

eLearning with Taco

Hydronic Design: Heat Loss — Part 1

Presented by John Barba

Residential Product Training and Program Manager



Glossary of Terms

ODT — Outdoor Design Temperature. The theoretical “coldest day of the year,” specific to a geographic area, based on ASHRAE 90A-1980. According to the ASHRAE standard, the design outdoor temperature would be the same or less than the actual outdoor temperature 97-1/2% of the time.

IDT — Indoor Design Temperature. The target temperature for determining the capacity of a heating system. Generally the IDT is around 70°F.

DTD — Design Temperature Difference. The difference between the ODT and IDT. If the ODT is 5°F and the IDT is 70°F, the DTD is 65°F.

U-value — A measure of a material’s ability to conduct heat, measured in BTU/HR/Square foot of area/Degree temperature difference.

R-value — The opposite of U-value. R-value is a measure of a material’s “thermal resistance,” how well that material prevents the transmission of heat.

Infiltration heat loss — The heat lost from a structure due to heated air leaking out through cracks, crevices and around windows. That heated air is replaced by cold outside air, which needs to be heated.

Transmission heat loss — The heat lost via conduction through the building materials of the structure — through doors and windows and through the walls.

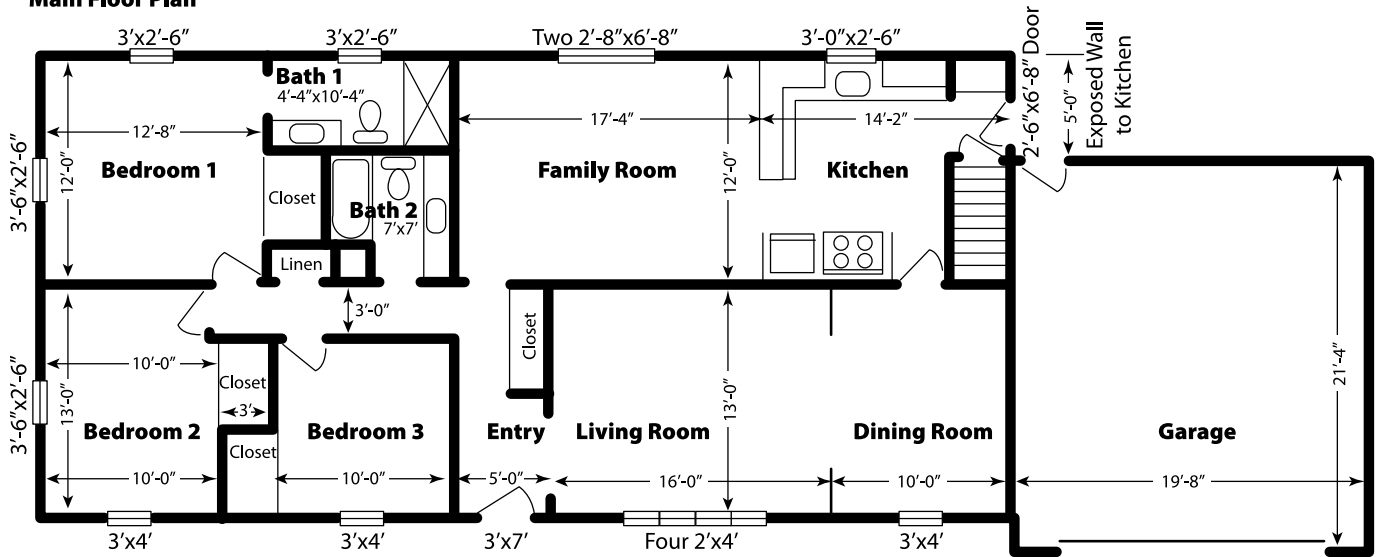
BTU — A BTU or British Thermal Unit, is a measurement of heat energy. It is the amount of heat needed to raise one pound of water one degree Fahrenheit.

BTUH

BTU’s per hour is a measurement of heat flow.

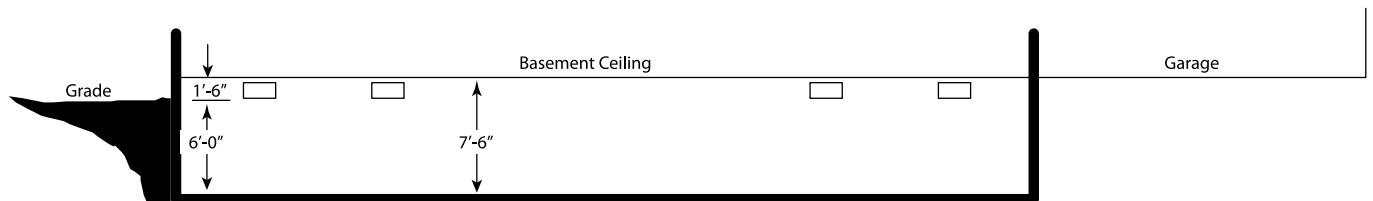
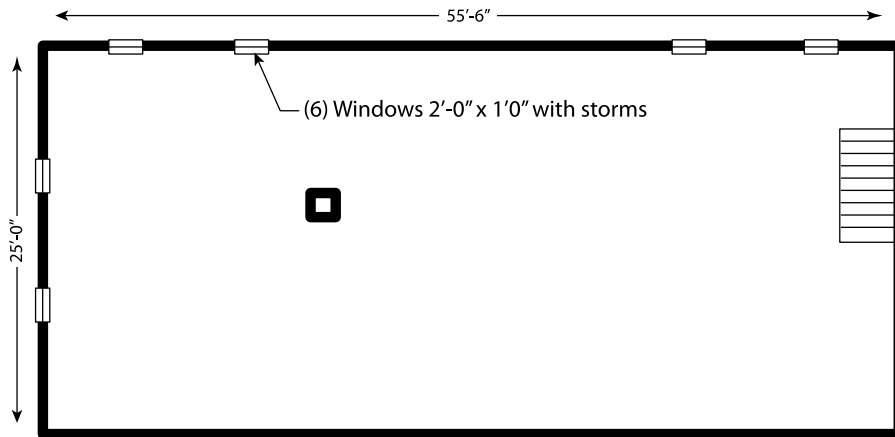
Project Floor Plan

Main Floor Plan



Main Floor Ceiling Height: 9'-0"

Basement Plan



Project Specifications

Location: Norwich, CT

(ODT) _____ (*Outdoor Design Temperature*)

(IDT) _____ (*Indoor Design Temperature*)

Walls:

Frame walls, insulation-backed vinyl siding, 5/8" plywood sheathing, 2 x 6 studs on 16" centers, R-19 insulation, vapor barrier and 1/2" drywall.

U-Factor _____

Ceilings:

1/2" drywall, R-44 insulation. No floor above. Unheated over entire area.

U-Factor _____

Windows:

Low E, double-pane, vinyl windows, with weatherstripping, without storm sash.

U-Factor _____

Basement Windows:

Low E, single pane, vinyl windows with storm sash.

U-Factor _____

Doors:

Metal with urethane core without storm door.

U-Factor _____

Sliding Glass:

Low E, double-pane, vinyl frame without storm door.

U-Factor _____

Garage: Unheated

Attic: Unheated

Basement: Heated

8" poured concrete, 2x4 studs on 16" centers,
R-13 insulation, vapor barrier and 1/2" drywall.

R-Factor _____

Table 1

Outdoor Design Temperature

Outdoor design temperature, ODT, for representative cities (At 97-1/2% frequency level, per ASHRAE 90A-1980 recommendation) Use different ODT if local conditions indicate the need. (Second number is heating degree days below 65°F)

AP= Airport AFB= Air Force Base CO= City Office

UNITED STATES

ALABAMA

Alexander City	22/.....
Anniston AP	22/2,810
Auburn	22/.....
Birmingham AP	21/2,710
Decatur	16/3,050
Dothan AP	27/1,400
Florence AP	21/3,199
Gadsden	20/3,000
Huntsville AP	16/3,190
Mobile AP	29/1,620
Mobile CO	29/1,620
Montgomery AP	25/2,250
Selma-Craig AFB	26/2,160
Talladega	22/.....
Tuscaloosa AP	23/2,590

ALASKA

Anchorage AP	-18/10,860
Barrow	-41/20,265
Fairbanks AP	-47/14,290
Juneau AP	1/9,080
Kodiak	13/8,860
Nome AP	-27/14,170

ARIZONA

Douglas AP	31/2,630
Flagstaff AP	4/7,290
Fort Huachuca AP	28/2,551
Kingman AP	25/.....
Nogales	32/2,150
Phoenix AP	34/1,680
Prescott AP	9/.....
Tucson AP	32/1,700
Winslow AP	10/4,780
Yuma AP	39/970

