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The U.S. Department of Energy (DOE) supports the development of commercial and residential building energy codes and standards by participating in industry review and update processes, and providing technical analyses to support both published model codes and potential changes. DOE publishes its findings in an effort to ensure transparency in its support, and to make its analysis available for public review and use. The Pacific Northwest National Laboratory (PNNL) simulates energy savings associated with changes in energy codes and standards. This analysis is used by the U.S. Department of Energy's Building Energy Codes Program to evaluate published versions of the code, as well as in developing proposed code changes. Commercial prototype building models Residential prototype building models Commercial The suite of commercial prototype buildings cover 75% of the commercial building floor area in the United States for new construction, including both commercial buildings and mid- to high-rise residential buildings, and across all U.S. climate zones. These prototype buildings—derived from DOE's Commercial Reference Building Models—cover all Reference Building types (with the exception of supermarkets), and also an additional prototype representing high-rise apartment buildings. As Standard 90.1 and IECC evolve, PNNL makes modifications to the commercial prototype building models, with extensive input from ASHRAE 90.1 Standing Standards Project Committee members and other building industry experts. The prototype models include 16 commercial building types in 19 climate locations (16 in the U.S. and 3 international locations) for recent editions of Standard 90.1 and IECC. The current combination results in an overall set of 3,344 total building models (in EnergyPlus™ Version 9.0). Tables 1 and 2 contain a scorecard for each prototype building. The scorecard is a spreadsheet (Microsoft® Excel®, .xls, format) that summarizes the building descriptions, thermal zone internal loads, schedules, and other key modeling input information. The suite of prototype models is available for download (compressed, .zip, format) for the respective edition of Standard 90.1 and IECC. Each file includes EnergyPlus model input files (.idf) and corresponding output files (.html) across all climate locations. DOWNLOADS Files may be downloaded either as complete packages, containing all building types, or by individual building type, either by specific Standard 90.1 or IECC editions or as complete sets from the tables below. ANSI/ASHRAE/IES Standard 90.1 Return to top IECC Return to top TMY3 Weather Files The associated EnergyPlus TMY3 weather files for the 19 climate locations are available for download in Table 3. Table 3. TMY3 Weather Files Thermal Zone Thermal Climate Zone Name Weather Location Weather Data Representative City 0A Extremely Hot Humid Ho Chi Minh City/Tan Son Nhat International Airport, Vietnam See note* Ho Chi Minh City, Vietnam 0B Extremely Hot Dry Dubai International Airport, United Arab Emirates See note* Dubai, United Arab Emirates 1A Very Hot Humid Honolulu International Airport, Hawaii EPW Honolulu, HI 1B Very Hot Dry New Delhi/Safdarjung Airport, Delhi, India See note* New Delhi, India 2A Hot Humid Tampa/MacDill AFB, Florida EPW Tampa, FL 2B Hot Dry Tucson/Davis-Monthan AFB, Arizona EPW Tucson, AZ 3A Warm Humid Atlanta/Hartsfield Jackson International Airport, Georgia EPW Atlanta, GA 3B Warm Dry El Paso International Airport, Texas EPW El Paso, TX 3C Warm Marine San Diego/Brown Field Municipal Airport, California EPW San Diego, CA 4A Mixed Humid New York/John F Kennedy International Airport, New York EPW New York, NY 4B Mixed Dry Albuquerque International Sunport, New Mexico EPW Albuquerque, NM 4C Mixed Marine Seattle-Tacoma International Airport, Washington EPW Seattle, WA 5A Cool Humid Buffalo Niagara International Airport, New York EPW Buffalo, NY 5B Cool Dry Denver/Aurora/Buckley AFB, Colorado EPW Denver, CO 5C Cool Marine Port Angeles/William R Fairchild International Airport, Washington EPW Port Angeles, WA 6A Cold Humid Rochester International Airport, Minnesota EPW Rochester, MN 6B Cold Dry Great Falls International Airport, Montana EPW Great Falls, MO 7 Very Cold International Falls International Airport, Minnesota EPW International Falls, MN 8 Subarctic/Arctic Fairbanks International Airport, Alaska EPW Fairbanks, AK All Thermal Zones ZIP *Note: the following