performance construction team
industry partnerships
Estimated U.S. Energy Consumption in 2018: 101.2 Quads

https://flowcharts.llnl.gov/
EIA’s residential energy survey now includes estimates for more than 20 new end uses.

Source: U.S. Energy Information Administration, 2015 Residential Energy Consumption Survey
How old are our rules of thumb?

Residential Code Stringency

Energy Use Intensity (EUI)

100 90 80 70 60 50


Graphic: Building Codes Assistance Project  Data: U.S. Department of Energy

25+ 20 15 12 10...

Heating Load BTU / SF (Heating CZ 5, Cooling CZ 2)
Insulation Challenges
HVAC Load Calculations

❖ BTU heating and cooling loads typically determined by ACCA Manual J, S, D calculations.

❖ Maintain comfort at “design conditions” 99% of the year, based on TMY3 data.
  ❖ 75°F summer, 70°F winter
  ❖ 50% relative humidity

❖ Systems sized at or below 140% of heating load and 115% of cooling load.

❖ Code officials are increasing enforcement of Load Calcs.


The good news - we have plenty of room for error on the heating loads.

The bad news - 8 out of the 10 hottest years on record have occurred after the TMY3 data set.

115% limit on cooling load just lost 5% of margin.

Don’t forget Heat Island Effect and humidity increases due to warmer air.
HVAC Load Calculations

- The good news - we have plenty of room for error on the heating loads.
- The bad news - 8 out of the 10 hottest years on record have occurred after the TMY3 data set.
- 115% limit on cooling load just lost 5% of margin.
- Don’t forget Heat Island Effect and humidity increases.
M&P Series Products

**AIR HANDLER**
- SVZ 12-18
- MVZ 12-36
- PVA 12-42

**CEILING MOUNT**
- SLZ 9-15
- MLZ 9-42
- PLA 12-42
- PCA 12-42

**FLOOR MOUNT**
- KI 9-18

**HORIZONTAL DUCTED**
- SEZ 9-18
- PEAD 12-42

**WALL MOUNT**
- HM 9-24
- GL 9-24
- D 30-36
- EF 9-18
- FH 6-24
- PKA 12-36

**SINGLE-ZONE**
- COOLING ONLY
  - STANDARD HP
  - HYPER-HEATING

**MULTI-ZONE**
- COOLING ONLY
  - STANDARD HP
  - HYPER-HEATING

**BRANCH BOX**
- 3 & 5 ZONE

**CONTROLS**
- Wireless Sensor
- kumo cloud™
- kumo station™
- BACnet/Modbus
- Thermostat Adapter
- Wired and Wireless Controllers
Right sizing VRF systems delivers efficiency:

- Verify building shell for load calcs
- Don’t assume rules of thumb
- DSB to match and de-rate equipment
- MyLinkDrive.com for docs, App Notes & Tech Tips

Image credit: Google Images
Residential Applications Notes (1xxx)

- Application Note 1001 - P-Series A Control Wiring Diagram
- Application Note 1003 - MSY-MCZ Wiring Diagram
- Application Note 1007 - P-Series Tanning Wiring Diagram
- Application Note 1019 - 1-3100-115_5130_115_X87-711_Wiring_Diagram
- Application Note 1011 - 1-3100-260_9610_260_X67-271_Wiring_Diagram
- Application Note 1012 - Drain Line Applications
- Application Note 1013 - Rated Capacity vs. Maximum Capacity
- Application Note 1014 - M-Series Dry Mode Description
- Application Note 1021 - M&R Series High Altitude Applications
- Application Note 1022 - Regarding Refrigerant Accessories
- Application Note 1024 - Supplemental Heat Control
- Application Note 1025 - No Simultaneous Heating and Cooling with MXZ
- Application Note 1027 - MXZ-C Wiring Diagram
- Application Note 1029 - Allowable Configurations of MVZ Air Handling Units with MXZ Multi-Zone Outdoor Units
- Application Note 1030 - MVZ FPA Electric Heater Configuration
- Application Note 1031 - TAZ MS303 Applications
- Application Note 1032 - Generator Application of HVAC Inverter Systems
- Application Note 1033 - Indoor Fan Continuous Operation
- Application Note 1034 - MXZ Branch Box Applications with Blue Diamond Pump
- Application Note 1035 - Low Ambient Cooling on M-Series Inverters
- Application Note 1036 - Applying MXZ-C Multi-Zone Systems

Commercial Applications Notes (2xxx)

- Application Note 2001 - ASHRAE Standards 15 & 34
Designing with Mini-splits

Creating comfort zones

What about small bedrooms and bathrooms?
# Diamond System Builder

## Use with Manual S – Equipment Selection

### Indoor Units:
- 3 / 2 to 3
- 30 / 15 to 30

### Capacity:
- Connectable capacity is not actual capacity:
  - Total Pipe Length: 100.0 / 230.0 feet
  - Furthest Actual: 40.0 / 82.0 feet
  - Furthest Equiv.: 40.0 / 82.0 feet

### Correction Factors:
- Outdoor Unit Capacity: 1.00 / 1.00
- Temperature: 0.97 / 0.99
- Piping Length: 0.99 / 1.00
- Defrosting: 0.95
- User Derate: 1.00 / 1.00
- Total Derate: 0.96 / 0.94
- Additional Refrigerant: 0.0 lb
- Total Refrigerant Amount: 8.8 lb

### Conditions (°F)

#### Cooling
- Indoor DB: 75.0
- Humidity: 59.0%
- Indoor WB: 64.9
- Outdoor DB: 95.0

#### Heating
- Indoor DB: 70.0
- Outdoor DB: 21.0
- Humidity: 72.8%
- Outdoor WB: 19.3

### Equipment Selection

- **MXZ-3C30NAHZ2-U1**
  - Model Number: SEZ-KD12NA4R1.TH
  - Group / Room / Tag Ref.: N/A / 2 / Master Bedroom
  - Clg. Total (Sens.): 11,048 BTU/h (7,729 BTU/h) 10,700 BTU/h
  - Mtg. Total: N/A / 3 / Living Room
  - Clg. Total (Sens.): 5,529 BTU/h (4,858 BTU/h) 5,444 BTU/h
  - Mtg. Total: N/A / 4 / Second Floor
  - Clg. Total (Sens.): 10,947 BTU/h (7,687 BTU/h)
  - Mtg. Total: N/A / 4 / Second Floor

### Website

http://meus1.mylinkdrive.com/item/Diamond_System_Builder.html
Case Studies

TINY HOMES
Clayton Homes
Maryville, TN

NET ZERO
Green Spaces
Chattanooga, TN

CUSTOM
Addison Homes
Greenville, SC

AFFORDABLE
Catawba Valley Habitat
Hickory, NC
Case Studies

LUXURY
Magleby Construction
Lindon, UT

MODULAR
Finish Werks
Savage, MD

PRODUCTION
PSW Homes
Austin, TX

PANELIZED
Eco-panels
Mocksville, NC
Case Studies

Multi Family

Distillery North Apts
Boston, MA

Village Square
Paoli, PA

North End Apts
Boston, MA

Challenge: "Selecting a space-saving, energy-efficient system that could keep a multifamily building comfortable during harsh winters".
Shawn LeMons
Performance Construction Mgr. (IECC, RESNET, LEED, PHIUS)
slemons@hvac.mea.com
720-648-0505