ARKANSAS

Blytheville AFB	15/3,760
Camden	23/.....
El Dorado AP	23/2,300
Fayetteville AP	12/3,840
Fort Smith AP	17/3,290
Hot Springs	23/2,729
Jonesboro	15/.....
Little Rock AP	20/3,170
Pine Bluff AP	22/2,588
Texarkana AP	23/2,530

CALIFORNIA

Bakersfield AP	32/2,150
Barstow	29/2,203

Blythe AP	33/.....
Burbank AP	39/1,700
Chico	30/2,835
Concord	27/3,035
Covina	35/.....
Crescent City AP	33/.....
Downey	40/.....
El Cajon	44/.....
El Centro AP	38/925
Escondido	41/.....
Eureka/Arcata AP	33/4,640
Fairfield-Travis AFB	32/2,725
Fresno AP	30/2,610
Hamilton AFB	32/3,311
Laguna Beach	43/.....
Livermore	27/3,035
Lompoc, Vandenberg AFB	38/3,451
Long Beach AP	43/1,803
Los Angeles AP	43/1,960
Los Angeles CO	40/1,960
Merced-Castle AFB	31/2,470
Modesto	30/.....
Monterey	38/2,750
Napa	32/.....
Needles AP	33/.....
Oakland AP	36/2,940
Oceanside	43/.....
Ontario	33/2,009
Oxnard	36/.....
Palmdale AP	22/2,929
Palm Springs	35/.....
Pasadena	35/1,694
Petaluma	29/.....
Pomona CO	30/2,166
Redding AP	31/.....
Redlands	33/.....
Richmond	36/.....
Riverside-March AFB	32/2,162
Sacramento AP	32/2,700
Salinas AP	32/.....
San Bernadino, Norton AFB	33
San Diego AP	44/1,500
San Fernando	39
San Francisco AP	38/3,040
San Francisco CO	40/3,040
San Jose AP	36/2,416
San Luis Obispo	35/2,472
Santa Ana AP	39/1,675
Santa Barbara MAP	36/2,470
Santa Cruz	38/.....
Santa Maria AP	33/2,930
Santa Monica CO	43/.....
Santa Paula	35/.....
Santa Rosa	29/3,065
Stockton AP	30/2,806

Ukiah	29/.....
Visalia	30/.....
Yreka	17/.....
Yuba City	31/.....

COLORADO

Alamosa AP	-16/8,529
Boulder	8/.....
Colorado Springs AP	2/6,410
Denver AP	1/6,150
Durango	4
Fort Collins	-4/.....
Grand Junction AP	7/5,660
Greeley	-5/.....
LaJunta AP	3/5,132
Leadville	-4/.....
Pueblo AP	0/5,480
Sterling	-2/.....
Trinidad AP	3/5,330

CONNECTICUT

Bridgeport AP	9/5,617
Hartford, Brainard Field	7/6,170
New Haven AP	7/5,890
New London	9/.....
Norwalk	9/.....
Norwich	7/.....
Waterbury	2/6,672
Windsor Locks, Bradley Field (S)	4/6,350

DELAWARE

Dover AFB	15/4,700
Wilmington AP	14/4,930

DISTRICT OF COLUMBIA

Andrews AFB	14/.....
Washington
National AP	17/4,240

FLORIDA

Belle Glade	44/.....
Cape Kennedy AP	38/711
Daytona Beach AP	35/879
Fort Lauderdale	46/244
Fort Myers AP	44/442
Fort Pierce	42/.....
Gainesville AP	31/1,081
Jacksonville AP	32/1,230
Key West AP	57/110
Lakeland CO	41/661
Miami AP	47/200
Miami Beach CO	48/200
Ocala	34
Orlando AP	38/720
Panama City, Tyndall AFB	33/1,390
Pensacola CO	29/1,480

Table 1 (Continued)

Outdoor Design Temperature (continued)

Outdoor design temperature, ODT, for representative cities (At 97-1/2% frequency level, per ASHRAE 90A-1980 recommendation)
Use different ODT if local conditions indicate the need. (Second number is heating degree days below 65°F)

AP= Airport AFB= Air Force Base CO= City Office

St. Augustine	35/1,051	Decatur	2/5,480	Keokuk	0/6,404
St. Petersburg	40/670	Dixon	-2/....	Marshalltown	-7/6,850
Sanford	38/....	Elgin	-2/....	Mason City AP	-11/7,790
Sarasota	42/....	Freeport	-4	Newton	-5/....
Tallahassee AP	30/1,520	Galesburg	-2/6,005	Ottumwa AP	-4/....
Tampa AP	40/700	Greenville	4/....	Sioux City AP	-7/6,960
West Palm Beach AP	45/270	Joliet	0/6,180	Waterloo	-10/7,370
GEORGIA		Kankakee	1/6,040	KANSAS	
Albany, Turner AFB	29/1,760	LaSalle/Peru	-2/....	Atchison	2/....
Americus	25/....	Macomb	0/....	Chanute AP	7/4,566
Athens	22/2,929	Moline AP	-4/6,410	Dodge City AP	5/....
Atlanta AP	22/2,990	Mt. Vernon	5/....	El Dorado	7/4,990
Augusta AP	23/2,410	Peoria AP	-4/6,070	Emporia	5/....
Brunswick	32/1,531	Quincy AP	3/5,267	Garden City AP	4/....
Columbus, Lawson AFB ...	24/2,380	Rantoul, Chanute AFB	1/5,966	Goodland AP	0/6,140
Dalton	22/....	Rockford	-4/6,840	Great Bend	4/....
Dublin	25/....	Springfield AP	2/5,530	Hutchinson AP	8/4,680
Gainesville	27/....	Waukegan	-3/....	Liberal	7/....
Griffin	22/....	INDIANA		Manhattan, Fort Riley	3/5,306
La Grange	23/....	Anderson	6/5,580	Parsons	9/4,158
Macon AP	25/2,160	Bedford	5/....	Russel AP	4/....
Marietta, Dobbins AFB	21/3,080	Bloomington	5/4,860	Salina	5/4,970
Moultrie	30/....	Columbus, Bakalar AFB	7/5,132	Topeka AP	4/5,210
Rome AP	22/3,326	Crawfordsville	3/....	Wichita AP	7/4,640
Savannah-Travis AP	27/1,850	Evansville AP	9/4,500	KENTUCKY	
Valdosta-Moody AFB	31/1,520	Fort Wayne AP	1/6,220	Ashland	10/4,555
Waycross	29/....	Goshen AP	1	Bowling Green AP	10/4,280
HAWAII		Hobart	2/....	Corbin AP	9/....
Hilo AP	62/0	Huntington	1/....	Covington AP	6/5,260
Honolulu AP	63/0	Indianapolis AP	2/5,630	Hopkinsville Campbell AFB	10/4,290
Kaneohe Bay MCAS	66/0	Jeffersonville	10/....	Lexington AP	8/4,760
Wahalwa	59/10	Kokomo	0/5,590	Louisville AP	10/4,610
IDAHO		Lafayette	3/5,820	Madisonville	10/....
Boise AP	10/5,830	LaPorte	3/....	Owensboro	10/4,200
Burley	2/....	Marion	0/....	Paducah	12/3,650
Coeur D'Alene AP	-1/6,660	Muncie	2/5,950	LOUISIANA	
Idaho Falls AP	-6/7,890	Peru, Bunker Hill AFB	-1	Alexandria AP	27/2,000
Lewiston AP	6/5,500	Richmond AP	2/....	Baton Rouge AP	29/1,610
Moscow	0/....	Shelbyville	3/....	Bogalusa	28/....
Mountain Home AFB	12/6,120	South Bend AP	1/6,460	Houma	35/....
Pocatello AP	-1/7,030	Terre Haute AP	4/5,360	Lafayette AP	30/1,550
Twin Falls AP	2/6,730	Valparaise	3/....	Lake Charles AP	31/1,490
ILLINOIS		Vincennes	6/....	Minden	25/....
Aurora	-1/6,660	IOWA		Monroe AP	25/2,310
Bellefonte, Scott AFB	6/4,480	Ames	-6/....	Natchitoches	26/....
Bloomington	-2/....	Burlington AP	-3/6,120	New Orleans AP	33/1,400
Carbondale	7/....	Cedar Rapids AP	-5/6,600	Shreveport AP	25/2,160
Champaign/Urbana	2/5,800	Clinton	-3/....	MAINE	
Chicago, Midway AP	0/6,160	Council Bluffs	-3/6,610	Augusta AP	-3/7,826
Chicago, O'Hare AP	-4/6,640	Des Moines AP	-5/6,610	Bangor, Dow AFB	-6/8,220
Chicago CO	2/6,640	Debuque	-7/7,380	Caribou AP	-13/9,770
Danville	1/5,538	Fort Dodge	-7/7,070	Lewiston	-2/7,690
		Iowa City	-6/6,404		

Table 1 (Continued)

Outdoor Design Temperature (continued)

Outdoor design temperature, ODT, for representative cities (At 97-1/2% frequency level, per ASHRAE 90A-1980 recommendation)
Use different ODT if local conditions indicate the need. (Second number is heating degree days below 65°F)

AP= Airport AFB= Air Force Base CO= City Office

Millinocket AP	-9/8,533
Portland	-1/7,570
Waterville	-4/.....

