

Form 1504WH

Whole-house heat loss

Hydronics Institute
Division of GAMA



Estimating heat loss — whole house method

Note: This is provided for estimating purposes only. You should do a complete heat loss for the house if you plan to install or replace heating units. You will need room-by-room heat loss to size heating units or radiant heating panels.

Background

To determine how much heat is needed to maintain a residence comfortably during the heating season, find the Outdoor Design Temperature (**ODT**) for the location. The ODT is the standard design heating season outdoor temperature for the area. You will find ODT data listed by city on pages 4 to 7 and in the ASHRAE Handbook, state codes, and Hydronics Institute Guide H-22. (The ODT is usually taken from the 97½% confidence level data — a temperature low enough that it is unlikely the outdoor temperature would be colder for more than 2½% of the time during the coldest months.)

A house loses heat through walls, ceilings, floors, windows and doors that are heated on the inside and exposed to the outdoors on the other side. (Interior walls, floors and ceilings don't lose heat if both sides are heated.) These losses are called "**transmission losses**" because heat passes through the construction.

In addition to the transmission losses, you must account for cold air that enters the house by infiltration. These are called "**infiltration losses**." The amount of infiltration depends on tightness of the building envelope. Loose construction causes high infiltration. Tight construction reduces infiltration.

The total heat loss for the house is the sum:

Total heat loss = Transmission + Infiltration.

The heating equipment in the home must replace the lost heat and provide additional heat needed for piping losses and pick-up needs (extra heat needed to heat house and piping from a cold start).

The usual allowance is 15% for water boilers. The Net Load Rating for a water boiler provides this allowance. You may find you need additional allowance if the system has a large water volume (gravity system or converted steam system) or if the house will be used intermittently during the heating season. Under these circumstances, you may want to add an additional allowance of 20% to provide for quick pick-up. See Part 2 of Hydronics Institute Guide 2000 for further discussion on boiler sizing.

You do not size **steam boilers** based on building heat loss. You have to size steam boilers to meet the requirements of the connected heating units. See Part 2 of Guide 2000 for procedure.

If the system includes an **indirect-fired water heater**, you usually do not need to add additional capacity because the piping and pick-up allowance is normally adequate. If heavy domestic water usage is expected, see Part 6 of Guide 2000 to determine the extra boiler capacity needed. (If the domestic water heating load is more than 25% of the boiler capacity, see Part 6 of Guide 2000.)

Heat loss estimate — Instructions

1. Dimensions — Measure dimensions of all heat loss surfaces (walls, windows, doors, floor, ceiling) and fill in the **Heat loss factors** table on page 2. Complete the calculations of the table to find square feet, cubic feet, etc., of heat loss surfaces.
2. Copy areas and volumes to **Calculations** table on page 3.
3. Heat loss factors — Find the factor for each heat loss surface from page 2 and enter data on page 3. Find the infiltration factor based on the house construction from the **Infiltration factors** table on page 3 and enter in the **Calculations** table. (For types of construction not listed, see Hydronics Institute Guide H-22, "Heat Loss Calculation Guide".)
4. Temperature difference, TD, equals inside design temperature (usually 70°F) minus ODT (pages 4 – 8). Enter this value in the **Calculations** table, page 3, and complete all calculations.

Heat loss factors

Gross cold wall (including windows and doors)				
Height	x	Length	=	Square feet
Front	x		=	
Left side	x		=	
Right side	x		=	
Rear	x		=	
Gross wall:				

Windows & outside doors						
Height	x	Width	x	Quantity	=	Square feet
	x		x		=	
	x		x		=	
	x		x		=	
	x		x		=	
Total windows & outside doors:						

Gross Wall:
Subtract Total windows & outside doors:
Net Wall:

Cold ceiling (attic or roof above)				
Length	x	Width	=	Square feet
	x		=	
	x		=	
	x		=	
	x		=	
Total cold ceiling:				

Cold floor (over cold basement or crawl space)								
Length	x	Width	=	Square feet				
	x		=					
	x		=					
Total cold floor:								
— or —								
Floor on concrete slab (cold edge only)								
Length	+	Width	+	Length	+	Width	=	Linear Feet
	+		+		+		=	
	+		+		+		=	
Linear ft. Total cold floor:								

Heated (finished) basement				
Width	x	Length	=	Square feet
Floor	x		=	
Height	x	Length	=	Square feet
Wall above grade	x		=	
Wall below grade	x		=	

Construction	Factor
Glass & outside doors:	
Single	1.14
Double glass	0.65
Storm windows	0.56
Walls not insulated:	
Wood frame	0.24
Brick	0.31
Walls, insulated:	
2" Batts (R-7)	0.10
3 5/8" Batts (R-11)	0.08
6" Batts (R-19)	0.06

Uninsulated	0.30
2" Batts (R-7)	0.11
3 5/8" Batts (R-11)	0.07
6" Batts (R-19)	0.05
8" Batts (R-28)	0.03
12" Batts (R-40)	0.02

Floor over unheated basement:	
Uninsulated	0.15
2" Batts	0.05
3 5/8" Batts	0.04
— or —	
Floor over cold vented crawl space:	
Uninsulated	0.36
2" Batts	0.09
3 5/8" Batts	0.06
— or —	
Slab floor on grade (x linear ft. perimeter):	
No edge insulation	0.86
1" Edge insulation	0.69
2" Edge insulation	0.53

