholid Ridwan, S.T., M.Sc., IPU.,ASEAN Eng.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

DAFTAR PUSTAKA

[1] A. Priandoyo, H. Vallack, and L. Emberson, "Energy and environment in Indonesia," in *2016 IEEE Conference on Technologies for Sustainability (SusTech)*, 2016, pp. 127–133, doi: 10.1109/SusTech.2016.7897154.

[2] Badan Pusat Statistik, "Neraca Energi Indonesia 2019–2023 (Energy Balances of Indonesia 2019–2023)", vol. 26. Jakarta, Indonesia: Badan Pusat Statistik, 2024, p. 9.

[3] S. I. Faizah dan U. A. Husaeni, "Development of consumption and supplying energy in Indonesia's economy," *International Journal of Energy Economics and Policy*, vol. 8, no. 6, pp. 313–321, 2018, doi: 10.32479/ijeep.6926.

[4] A. Sugiyono, "Outlook Energi Indonesia 2015–2035: Prospek Energi Baru Terbarukan," *Energi dan Lingkungan*, vol. 12, no. 2, pp. 87–96, 2016.

[5] Dewan Energi Nasional, *Outlook Energi Indonesia 2022*, 2022.

[6] A. Alaidroos dan M. Krarti, "Optimal design of residential building envelope systems in the Kingdom of Saudi Arabia," *Energy and Buildings*, vol. 86, pp. 104–117, 2015, doi: 10.1016/j.enbuild.2014.09.083.

[7] M. Bayoumi, "Impacts of window opening grade on improving the energy efficiency of a façade in hot climates," *Building and Environment*, vol. 119, hal. 31–43, 2017, doi: 10.1016/j.buildenv.2017.04.008.

[8] S. Grynning, A. Gustavsen, B. Time, dan B. P. Jelle, "Windows in the buildings of tomorrow: Energy losers or energy gainers?" *Energy and Buildings*, vol. 61, hal. 185–192, 2013, doi: 10.1016/j.enbuild.2013.02.029.

[9] A. S. Muhaisen dan H. R. Dabboor, "Studying the impact of orientation, size, and glass material of windows on heating and cooling energy demand of the Gaza Strip buildings," *Journal of Architecture and Planning*, vol. 27, no. 1, hal. 1–15, 2012.

[10] E. B. Ettah, J. G. Egbe, S. A. Takim, U. P. Akpan, dan E. B. Oyom, "Investigation of the thermal conductivity of polyvinil chloride (PVC) ceiling material produced in EPZ Calabar, for application in tropical climate zones," *IOSR Journal of Polymer and Textile Engineering (IOSR-JPTE)*, vol. 3, no. 2, hal. 34–38, 2016.

[11] Y. L. Hou, H. Z. Mu, G. T. Dong, dan J. Shi, "Influences of Urban temperature on the electricity consumption of Shanghai," *Advances in Climate Change Research*, vol. 5, no. 2, hal. 74–80, 2014, doi: 10.3724/SP.J.1248.2014.074.

[12] S. Selkowitz, "Window performance and building energy use: Some technical options for increasing energy efficiency," *Energy Sources: Conservation and Renewables*, 1985.

UNIVERSITAS
GADJAH MADA
Simulasi Pengaruh Material Rangka Jendela dan Window-to-Wall Ratio terhadap Energi Pendinginan Bangunan Pada 38 Provinsi Indonesia
AALIYAH CALISTA ADLI, Dr. Eng. Ir. Mohammad Kholid Ridwan, S.T., M.Sc., IPU.,ASEAN Eng.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

[13] V. Sangrutsamee dan T. Sripanom, "Investigating the influence of different materials on window thermal performance," *Journal of Architectural/Planning Research and Studies*, vol. 12, no. 2, hal. 25–38, 2015.

[14] M. Iqbal, A. Atthaillah, A. Safyan, L. Indriani, dan A. M. Sina, "Kenyamanan termal pada bangunan berventilasi alami di iklim tropis," *Nature: National Academic Journal of Architecture*, vol. 11, no. 2, hal. 152–163, 2024, doi: 10.24252/nature.v11i2a3.

[15] ASHRAE, "ASHRAE Handbook—Fundamentals (SI Edition)", 2017 ed. Atlanta, GA, USA: American Society of Heating, Refrigerating and Air-Conditioning Engineers, 2017.

[16] A. Dutta, A. Samanta, dan S. Neogi, "Influence of orientation and the impact of external window shading on building thermal performance in tropical climate," *Energy and Buildings*, vol. 139, hal. 680–689, 2017, doi: 10.1016/j.enbuild.2017.01.061.