MARYLAND

Baltimore AP	13/4,680
Baltimore CO	17/.....
Cumberland	10/5,070
Frederick AP	12/5,030
Hagerstown	12/5,130
Salisbury	16/4,220

MASSACHUSETTS

Boston AP	9/5,630
Clinton	2/.....
Fall River	9/5,774
Framingham	6/.....
Gloucester	5/.....
Greenfield	-2/.....
Lawrence	0/6,195
Lowell	1/6,060
New Bedford	9/5,400
Pittsfield AP	-3/7,580
Springfield, Westover AFB ..	0/5,840
Taunton	9/.....
Worcester AP	4/6,970

MICHIGAN

Adrian	3/.....
Alpena AP	-6/8,510
Battle Creek AP	5/6,580
Benton Harbor AP	5/.....
Detroit	6/6,290
Escanaba	-7/8,481
Flint AP	1/7,200
Grand Rapids AP	5/6,890
Holland	6/.....
Jackson AP	5/.....
Kalamazoo	5/.....
Lansing AP	1/6,940
Marquette CO	-8/8,390
Mt. Pleasant	4/.....
Muskegon AP	6/6,700
Pontiac	4/.....
Port Huron	4/6,564
Saginaw AP	4/7,120
Sault Ste. Marie AP	-8/9,050
Traverse City AP	1/7,700
Ypsilanti	5/6,424

MINNESOTA

Albert Lea	-12/.....
Alexandria AP	-16/.....
Bemidji AP	-26/10,203
Brainerd	-16/.....
Duluth AP	-16/9,890

Fairbault	-12/.....
Fergus Falls	-17/.....
International Falls AP	-25/10,600
Mankato	-12/8,310
Minneapolis/St. Paul AP ..	-12/8,250
Rochester AP	-12/8,295
St. Cloud AP	-11/8,890
Virginia	-21/.....
Wilmar	-11/.....
Winona	-10/.....

MISSISSIPPI

Biloxi, Keesler AFB	31/1,500
Clarksdale	19/.....
Columbus AFB	20/2,890
Greenville AFB	20/2,580
Greenwood	20/.....
Hattiesburg	27/1,840
Jackson AP	25/2,260
Laurel	27/.....
McComb AP	26/.....
Meridian AP	23/2,340
Natchez	27/1,800
Tupelo	19/.....
Vicksburg CO	26/2,040

MISSOURI

Cape Girardeau	13/.....
Columbia AP	4/5,070
Farmington AP	8/.....
Hannibal	3/5,512
Jefferson City	7/4,620
Joplin AP	10/4,090
Kansas City AP	6/4,750
Kirksville AP	0/.....
Mexico	4/.....
Moberly	3/.....
Poplar Bluff	16/3,910
Rolla	9/.....
St. Joseph AP	2/5,440
St. Louis AP	6/4,900
St. Louis CO	8/.....
Sedalia, Whiteman AFB	4/5,012
Sikeston	15/.....
Springfield AP	9/4,900

MONTANA

Billings AP	-10/7,150
Bozeman	-14/.....
Butte AP	-17/9,730
Cut Bank AP	-20/9,033
Glasgow AP	-18/9,000
Glendale	-13/.....
Great Falls AP	-15/7,670
Havre	-11/8,880
Helena AP	-16/8,190

Kalispell AP	-7/8,150
Lewiston AP	-16/8,586
Livingston AP	-14/.....
Miles City AP	-15/7,810
Missoula AP	-6/8,000

NEBRASKA

Beatrice	-2/.....
Chadron AP	-3/7,100
Columbus	-2/.....
Fremont	-2/.....
Grand Island AP	-3/6,440
Hastings	-3/6,070
Kearney	-4/.....
Lincoln CO	-2/6,050
McCook	-2/.....
Norfolk	-4/7,010
North Platte AP	-4/6,680
Omaha AP	-3/6,290
Scottsbluff AP	-3/6,670
Sidney AP	-3/7,030

NEVADA

Carson City	9/5,753
Elko AP	-2/7,430
Ely AP	-4/7,710
Las Vegas AP	28/2,610
Lovelock AP	12/.....
Reno AP	10/6,150
Reno CO	11/.....
Tonopah AP	10/5,900
Winnemucca AP	3/6,760

NEW HAMPSHIRE

Berlin	-9/8,270
Claremont	-4/7,850
Concord AP	-3/7,360
Keene	-7/7,460
Laconia	-5/7,560
Manchester, Grenier AFB ..	-3/7,100
Portsmouth, Pease AFB	2/6,710

NEW JERSEY

Atlantic City CO	13/4,810
Long Branch	13/.....
Newark AP	14/4,900
New Brunswick	10/5,400
Paterson	10/5,360
Phillipsburg	6/.....
Trenton CO	14/4,980
Vineland	11/.....

NEW MEXICO

Alamogordo, Holloman AFB	19/3,240
Albuquerque AP	16/4,250
Artesia	19/.....

Table 1 (Continued)

Outdoor Design Temperature (continued)

Outdoor design temperature, ODT, for representative cities (At 97-1/2% frequency level, per ASHRAE 90A-1980 recommendation) Use different ODT if local conditions indicate the need. (Second number is heating degree days below 65°F)

AP= Airport AFB= Air Force Base CO= City Office

Carlsbad AP	19/2,835
Clovis AP	13/4,200
Farmington AP	6/5,713
Gallup	5/.....
Grants	4/.....
Hobbs AP	18/.....
Las Cruces	20/3,194
Los Alamos	9/.....
Raton AP	1/6,228
Roswell, Walker AFB	18/3,680
Santa Fe CO	10/6,120
Silver City AP	10/3,705
Socorro AP	17/.....
Tucumcari AP	13/4,047

NEW YORK

Albany AP	-1/6,900
Albany CO	1/.....
Auburn	2/.....
Batavia	5/.....
Binghamton AP	1/7,340
Buffalo AP	6/6,960
Cortland	0/.....
Dunkirk	9/6,851
Elmira AP	1/.....
Geneva	2/.....
Glen Falls	-5/7,270
Gloversville	-2/.....
Hornell	0/.....
Ithaca	0/7,052
Jamestown	3/6,849
Kingston	2/.....
Lockport	7/6,724
Massena AP	-8/.....
Newburg-Stewart AFB	4/6,336
NYC-Central Park	15/4,880
NYC-Kennedy AP	15/5,219
NYC-La Guardia AP	15/4,811
Niagra Falls ANYC-LaP	7/6,688
Olean	2
Oneonta	-4/.....
Oswego CO	7/6,792
Plattsburg AFB	-8/8,044
Poughkeepsie	6/5,820
Rochester AP	5/6,760
Rome-Griffiss AFB	-5/7,331
Schenectady	1/6,650
Suffolk County AFB	10/5,951
Syracuse AP	2/6,720
Utica	-6/7,200
Watertown	-6/7,300

NORTH CAROLINA

Asheville AP	14/4,130
Charlotte AP	22/3,200

Durham	20/.....
Elizabeth City AP	19/3,207
Fayetteville, Pope AFB	20/3,080
Goldsboro, Seymour-Johnson AFB	21/3,124
Greensboro AP	18/3,810
Greenville	21/.....
Henderson	15/.....
Hickory	18/.....
Jacksonville	24/.....
Lumberton	21/.....
New Bern AP	24/.....
Raleigh/Durham AP	20/3,440
Rocky Mount	21/.....
Wilmington AP	26/2,380
Winston-Salem AP	20/3,650

NORTH DAKOTA

Bismark AP	-19/8,960
Devil's Lake	-21/9,901
Dickinson AP	-17/8,942
Fargo AP	-18/9,250
Grands Forks AP	-22/9,930
Jamestown AP	-18/.....
Minot AP	-20/9,610
Williston	-21/9,180

OHIO

Akron-Canton AP	6/6,140
Ashtabula	9/.....
Athens	6/.....
Bowling Green	2/.....
Cambridge	7/.....
Chillicothe	6/.....
Cincinnati CO	6/4,830
Cleveland AP	5/6,200
Columbus AP	5/5,670
Dayton AP	4/5,620
Defiance	4/.....
Findlay AP	3/.....
Fremont	1/.....
Hamilton	5/.....
Lancaster	5/.....
Lima	4/5,870
Mansfield AP	5/6,403
Marion	5/.....
Middletown	5/.....
Newark	5/5,655
Norwalk	1/.....
Portsmouth	10/4,410
Sandusky GO	6/5,796
Springfield	3/4,284
Stubenville	5/.....
Toledo AP	1/6,430
Warren	5/.....
Wooster	6/.....