international weather data files are available through ASHRAE Weather Data Center VNM_Ho.Chi.Minh.City-Tan.Son.Nhat.Intl.AP.489000 IWEC2.epw ARE_Dubai.Intl.AP.411940 IWEC2.epw IND_Delhi_New.Delhi-Safdarjung.Airport.421820 IWEC2.epw Return to top Residential For residential buildings, PNNL uses two base prototypes to simulate the following building types: Single-family detached house Multi-family low-rise apartment building These prototypes are then modified to accommodate four different heating system types and four foundation types typically found in new residential construction. The result is an expanded set of 32 models, which is then simulated across 18 climate locations for each edition of the International Energy Conservation Code (IECC). This combination results in a set of 3,552 residential energy models (in EnergyPlus™ Version 9.5). The energy models for the 2015, 2018, and 2021 editions of the IECC are listed in Table 4. Each compressed (.zip) file includes EnergyPlus model input files (.idf) and corresponding output files (.htm) for each of the eight climate zones (1-8) and three moisture regimes (A=Moist, B=Dry, C=Marine) defined in the IECC. Each file is assigned a unique name using the following naming convention: Where, XX = Prototype, either Multi-family (MF) or Single-family (SF) CZ = Climate zone designator (e.g., CZ2B for climate zone 2, moisture regime B; CZ1AT for climate zone 1, moisture regime A, Tropical, CZ3AWH for climate zone 3, moisture regime A, Warm-Humid) HeatingSystemType = One of four heating system types: Electric Resistance, Gas Furnace, Oil Furnace or Heat Pump FoundationType = One of four Foundation types: slab, crawlspace, heated basement, unheated basement IECC = International Energy Conservation Code Year = Year of published Code Downloads The energy models for the 2015, 2018 and 2021 versions of the IECC are listed in Table 4 and can be downloaded either by specific IECC edition or complete sets by climate zone. The complete sets contain prototypes with earlier versions of the IECC. The .idf files may be opened and modified in EnergyPlus or using the OpenStudio plugin in Trimble SketchUp. The single family prototypes are now complete EnergyPlus files utilizing the airflow network for duct leakage modeling. Previous single family prototype models posted on the Energy Codes website did not contain duct leakage specifications. Calculating loads for duct leakage required multiple EnergyPlus simulations with and without duct leakage and post processing the results for both single family and multifamily buildings. As a result, there may be large differences in energy consumption when comparing the latest single family prototypes results to older prototype results downloaded from this website. The multifamily prototype models do not contain duct leakage specifications, and the duct leakage adjustment are applied during the post-processing. We are working on updating the MF models to incorporate the airflow network with duct leakage loops. Return to top TMY3 Weather Files The associated EnergyPlus TMY3 weather files for the 18 climate locations are available for download in Table 5. Table 5. TMY3 Weather Files for Residential Buildings Climate Zone and Representative City Weather Data 1A Honolulu, HI (tropical) USA_HI_Honolulu.Intl._AP_.911820_TMY3.epw 1A Miami, FL USA_FL_Miami.Intl._AP_.722020_TMY3.epw 2A Tampa, FL USA_FL_Tampa-MacDill.AFB_.747880_TMY3.epw 2B Tucson, AZ USA_AZ_Tucson-Davis-Monthan.AFB_.722745_TMY3.epw 3A Atlanta, GA USA_GA_Atlanta-HartsfieldJackson.Intl._AP_.722190_TMY3.epw 3AWH Montgomery, AL USA_AL_Montgomery-Dannelly.Field_.722260_TMY3.epw 3B El Paso, TX USA_TX_El.Paso_.Intl._AP_.722700_TMY3.epw 3C San Diego, CA USA_CA_San.Deigo-Brown.Field_.Muni._AP_.722904_TMY3.epw 4A New York, NY USA_NY_New.York-John.F.Kennedy.Intl._AP_.744860_TMY3.epw 4B Albuquerque, NM USA_NM_Albuquerque.Intl._Sunport.723650_TMY3.epw 4C Seattle, WA USA_WA_Seattle-Tacoma.Intl._AP_.727930_TMY3.epw 5A Buffalo, NY USA_NY_Buffalo.Niagara.Intl._AP_.725280_TMY3.epw 5B Denver, CO USA_CO_Denver-Aurora-Buckley.AFB_.724695_TMY3.epw 5C Port Angeles, WA USA_WA_Port-Angeles-William.R.Fairchild.Intl._AP_.727885_TMY3.epw 6A Rochester, MN USA_MN_Rochester.Intl._AP_.726440_TMY3.epw 6B Great Falls, MT USA_MT_Great.Falls_.Intl._AP_.727750_TMY3.epw 7 International Falls, MN USA_MN_International.Falls_.Intl._AP_.702610_TMY3.epw All Climate Zones IECC_epw.zip

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