[17] A. Alsehail dan A. Almhafdy, "The effect of Window-to-Wall Ratio (WWR) and Window Orientation (WO) on thermal performance: A preliminary overview," *Environment-Behaviour Proceedings Journal*, 2020.

[18] S. K. Alghoul, H. G. Rijabo, dan M. E. Mashena, "Energy consumption in buildings: A correlation for the influence of window to wall ratio and window orientation in Tripoli, Libya," *Journal of Building Engineering*, vol. 13, hal. 169–176, 2017, doi: 10.1016/j.jobe.2017.04.003.

[19] M. Alwetaishi, "Impact of glazing to wall ratio in various climatic regions: A case study," *Journal of King Saud University - Engineering Sciences*, vol. 31, no. 1, hal. 6–18, 2019, doi: 10.1016/j.jksues.2017.03.001.

[20] A. Benallou, "Mechanisms and laws of heat transfer," dalam *Energy and Mass Transfers: Balance Sheet Approach and Basic Concepts*, vol. 1, bab 2. Wiley, 2018, doi: 10.1002/9781119476894.ch2.

[21] A. Song, Y. Kim, S. Hwang, M. Shin, dan S. Lee, "A comprehensive review of thermal transmittance assessments of building envelopes," *Buildings*, vol. 14, no. 10, hal. 3304, 2024, doi: 10.3390/buildings14103304.

[22] A. Tzempelikos dan A. K. Athienitis, "The impact of shading design and control on building cooling and lighting demand," Solar Energy, vol. 81, no. 3, hal. 369–382, 2007, doi: 10.1016/j.solener.2006.06.015.

[23] Y. Choi, A. Ozaki, dan H. Lee, "Impact of window frames on annual energy consumption of residential buildings and its contribution to CO_2 emission reductions at the city scale," *Energies*, vol. 15, no. 10, hal. 3692, 2022, doi: 10.3390/en15103692.

UNIVERSITAS
GADJAH MADA
Simulasi Pengaruh Material Rangka Jendela dan Window-to-Wall Ratio terhadap Energi Pendinginan Bangunan Pada 38 Provinsi Indonesia
AALIYAH CALISTA ADLI, Dr. Eng. Ir. Mohammad Kholid Ridwan, S.T., M.Sc., IPU.,ASEAN Eng.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

[24] A. Sinha dan A. Kutnar, "Carbon footprint versus performance of aluminum, plastic, and wood window frames from cradle to gate," *Buildings*, vol. 2, no. 4, hal. 542–553, 2012, doi: 10.3390/buildings2040542.

[25] Y. Mo, C. Wang, M. A. Kassem, D. Wang, dan Z. Chen, "Optimizing window configurations for energy-efficient buildings with aluminum alloy frames and helium-filled insulating glazing," *Sustainability*, vol. 16, no. 15, 2024, doi: 10.3390/su16156522.

[26] M. Muchsin dan D. Hadisoesilo, "Pengaruh desain jendela dan orientasi bangunan terhadap kenyamanan termal ruang menggunakan CBE Thermal Comfort Tool," *JoDA–Journal of Digital Architecture*, vol. 3, no. 2, hal. 69–75, 2024, doi: 10.24167/joda.v3i2.12673.

[27] S. Veronica, A. F. A. H. Hasibuan, E. F. Luke, G. J. A. Thoha, M. R. Kurniawan, dan R. I. Alparizi, "Pengujian model dengan material kayu pada penggunaan dalam dan luar ruangan," *Jurnal Arsitektur*, vol. 6, no. 1, 2024, doi: 10.33005/border.v6i1.764.

[28] M. Asif, T. Muneer, dan J. Kubie, "Sustainability analysis of window frames," *Building Services Engineering Research & Technology*, vol. 26, no. 1, 2005, doi: 10.1191/0143624405bt118tn.

[29] M. C. Onyeaju, E. Osarolube, E. O. C. Chukwuocha, C. E. Ekuma, dan G. A. J. Omasheye, "Comparison of the thermal properties of asbestos and polyvinilchloride (PVC) ceiling sheets," *Materials Sciences and Applications*, vol. 3, no. 4, hal. 240–244, 2012, doi: 10.4236/msa.2012.34035.

[30] R. Ourghi, A. Al-Anzi, and M. Krarti, "A Simplified Analysis Method to Predict the Impact of Shape on Annual Energy Use for Office Buildings," *Energy Conversion and Management*, vol. 48, no. 1, pp. 300–305, 2007.

[31] J. Shaeri, A. Habibi, M. Yaghoubi, and A. Chokhachian, "The Optimum Window-to-Wall Ratio in Office Buildings for Hot-Humid, Hot-Dry, and Cold Climates in Iran," *Environments*, vol. 6, no. 4, p. 45, 2019, doi: 10.3390/environments6040045.