Youngstown AP	4/6,370
Zanesville AP	7/.....

OKLAHOMA

Ada	14/.....
Altus AFB	16/3,190
Ardmore	17/3,060
Bartlesville	10/.....
Chickasha	14/.....
Enid-Vance AFB	13/3,971
Lawton AP	16/3,250
McAlester	19/3,255
Muskogee AP	15/.....
Norman	13/3,247
Oklahoma City AP	13/3,700
Ponca City	9/3,850
Seminole	15/.....
Stillwater	13/.....
Tulsa AP	13/3,730
Woodward	10/.....

OREGON

Albany	22/.....
Astoria AP	29/5,190
Baker AP	6/.....
Bend	4/.....
Corvallis	22/4,854
Eugene AP	22/4,740
Grants Pass	24/4,375
Klamath Falls AP	9/6,810
Medford AP	23/4,880
Pendleton AP	5/4,700
Portland AP	23/4,635
Portland CO	24/.....
Roseburg AP	23/4,491
Salem AP	23/4,760
The Dallas	19/.....

PENNSYLVANIA

Allentown AP	9/5,810
Altoona CO	5/6,192
Butler	6/.....
Chambersburg	8/5,170
Erie AP	9/6,540
Harrisburg AP	11/5,280
Johnstown	2/7,804
Lancaster	8/5,560
Meadville	4/.....
New Castle	7/5,800
Philadelphia AP	14/5,180
Pittsburgh AP	5/5,950
Pittsburgh GO	7/.....
Reading CO	13/4,960
Scranton/Wilkes-Barre	5/6,160
State College	7/6,160
Sunbury	7/.....

Table 1 (Continued)

Outdoor Design Temperature (continued)

Outdoor design temperature, ODT, for representative cities (At 97-1/2% frequency level, per ASHRAE 90A-1980 recommendation)
Use different ODT if local conditions indicate the need. (Second number is heating degree days below 65°F)

AP= Airport AFB= Air Force Base CO= City Office

West Chester	13/...
Williamsport AP	7/5,950
York	12/...

RHODE ISLAND

Newport	9/5,800
Providence AP	9/5,950

SOUTH CAROLINA

Anderson	23/...
Charleston AFB	27/2,070
Charleston CO	28/2,146
Columbia AP	24/2,520
Florence AP	25/2,480
Georgetown	26/2,228
Greenville AP	22/3,070
Greenwood	22/2,890
Orangeburg	24/...
Rock Hill	23/...
Spartanburg AP	22/...
Sumter-Shaw AFB	25/2,453

SOUTH DAKOTA

Aberdeen AP	-15/8,620
Brookings	-13/...
Huron AP	-14/8,220
Mitchel	-10/...
Pierre AP	-10/7,550
Rapid City AP	-7/7,370
Sioux Falls AP	-11/7,840
Watertown AP	-15/8,390
Yankton	-7/...

TENNESSEE

Athens	18/...
Bristol-Tri City AP	14/4,143
Chattanooga AP	18/3,380
Clarksville	12/...
Columbia	15/...
Dyersburg	15/...
Greenville	16/...
Jackson AP	16/3,350
Knoxville AP	19/3,510
Memphis AP	18/3,210
Murfreesboro	14/...
Nashville AP	14/3,610
Tulahoma	13/3,577

TEXAS

Abilene AP	20/2,620
Alice AP	34/...
Amarillo AP	11/4,140
Austin AP	28/1,720
Bay City	33/...
Beaumont	31/1,370
Beeville	33/1,189

Big Springs AP	20/...
Brownsville AP	39/600
Brownwood	22/2,437
Bryan AP	29/1,640
Corpus Christi AP	35/930
Corsicana	25/...
Dallas AP	22/2,320
Del Rio, Laughlin AFB	31/1,520
Denton	22/...
Eagle Pass	32/1,423
El Paso AP	24/2,680
Fort Worth AP	22/2,390
Galveston AP	36/1,270
Greenville	22/...
Harlingen	39/693
Houston AP	32/1,410
Houston CO	33/...
Huntsville	27/...
Killeen-Gray AFB	25/...
Lamesa	17/...
Laredo AFB	36/800
Longview	24/...
Lubbock AP	15/3,570
Lufkin AP	29/1,940
McAllen	39/...
Midland AP	21/2,600
Mineral Wells AP	22/...
Palestine CO	27/...
Pampa	12/...
Pecos	21/...
Plainview	13/...
Port Arthur AP	31/1,447
San Angelo, Goodfellow AFB	22/2,220
San Antonio AP	30/1,560
Sherman-Perrin AFB	20/2,837
Snyder	18/...
Temple	27/...
Tyler AP	24/...
Vernon	17/...
Victoria AP	32/1,160
Waco AP	26/2,040
Wichita Falls AP	18/2,900

UTAH

Cedar City AP	5/5,680
Logan	2/6,750
Moab	11/...
Ogden AP	5/6,012
Price	5/...
Provo	6/5,720
Richfield	5/...
St. George CO	21/...
Salt Lake City AP	8/5,990
Vernal AP	0/...

VERMONT

Barre	-11/...
Burlington AP	-7/8,030
Rutland	-8/7,440

VIRGINIA

Charlottesville	18/4,220
Danville AP	16/3,510
Fredericksburg	14/...
Harrisonburg	16/...
Lynchburg AP	16/4,166
Norfolk AP	22/3,440
Petersburg	17/...
Richmond AP	17/3,910
Roanoke AP	16/4,150
Staunton	16/4,307
Winchester	10/4,780

WASHINGTON

Aberdeen	28/5,316
Bellingham AP	15/5,420
Bremerton	25/5,432
Ellensburg AP	6/...
Everett-Paine AFB	25/5,940
Kennewick	11/...
Longview	24/5,064
Moses Lake, Larson AFB	7/...
Olympia AP	22/5,236
Port Angeles	27/...
Seattle-Boeing Fld	26/...
Seattle CO	27/4,424
Seattle-Tacoma AP	26/5,190
Spokane AP	2/6,770
Tacoma-McChord AFB	24/5,287
Walla Walla AP	7/4,800
Wenatchee	11/...
Yakima AP	5/5,950

WEST VIRGINIA

Beckley	4/5,615
Bluefield AP	4/5,000
Charleston AP	11/4,510
Clarksburg	10/4,590
Elkins AP	6/5,680
Huntington CO	10/4,340
Martinsburg AP	10/5,231
Morgantown AP	8/5,100
Parkersburg CO,	11/4,780
Wheeling	5/5,220

WISCONSIN

Appleton	-9/...
Ashland	-16/...
Beloit	-3/...
Eau Claire AP	-11/7,970
Fond du Lac	-8/...

Table 1 (Continued)

Outdoor Design Temperature (continued)

Outdoor design temperature, ODT, for representative cities (At 97-1/2% frequency level, per ASHRAE 90A-1980 recommendation)
Use different ODT if local conditions indicate the need. (Second number is heating degree days below 65°F)

AP= Airport AFB= Air Force Base CO= City Office

Green Bay AP	-9/8,100
LaCrosse AP	-9/7,530
Madison AP	-7/7,720
Manitowoc	-7/.....
Marinette	-11/.....
Milwaukee AP	-4/7,470
Racine	-2/.....
Sheboygan	-6/.....
Stevens Point	-11/.....
Waukesha	-5/.....
Wausau AP	-12/8,490

WYOMING

Casper AP	-5/7,510
Cheyenne AP	-1/7,370
Cody AP	-13/.....
Evanston	-3/.....
Lander AP	-11/7,870
Laramie AP	-6/7,560
Newcastle	-12/.....
Rawlins	-4/.....
Rock Springs AP	-3/8,430
Sheridan AP	-8/7,740
Torrington	-8/.....

CANADA

ALBERTA

Calgary AP	-23/9,703
Edmonton AP	-25/10,268
Grande Prairie AP	-33/11,129
Jasper	-26/10,112
Lethbridge AP	-22/8,644
McMurray AP	-38/12,462
Medicine Hat AP	-24/8,852
Red Deer AP	-26/10,302

BRITISH COLUMBIA

Dawson Creek	-33/10,800
Fort Nelson AP	-40/10,874
Kamloops CO	-15/6,799
Nanaimo	20/5,554
New Westminster	18/.....
Penticton AP	4/6,522
Prince George AP	-28/9,755
Prince Rupert CO	2/2,029
Trail	0/6,711

Vancouver AP	19/5,515
Victoria CO	23/5,579

MANITOBA

Brandon	-27/10,828
Churchill AP	-39/16,728
Dauphin AP	-28/.....
Flin Flon	-37/12,414
Portage la Prairie AP	-24/10,800
The Pas AP	-33/12,281
Winnipeg AP	-27/10,679

NEW BRUNSWICK

Campbellton CO	-14/.....
Chatham AP	-10/.....
Edmundston CO	-16/9,796
Fredericton AP	-11/8,671
Moncton AP	-8/8,711
Saint John AP	-8/8,453

NEWFOUNDLAND

Corner Brook	0/8,978
Gander AP	-1/9,254
Goose Bay AP	-24/11,887
St. John's AP	7/8,991
Stephenville AP	4/8,717

NORTHWEST TERRITORY

Fort Smith AP	-45/.....
Frobisher AP	-41/17,876
Inuvik	-53/.....
Resolute AP	-47/22,673
Yellowknife AP	-46/15,634

NOVA SCOTIA

Amherst	-6/8,400
Halifax AP	5/7,361
Kentville	1/7,792
New Glasgow	-5/.....
Sydney AP	3/8,049
Truro CO	-5/8,226
Yarmouth AP	9/7,340

ONTARIO

Belleville	-7/7,709
Chatham	3/6,503
Cornwall	-9/8,200
Hamilton	1/6,821
Kaupuskasing AP	-28/11,560
Kenora AP	-28/10,796
Kingston	-7/7,724
Kitchener	-2/7,566
London AP	0/7,349
North Bay AP	-18/9,677
Oshawa	-3/7,600
Ottawa AP	-13/8,693

Owen Sound	-2/.....
Peterborough	-9/8,309
St. Catharines	3/6,537
Sarnia	3/7,061
Sault Ste. Marie AP	-13/9,500
Sudbury AP	-19/9,600
Thunder Bay AP	-24/10,405
Timmins AP	-29/11,400
Toronto AP	-1/6,827
Windsor AP	4/6,579

PRINCE EDWARD ISLAND

Charlottetown AP	-4/8,486
Summerside AP	-4/8,440

QUEBEC

Bagotville AP	-23/.....
Chicoutimi	-22/10,104
Drummondville	-14/8,700
Granby	-14/8,400
Hull	-14/8,700
Megantic AP	-16/.....
Montreal AP	-10/8,213
Quebec AP	-14/8,937
Rimouski	-12/9,906
St. Jean	-11/8,500
St. Jeroime	-13/9,285
Sept. Iles AP	-21/.....
Shawinigan	-14/9,380
Sherbrooke CO	-21/8,490
Theftord Mines	-14/9,815
Trois Rivières	-13/9,306
Val d'Or	-27/11,169
Valleyfield	-10/8,300

SASKATCHEWAN

Estevan AP	-25/9,950
Moose Jaw AP	-25/9,894
North Battleford AP	-30/11,082
Prince Albert AP	-35/11,630
Regina AP	-29/10,806
Saskatoon AP	-31/10,856
Swift Current AP	-25/9,849
Yorkton AP	-30/11,362

YUKON TERRITORY

Whitehorse AP	-43/12,475
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Table 2

Infiltration Heat Loss Factors

NOTE: Number of air changes per hour = infiltration factor divided by 0.018

1	Infiltration heat loss factors Windows/doors NOT weatherstripped and NO storm sash	FACTOR
a	Room with windows or doors ONE side only	0.018
b	Room with windows or doors TWO sides	0.027
c	Room with windows or doors THREE sides	0.036
d	Entry Hall	0.036
e	Sun room with many windows on THREE sides	0.054
2	Infiltration heat loss factors Windows/doors ARE weatherstripped and OR WITH storm sash	FACTOR
a	Room with windows or doors ONE side only	0.012
b	Room with windows or doors TWO sides	0.018
c	Room with windows or doors THREE sides	0.027
d	Entry Hall	0.027
e	Sun room with many windows on THREE sides	0.036
3	Infiltration heat loss factors Porous wall construction (frame with no sheathing or plain block)	FACTOR
a	Room with ONE outside wall, with or without windows/doors	0.027
b	Room with TWO outside walls, with or without windows/doors	0.045
c	Room with THREE outside walls, with or without windows/doors	0.068
d	Room with FOUR outside walls, with or without windows/doors	0.068

Table 3

Transmission Heat Loss Factors (4 through 8)

4	Windows		Without storm sash			With storm sash		
	Frame - Thermal break -		Aluminum		Wood/vinyl	Aluminum		Wood/vinyl
			No	Yes	n/a	No	Yes	n/a
a		Single glass or acrylic	1.155	1.045	0.990	0.650	0.525	0.475
b		Low emittance single glass (e = .60)	1.071	0.696	0.918	0.572	0.462	0.418
c		Double glass	0.725	0.609	0.551	0.490	0.385	0.341
d		Low emittance double glass	0.475	0.399	0.361	0.378	0.297	0.263
e		Triple glass	0.546	0.439	0.380	0.378	0.311	0.263
f		Low emittance triple glass	0.448	0.360	0.312	-	-	-
g		Jalousie windows	1.100	-	-	0.500	-	-
5	Skylights		Aluminum		Wood/vinyl			
	Frame - Thermal break -		No	Yes	n/a			
a		Single clear glass	1.292	1.169	1.107			
b		Single plastic dome	1.208	1.093	1.035			
c		Double glass or plastic	0.875	0.735	0.665			
d		Double low emittance glass	0.650	0.546	0.494			
6	Wood doors		Storm door					
			None	Wood		Metal		
a		Panel door	0.670	0.360	0.410			
b		Hollow core	0.560	0.330	0.360			
c		Solid core	0.460	0.290	0.320			
7	Metal doors		Storm door					
			None	Wood		Metal		
a		Fiberglass or mineral wool core	0.59	-	0.37			
b		Polystyrene core	0.47	-	0.32			
c		Urethane core	0.19	-	0.17			
8	Sliding glass doors		Without storm door			With storm door		
	Frame - Thermal break -		Aluminum		Wood/vinyl	Aluminum		Wood/vinyl
			No	Yes	n/a	No	Yes	n/a
a		Single pane clear glass	1.155	1.045	0.990	0.650	0.525	0.475
b		Single pane low emittance glass	0.956	0.865	0.819	0.572	0.462	0.418
c		Double pane clear glass	0.725	0.609	0.551	0.490	0.385	0.341
d		Double pane low emittance glass	0.475	0.399	0.361	0.378	0.297	0.263
e		Triple pane clear glass	0.490	0.385	0.341	-	-	-
f		Triple pane low emittance glass	0.378	0.297	0.263	-	-	-

Table 3 (Continued)

Transmission Heat Loss Factors (9 through 11)

9	French doors		Aluminum		Wood/vinyl
	Frame - Thermal break -		No	Yes	n/a
a	Single pane clear glass		1.210	0.990	0.935
b	Single pane low emittance glass		1.001	0.819	0.774
c	Double pane clear glass		0.754	0.551	0.522
d	Double pane low emittance glass		0.494	0.361	0.342
e	Triple pane clear glass		0.585	0.390	0.371
f	Triple pane low emittance glass		0.405	0.270	0.257

10	Frame Walls - wood or asbestos-cement - Siding						U Factor	
		Paper	Sheathing	Studs	Cavity Insulation	Vapor Seal		Inside
a*	Wood	None	None	2x4 @ 16" ctrs	None	No	1/2" drywall	0.330
b	Wood	None	5/8" plywood	2x4 @ 16" ctrs	None	No	1/2" drywall	0.250
c	Asbestos-cement over wood	Yes	None	2x4 @ 16" ctrs	None	No	1/2" drywall	0.300
d	Asbestos-cement over wood	Yes	5/8" plywood	2x4 @ 16" ctrs	None	No	1/2" drywall	0.230
e	Asbestos-cement shingles	Yes	5/8" plywood	2x4 @ 16" ctrs	None	No	1/2" drywall	0.290
f	Wood	Yes	5/8" plywood	2x4 @ 16" ctrs	1/2" board	No	plaster	0.190
g	Wood	None	25/32" insulating board	2x4 @ 16" ctrs	None	No	1/2" drywall	0.220
h	Wood	Yes	5/8" plywood sheathing w/ 1/2" flex insulation in contact with sheathing	2x4 @ 16" ctrs	None	No	1/2" drywall	0.180
i	Wood	Yes	5/8" plywood sheathing with 1/2" flex insulation, air space both sides	2x4 @ 16" ctrs	None	No	1/2" drywall	0.150
j	Wood	Yes	5/8" plywood	2x4 @ 16" ctrs	3 1/2" (R-13)	No	1/2" drywall	0.080
k	Wood	Yes	5/8" plywood	2x4 @ 16" ctrs	2" (R-7)	No	1/2" drywall	0.100
l	Wood	Yes	1" styrofoam board	2x4 @ 16" ctrs	3 1/2" (R-13)	No	1/2" drywall	0.067
m	3/4" x 10" wood siding	None	5/8" plywood	2x6 @ 24" ctrs	6" (R-19)	Yes	1/2" drywall	0.059
n	3/4" x 10" wood siding	None	1" styrofoam board	2x6 @ 24" ctrs	6" (R-19)	Yes	1/2" drywall	0.050