[32] J. Li et al., "A Review of Building Physical Shapes on Heating and Cooling Energy Consumption," *Energies*, vol. 17, no. 22, 2024.

[33] J. Zhang, N. H. Wong, and D. J. C. Hii, *The Relationship Between Building Form Typology and Cooling Loads in the Tropical Climatic Context.*

[34] World Meteorological Organization, *WMO Guidelines on the Calculation of Climate Normals*, WMO-No. 1203, Geneva, Switzerland, 2017.

[35] P. G. A. S. K. W. Notodipuro dan A. Mandala, "The effect of building shape and orientation on energy use at sloped sites in tropical climates using Sefaira," *ARTEKS: Jurnal Teknik Arsitektur*, vol. 7, no. 1, hal. 131–142, 2022, doi: 10.30822/arteks.v7i1.1397.

UNIVERSITAS
GADJAH MADA
Simulasi Pengaruh Material Rangka Jendela dan Window-to-Wall Ratio terhadap Energi Pendinginan Bangunan Pada 38 Provinsi Indonesia
AALIYAH CALISTA ADLI, Dr. Eng. Ir. Mohammad Kholid Ridwan, S.T., M.Sc., IPU.,ASEAN Eng.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

[36] H. K. Jabbar, M. N. Hamoodi, dan A. N. Al-Hameedawi, "Urban heat islands: A review of contributing factors, effects, and data," *IOP Conference Series: Earth and Environmental Science*, vol. 1129, no. 1, hal. 012038, 2023, doi: 10.1088/1755-1315/1129/1/012038.

[37] Q. Zheng, M. Hao, R. Miao, J. R. Schaadt, dan C. Dames, "Advances in thermal conductivity for energy applications: a review," *Progress in Energy*, vol. 3, 2020.

[38] Badan Standardisasi Nasional, *SNI 6389:2020: Konservasi Energi Selubung Bangunan pada Bangunan Gedung*. Jakarta, Indonesia: Badan Standardisasi Nasional, 2020.

[39] V. Shabunko, C. M. Lim, dan S. Mathew, "EnergyPlus models for the benchmarking of residential buildings in Brunei Darussalam," *Energy & Buildings*, vol. 169, hal. 507–516, 2018, doi: 10.1016/j.enbuild.2018.04.030.

[40] U.S. Department of Energy, *EnergyPlus Input Output Reference*, Version 26.1.0. Washington, DC, USA: U.S. Department of Energy, Mar. 2026. EnergyPlus Input Output Reference v26.1.0

[41] National Aeronautics and Space Administration (NASA) Langley Research Center, "NASA Prediction of Worldwide Energy Resources (POWER) Data Access Viewer," [Online]. Available: https://power.larc.nasa.gov/data-access-viewer/. Accessed: 25-Jun-2024.

[42] Szokolay, S. V. (2008). Introduction to Architectural Science: The Basis of Sustainable Design. Routledge.

[43] Depecker, P., Menezo, C., Virgone, J., & Lepers, S. (2001). Design of buildings shape and energetic consumption. Building and Environment, 36(5), 627–635.

[44] AlAnzi, A., Seo, D., & Krarti, M. (2009). Impact of building shape on thermal performance of office buildings in Kuwait. Energy Conversion and Management, 50(3), 822–828.

[45] Goia, F., "Search for the Optimal Window-to-Wall Ratio in Office Buildings in Different European Climates and the Implications on Total Energy Saving Potential," *Solar Energy*, vol. 132, pp. 467–492, 2016.

[46] American Society of Heating, Refrigerating and Air-Conditioning Engineers, U.S. Green Building Council, and Illuminating Engineering Society, "ASHRAE Standard 189.1-2009: Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings". Atlanta, GA, USA: American Society of Heating, Refrigerating and Air-Conditioning Engineers, 2009.

UNIVERSITAS
GADJAH MADA
Simulasi Pengaruh Material Rangka Jendela dan Window-to-Wall Ratio terhadap Energi Pendinginan Bangunan Pada 38 Provinsi Indonesia
AALIYAH CALISTA ADLI, Dr. Eng. Ir. Mohammad Kholid Ridwan, S.T., M.Sc., IPU.,ASEAN Eng.
Universitas Gadjah Mada, 2026 | Diunduh dari http://etd.repository.ugm.ac.id/

[47] N. M. Razali and Y. B. Wah, "Power comparisons of Shapiro-Wilk, Kolmogorov-Smirnov, Lilliefors and Anderson-Darling tests," *Journal of Statistical Modeling and Analytics*, vol. 2, no. 1, pp. 21–33, 2011.

[48] Kim, H. Y. (2014). *Nonparametric methods for comparing three or more groups and repeated measures*. Restorative Dentistry & Endodontics, 39(4), 329–332.