11	Frame Walls - aluminum or vinyl - Siding						U Factor	
		Paper	Sheathing	Studs	Cavity Insulation	Vapor Seal		Inside
a	Hollow	Yes	5/8" plywood	2x4 @ 16" ctrs	3 1/2" (R-13)	Yes	1/2" drywall	0.087
b	Hollow	Yes	5/8" plywood	2x6 @ 24" ctrs	6" (R-19)	Yes	1/2" drywall	0.067
c	Insulation backed	Yes	5/8" plywood	2x4 @ 16" ctrs	3 1/2" (R-13)	Yes	1/2" drywall	0.079
d	Insulation backed	Yes	5/8" plywood	2x6 @ 16" ctrs	6" (R-19)	Yes	1/2" drywall	0.058
e	Insulation backed	Yes	5/8" plywood	2x6 @ 24" ctrs	6" (R-19)	Yes	1/2" drywall	0.057
f	Insulation backed	Yes	5/8" plywood + 1" extr. polystyrene	2x4 @ 16" ctrs	3 1/2" (R-13)	Yes	1/2" drywall	0.044

Table 3 (Continued)

Transmission Heat Loss Factors (12 through 14)

12 Frame Walls - Stucco								
		Paper	Sheathing	Studs	Cavity Insulation	Vapor Seal	Inside	U Factor
a	Stucco exterior	None	5/8" plywood	2x4 @ 16" ctrs	3 1/2" (R-13)	Yes	1/2" drywall	0.081
b	Stucco exterior	None	5/8" plywood	2x6 @ 24" ctrs	6" (R-19)	Yes	1/2" drywall	0.058
c	Stucco on 8" hollow tile	None	Furred	None	Plaster on 1/2" insulating board			0.250
d	Stucco on 8" hollow tile	None	Furred	None	Plaster on 1/2" insulating board			0.190
13 Walls - Brick								
		Paper	Sheathing	Studs	Cavity Insulation	Vapor Seal	Inside	U Factor
a	8" brick	None	None	None	None	No	1/2" plaster	0.470
b	8" brick	None	Furred	None	None	No	Lath/plaster	0.310
c	12" brick	None	None	None	None	No	1/2" plaster	0.330
d	12" brick	None	Furred	None	None	No	Lath/plaster	0.250
e	4" brick, 8" hollow tile	None	None	None	None	No	1/2" plaster	0.310
f	4" brick, 8" hollow tile	None	Furred	None	None	No	1/2" drywall	0.230
g	4" brick, 4" lt. wt. aggregate block	None	Furred	None	None	No	1/2" drywall	0.250
h	4" brick	Yes	5/8" plywood	2x4 @ 16" ctrs	None	No	1/2" drywall	0.290
i	8" brick	None	1/2" insulating board, furred	None	None	No	1/2" plaster	0.220
j	12" brick	None	1/2" insulating board, furred	None	None	No	1/2" plaster	0.200
k	4" brick, 8" hollow tile	None	1/2" insulating board	None	None	No	1/2" plaster	0.180
l	4" brick, 4" lt. wt. aggregate block	None	1/2" insulating board	None	None	No	1/2" plaster	0.190
m	4" brick	Yes	5/8" plywood	2x4 @ 16" ctrs	Plaster on 1/2" insulating board			0.220
n	4" brick	None	25/32" insulating board	2x4 @ 16" ctrs	None	No	1/2" drywall	0.230
o	4" brick	Yes	5/8" plywood	2x4 @ 16" ctrs	2" (R-7)	No	1/2" drywall	0.090
p	4" brick	Yes	5/8" plywood	2x4 @ 16" ctrs	3 1/2" (R-13)	No	1/2" drywall	0.080
q	4" brick	Yes	5/8" plywood	2x6 @ 24" ctrs	6" (R-19)	Yes	1/2" drywall	0.065
14 Wood foundations								
		Paper	Sheathing	Studs	Cavity Insulation	Vapor Seal	Inside	U Factor
a	Above grade	None	5/8" treated plywood	2x6 @ 24" ctrs	6" (R-19)		1/2" Drywall	0.063
b	Below grade	None	5/8" treated plywood	2x6 @ 24" ctrs	6" (R-19)		1/2" Drywall	0.055

Table 3 (Continued)

Transmission Heat Loss Factors (15 through 17)

15 Masonry Wall - Hollow concrete block							U
Gravel aggregate							Factor
	Above grade to 2 feet below grade	Comments	Studs	Cavity Insulation	Vapor Seal	Inside	
a*	8" block, plain		None	None	None	None	0.530
b*	12" block, plain		None	None	None	1/2" plaster	0.470
c	8" block		None	None	None	1/2" plaster	0.490
d	8" block		Furred	None	None	1/2" drywall	0.330
e	8" block	1/2" insulating board	Furred	None	None	1/2" plaster	0.230
f	8" block	Vermiculite or equiv. block fill	Furred	None	None	1/2" drywall	0.275
g	8" block		2x4 @ 16" ctrs	3 1/2" (R-13)	Yes	1/2" drywall	0.080
h	8" block	Vermiculite or equiv. block fill	2x4 @ 16" ctrs	3 1/2" (R-13)	Yes	1/2" drywall	0.077
2 to 5 five feet below grade							
i	8" or 12" block, plain (basement wall)		None	None	None	None	0.132
j	8" or 12" block, plain (basement wall)	1" polystyrene to 3 feet deep	None	None	None	None	0.090
k	8" or 12" block, plain (basement wall)	2" polystyrene to 3 feet deep	None	None	None	None	0.068
l	8" block		Furred	None	None	1/2" drywall	0.112
m	8" block	1/2" insulating board	Furred	None	None	1/2" plaster	0.096
n	8" block (basement wall)		2x4 @ 16" ctrs	3 1/2" (R-13)	Yes	1/2" drywall	0.050
More than 5 feet below grade							
o	8" or 12" block, plain (basement wall)		None	None	None	None	0.100
p	8" or 12" block, plain (basement wall)	1" polystyrene to 3 feet deep	None	None	None	None	0.080
q	8" or 12" block, plain (basement wall)	2" polystyrene to 3 feet deep	None	None	None	None	0.067
r	8" block		Furred	None	None	1/2" drywall	0.088
s	8" block	1/2" insulating board	Furred	None	None	1/2" plaster	0.078
t	8" block (basement wall)		2x4 @ 16" ctrs	3 1/2" (R-13)	Yes	1/2" drywall	0.045
16 Masonry Wall - Hollow concrete block							U
Cinder aggregate							Factor
	Above grade to 2 feet below grade	Comments	Studs	Cavity Insulation	Vapor Seal	Inside	
a*	8" block, plain		None	None	None	None	0.390
b	8" block		None	None	None	1/2" plaster	0.380
c	8" block		Furred	None	None	1/2" drywall	0.270
d	8" block	1/2" insulating board	Furred	None	None	1/2" plaster	0.200
17 Masonry Wall - Hollow concrete block							U
Light weight aggregate							Factor
	Above grade to 2 feet below grade	Comments	Studs	Cavity Insulation	Vapor Seal	Inside	
a*	8" block, plain		None	None	None	None	0.350
b	8" block		None	None	None	1/2" plaster	0.340
c	8" block		Furred	None	None	1/2" drywall	0.250
d	8" block	1/2" insulating board	Furred	None	None	1/2" plaster	0.190
e	8" block	1" insulating blanket	Furred	None	None	1/2" drywall	0.150
f	8" block	Vermiculite filled cores	Furred	None	None	1/2" drywall	0.143

Table 3 (Continued)

Transmission Heat Loss Factors (18 through 20)

18	Poured concrete wall	Comments	Studs	Cavity Insulation	Vapor Seal	Inside	U Factor
	Above grade to 2 feet below grade						
a	8" wall, plain						0.670
b	12" wall, plain						0.560
c	8" wall		2x4 @ 16" ctrs	3 1/2" (R-13)	Yes	1/2" drywall	0.083
	2 to 5 five feet below grade						
d	8" wall, plain						0.142
e	12" wall, plain						0.135
f	8" wall		2x4 @ 16" ctrs	3 1/2" (R-13)	Yes	1/2" drywall	0.052
	More than 5 feet below grade						
g	8" wall, plain						0.106
h	12" wall, plain						0.102
i	8" wall		2x4 @ 16" ctrs	3 1/2" (R-13)	Yes	1/2" drywall	0.046
19	Limestone or sandstone wall	Comments	Studs	Cavity Insulation	Vapor Seal	Inside	U Factor
	Above grade to 2 feet below grade						
a	8" stone		Furred	None	None	1/2" drywall	0.390
b	8" stone		Furred	Plaster on 1/2" insulating board			0.250
c	12" stone		Furred	None	None	1/2" drywall	0.340
d	12" stone		Furred	Plaster on 1/2" insulating board			0.230
	2 to 5 five feet below grade						
e	12" stone		None	None	None	None	0.190
f	16" stone		None	None	None	None	0.180
	More than 5 feet below grade						
g	12" stone		None	None	None	None	0.120
h	16" stone		None	None	None	None	0.120
20	Glass block wall	Comments					U Factor
a	5 3/4" x 5 3/4" x 3 7/8" thick						0.610
b	7 3/4" x 7 3/4" x 3 7/8" thick						0.560
c	7 3/4" x 7 3/4" x 3 7/8" thick	Figerglass screen dividing cavity					0.490
d	11 3/4" x 11 3/4" x 3 7/8" thick						0.530

Table 3 (Continued)

Transmission Heat Loss Factors (21 through 24)

21	Cold partitions - frame wall		Cavity Insulation	Vapor Seal	Inside	U Factor	
	Exposed to unheated spaces	Comments					
a	Studs (2 x 4)	lath and plaster on one side only	None	None	None	0.330	
b	Studs (2 x 4)	1/2" insulating board			1/2" plaster on one side only	0.220	
c	Studs (2 x 4)	1/2" insulating board on exposed side	None	None	1/2" drywall	0.180	
d	Studs (2 x 4)	lath and plaster on both sides	None	None	None	0.230	
e	Studs (2 x 4)	1/2" insulating board	None	None	1/2" plaster on both sides	0.150	
f	Studs (2 x 4)	lath and plaster on both sides	3 1/2" (R-13)	None	None	0.080	
g	Studs (2 x 4)	lath and plaster on both sides	2" (R-7)	None	None	0.100	
h	Studs (2 x 6)	1/2" drywall outside	6" (R-19)	Yes	1/2" drywall	0.065	
22	Ceiling with attic space above		Cavity Insulation	Sheathing	Inside	U Factor	
		Comments					
a	1/2" dry wall (gypsum board)	no floor above	None	None	None	0.300	
b	1/2" dry wall (gypsum board)	tight floor above			1/2" plaster on one side only	0.180	
c	1/2" plaster	no floor above	1/2" insulating board	None	1/2" drywall	0.220	
d	1/2" plaster	tight floor above	1/2" insulating board	None	None	0.140	
e	1/2" dry wall (gypsum board)	1/2" insulating board on top of joists		None	1/2" plaster on both sides	0.180	
f	1/2" dry wall (gypsum board)	with or without a floor above	3 1/2" (R-13)	None	None	0.070	
g	1/2" dry wall (gypsum board)	with or without a floor above	2" (R-7)	None	None	0.110	
h	1/2" dry wall (gypsum board)	with or without a floor above	6" (R-19)	None	None	0.050	
i	1/2" dry wall (gypsum board)	with or without a floor above	8" (R-29)	None	None	0.030	
j	1/2" dry wall (gypsum board)	with or without a floor above	10" (R-37)	None	None	0.030	
k	1/2" dry wall (gypsum board)	with or without a floor above	12" (R-44)	None	None	0.020	
23	Ceiling - part of asphalt shingled roof		Cavity insulation	Rafters	Sheathing	Shingles	U Factor
	NO attic space above						
a	1/2" dry wall (gypsum board)		None	Yes	Wood	Yes	0.290
b	1/2" plaster		1/2" insulating board	Yes	Wood	Yes	0.220
c	1/2" dry wall (gypsum board)		3 5/8" (R-13)	Yes	Wood	Yes	0.060
d	1/2" dry wall (gypsum board)		2" (R-7)	Yes	Wood	Yes	0.090
e	1/2" dry wall (gypsum board)		6" (R-19)	Yes	Wood	Yes	0.040
24	Ceiling - part of built-up roof		Cavity insulation	Rafters	Sheathing	Thickness	U Factor
	NO attic space above						
a	1/2" dry wall (gypsum board)		None	Yes	Wood	3/8"	0.270
b	1/2" plaster		1/2" insulating board	Yes	Wood	3/8"	0.220
c	1/2" dry wall (gypsum board)		3 5/8" (R-13)	Yes	Wood	3/8"	0.060
d	1/2" dry wall (gypsum board)		2" (R-7)	Yes	Wood	3/8"	0.090
e	1/2" dry wall (gypsum board)		6" (R-19)	Yes	Wood	3/8"	0.040

Table 3 (Continued)

Transmission Heat Loss Factors (25 through 27)

25	Wood floor, over enclosed unheated space		Primary flooring	Sub-flooring	Cavity Insulation	U Factor
	Comments					
a	Maple or oak			Pine on joists	None	0.150
b	Maple or oak	½" insulating boards on bottom of joists		Pine on joists	None	0.090
c	Carpet and rubber pad		5/8" plywood	None	None	0.060
d	Maple or oak			Pine on joists	2" (R-7)	0.050
e	Maple or oak			Pine on joists	3 5/8" (R-13)	0.040
f	Maple or oak			5/8" plywood	6" (R-19)	0.030
g	Carpet and fibrous pad		5/8" plywood	5/8" plywood	6" (R-19)	0.020
26	Wood floor, over exposed space		Primary flooring	Sub-flooring	Cavity Insulation	U Factor
	Comments					
a	Maple or oak			Pine on joists		0.350
b	Carpet and rubber pad		5/8" plywood	None		0.270
c	Maple or oak	½" insulating boards on bottom of joists		Pine on joists		0.200
d	Maple or oak			Pine on joists	2" (R-7)	0.090
e	Maple or oak			Pine on joists	3 5/8" (R-13)	0.060
f	Maple or oak			5/8" plywood	6" (R-19)	0.050
27	Concrete floor	Edge Insulation	Comments			U Factor
a	On ground or fill	none	per linear foot of exposed edge, not square foot			0.810
b	On ground or fill	1"	per linear foot of exposed edge, not square foot			0.690
c	On ground or fill	2"	per linear foot of exposed edge, not square foot			0.530
d	Floor on ground below grade		per square foot of area only, not linear edge loss			0.040

Heat Loss Worksheet

Page _____ of _____ Total Btuh for Page _____ Total Btuh for Building _____

Customer _____ Name _____ TEL: (____) _____

Address _____ Heat Loss Calculated by _____ Date ____/____/____

Room (add 20% for bathrooms)
Indoor/Outdoor desn. temp.
DTD (Indoor temp — Outdoor temp)
Exposed Walls

LENGTH	WIDTH	HEIGHT
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LENGTH	WIDTH	HEIGHT
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1 Infiltration Transmission Table Section 1-3	Heat Loss = Use volume above grade only	Volume (LxWxH) x Factor x DTD = Btuh x x
2 Ceiling Transmission Table Section 22-24	Heat Loss =	Area (LxW) x Factor x DTD = Btuh x x
3 Floor Transmission Table Section 25-27	Heat Loss =	Area (LxW) x Factor x DTD = Btuh x x =
4 Slab Transmission Table Section 27	Heat Loss = Exposed	Perimeter (feet) x Factor x DTD = Btuh x x =
5 Windows Transmission Table Section 4-5	Heat Loss =	Sash Area (LxW) x Factor x DTD = Btuh x x =
6 Doors Transmission Table Section 6-9	Heat Loss =	Door Area (LxW) x Factor x DTD = Btuh x x =
7 Walls Transmission Table Section 10-21	Net Wall Area= Heat Loss= Exposed Below Grade more than 2 feet Cold Partitions	Wall Area (LxH) - Window Area - Door area= Net Wall Area (LxW) x Factor x DTD = Btuh x x = x x = x x =

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Room Totals

Baseboard ft. — Heat loss, Btuh—

Baseboard ft. — Heat loss, Btuh—

Baseboard ft. — Heat loss, Btuh—

Room (add 20% for bathrooms) Exposed Walls		
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Room Totals

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Baseboard ft. — Heat loss, Btuh—

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Heat Loss Worksheet

Page _____ of _____ Total Btuh for Page _____ Total Btuh for Building _____

Customer _____ Name _____ TEL: (____) _____

Address _____ Heat Loss Calculated by _____ Date ____/____/____

Room (add 20% for bathrooms)
Indoor/Outdoor desn. temp.
DTD (Indoor temp — Outdoor temp)
Exposed Walls

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Room Totals

Room (add 20% for bathrooms)
Exposed Walls

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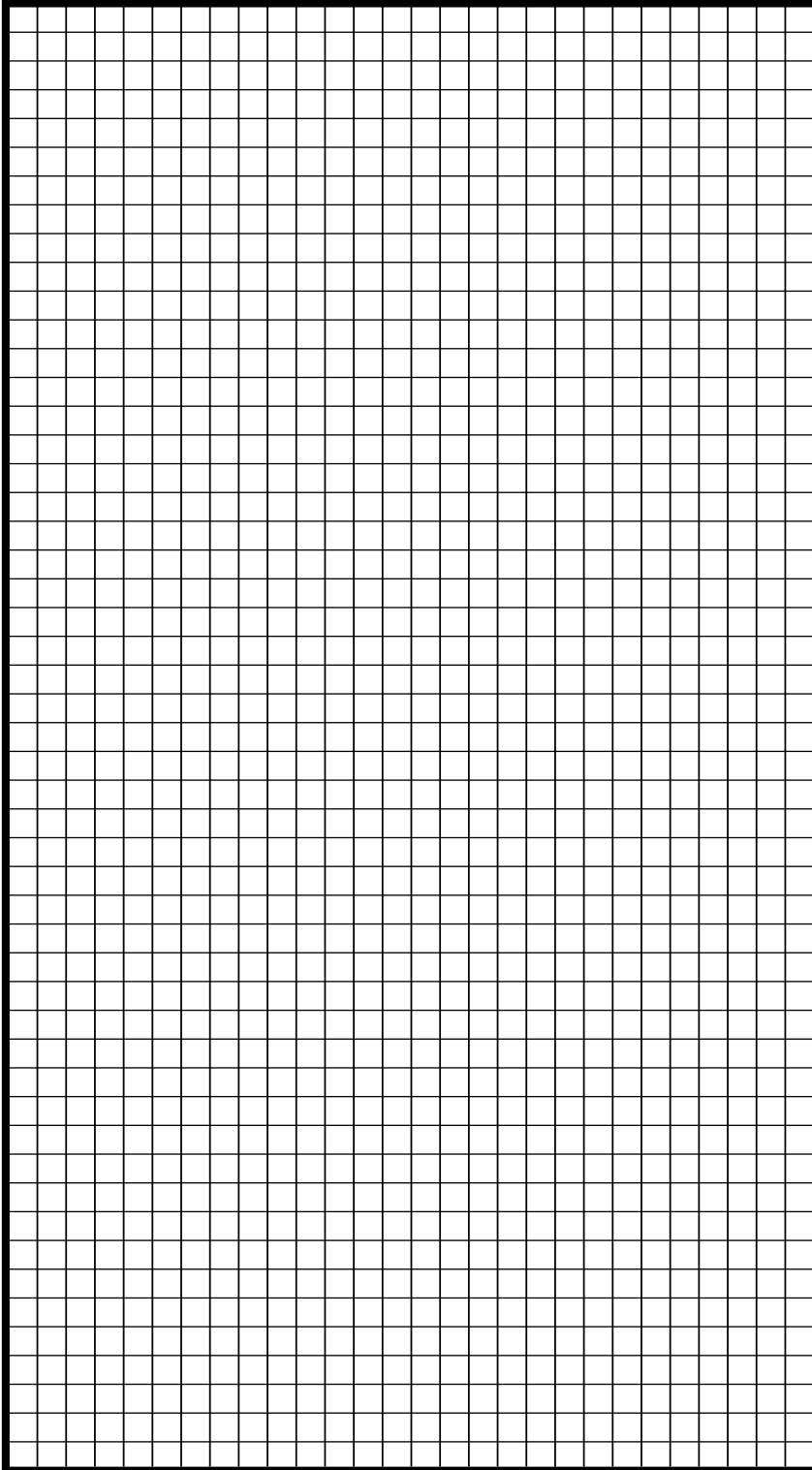
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Baseboard ft. — Heat loss, Btuh—

Room Totals

Sketch floor plan of building below



Construction Details

Ceilings (Shown by number on 1504)

1 Attic above _____ Insulation
 _____ 2" 6"
 _____ 3" 8"
2 No attic above _____
 _____ 4" 12"

1 Table _____ U-factor _____

2 Table _____ U-factor _____

Exposed Walls

Siding:

Wood Vinyl Aluminum
 Brick Concrete

Insulation:

None 3-1/2" 6"

Table _____ U-factor _____

Windows/Doors

(Shown by letter on 1504)

Height X Width = Area Table U-factor
 (Feet) (Feet) (Sq. Ft.)

A _____
 single double triple storm

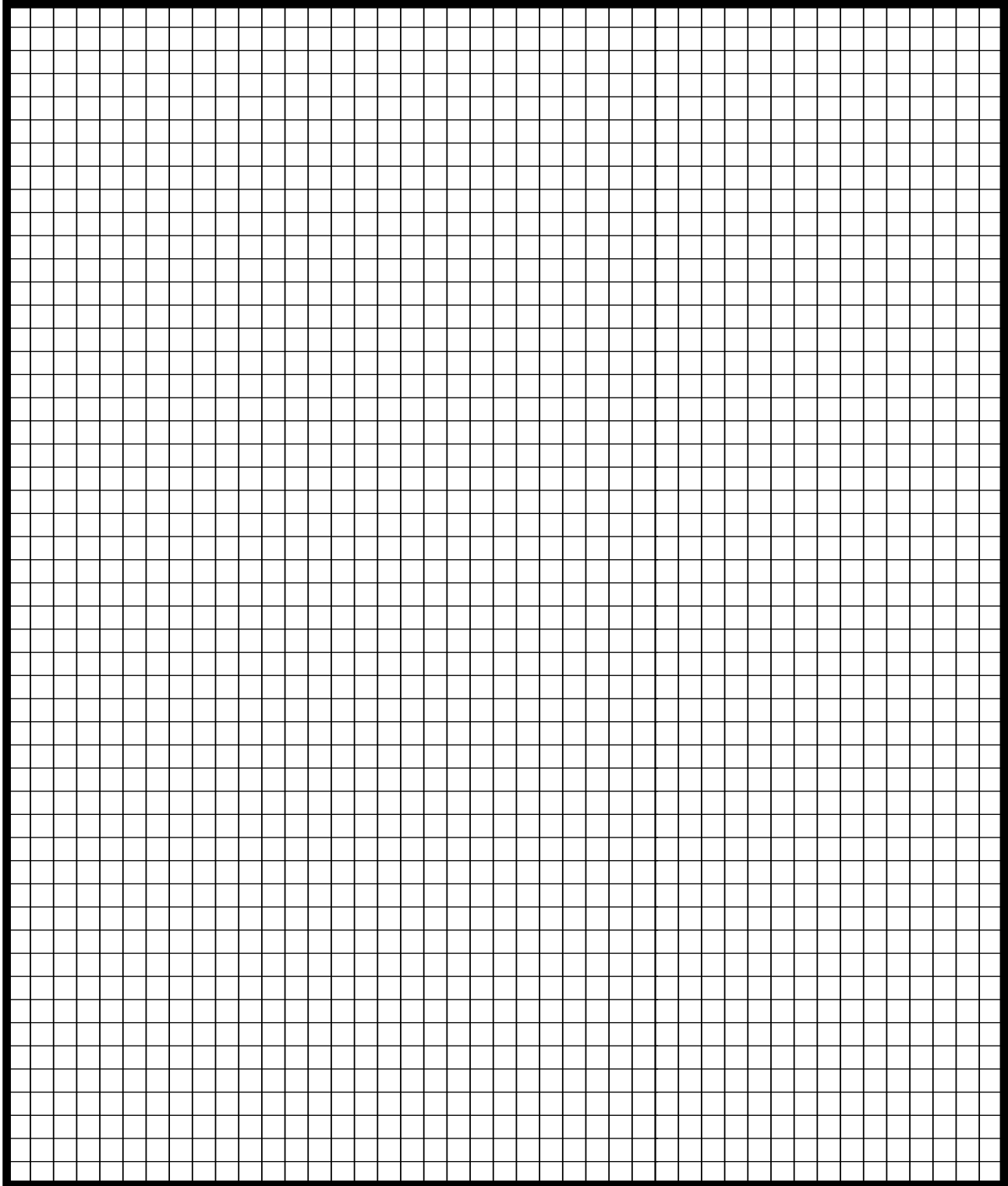
B _____
 single double triple storm

C _____
 single double triple storm

D _____
 single double triple storm

E _____
 single double triple storm

Extra Graph Paper (if necessary)





Order Form

Bill to Address

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Qty	Description	Unit Price	Total
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	I=B=R Ratings for Boilers, Baseboard Radiation, Finned Tube (Commercial) and Indirect-Fired Water Heaters (January 2008)	<input type="checkbox"/> \$15 Nonmember <input type="checkbox"/> \$10 Member	
	H-22 Heat Loss Calculation (2001)	\$33.50	
	1504WH Whole-House Heat Loss Estimate Form	<input type="checkbox"/> Single copy for \$2 <input type="checkbox"/> Pack of 25 for \$12	
	Worksheet Pads for Form 1504 - for use with Guide H-22 (50 sheets to a pad)	\$5 per pad	
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 If you have any questions, we can be reached via email at publications@ahrinet.org or by phone at 703.524.8800 from 9 am to 5 pm, ET.

Thank You!

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Taco, Inc., 1160 Cranston Street, Cranston, RI 02920 (401) 942-8000 / Fax (401) 942-2360
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