Floor (square feet)	0.04
Foundation wall, uninsulated:	
Above grade	0.53
Below grade	0.06
Foundation wall, 2" insulation:	
Above grade	0.13
Below grade	0.04

Calculation							
	Multiply	x	Factor	x	TD	=	Btu per hour
Windows/doors	Sq ft	x		x	'F	=	
Net wall	Sq ft	x		x	'F	=	
Cold ceiling	Sq ft	x		x	'F	=	
Cold floor (If applicable)	Sq ft	x		x	'F	=	
Slab floor (If applicable)	Lin ft	x		x	'F	=	
Basement floor (If applicable)	Sq ft	x		x	'F	=	
Basement walls above grade (If applicable)	Sq ft	x		x	'F	=	
Basement walls below grade (If applicable)	Sq ft	x		x	'F	=	
Infiltration	Cub ft	x		x	'F	=	
TOTAL						=	

Infiltration factors			
Fully detached residence	Attached residence	Assumed air changes	Factor
New construction Very tight Extra heavy insulation	Front & back exposed Heavy insulation	½ per hour	0.009
Tight construction Heavy insulation	Front & back exposed Insulated	¾ per hour	0.011
Standard house Some insulation	Front, back, 1 side exposed Insulated	1 per hour	0.018
Older house Good condition	Front, back, 1 side exposed No insulation	1½ per hour	0.027
Loose construction Air leaks		2 per hour	0.036

Table 10 Outdoor design temperatures (AP=airport; AFB=air force base; CO=city office)

ALABAMA	ODT	Fairfield-Travis AFB	32	Leadville	-14	Moultrie	30
Alexander City	22	Fresno AP	30	Pueblo AP	0	Rome AP	22
Anniston AP	22	Hamilton AFB	32	Sterling	-2	Savannah-Travis AP	27
Auburn	22	Laguna Beach	43	Trinidad AP	3	Valdosta-Moody AFB	31
Birmingham AP	21	Livermore	27	CONNECTICUT	ODT	Waycross	29
Decatur	16	Lompoc, Vandenburg AFB	38	Bridgeport AP	9	HAWAII	ODT
Dothan AP	27	Long Beach AP	43	Hartford, Brainard Field	7	Hilo AP	62
Florence AP	21	Los Angeles AP	43	New Haven AP	7	Honolulu AP	63
Gadsden	20	Los Angeles CO	40	New London	9	Kaneohe Bay MCAS	66
Huntsville AP	16	Merced-Castle AFB	31	Norwalk	9	Wahaloa	59
Mobile AP	29	Modesto	30	Norwich	7	IDAHO	ODT
Mobile CO	29	Monterey	38	Waterbury	2	Boise AP	10
Selma, Craig AFB	25	Napa	32	Windsor Locks, Bradley Field	4	Burley	2
Montgomery AP	26	Needles AP	33	DELAWARE	ODT	Coeur D'Alene AP	-1
Talladega	22	Oakland AP	36	Dover AFB	15	Idaho Falls AP	-6
Tuscaloosa AP	23	Oceanside	43	Wilmington AP	14	Lewiston AP	6
ALASKA	ODT	Ontario	33	DISTRICT OF COLUMBIA	ODT	Moscow	0
Anchorage AP	-18	Oxnard	36	Andrews AFB	14	Mountain Home AFB	12
Barrow	-41	Palmdale AP	22	Washington National AP	17	Pocatello AP	-1
Fairbanks AP	-47	Palm Springs	35	FLORIDA	ODT	Twin Falls AP	2
Juneau AP	1	Pasadena	35	Belle Glade	44	ILLINOIS	ODT
Kodiak	13	Petaluma	29	Cape Kennedy AP	38	Aurora	-1
Nome AP	-27	Pomona CO	30	Daytona Beach AP	35	Belleville, Scott AFB	6
ARIZONA	ODT	Redding AP	31	Fort Lauderdale	46	Bloomington	-2
Douglas AP	31	Redlands	33	Fort Myers AP	44	Carbondale	7
Flagstaff AP	4	Richmond	36	Fort Pierce	42	Champaign/Urbana	2
Fort Huachuca AP	28	Riverside-March AFB	32	Gainesville AP	31	Chicago, Midway AP	0
Kingman AP	25	Sacramento AP	32	Jacksonville AP	32	Chicago, O'Hare AP	-4
Nogales	32	Salinas AP	32	Key West AP	57	Chicago CO	2
Phoenix AP	34	San Bernadino, Norton AFB	33	Lakeland CO	41	Danville	1
Prescott AP	9	San Diego AP	44	Miami AP	47	Decatur	2
Tucson AP	32	San Fernando	39	Miami Beach CO	48	Dixon	-2
Winslow AP	10	San Francisco AP	38	Ocala	34	Elgin	-2
Yuma AP	39	San Francisco CO	40	Orlando AP	38	Freeport	-4
ARKANSAS	ODT	San Jose AP	36	Panama City, Tyndall AFB	33	Galesburg	-2
Blytheville AFB	15	San Luis Obispo	35	Pensacola CO	29	Greenville	4
Camden	23	Santa Ana AP	39	St. Augustine	35	Joliet	0
El Dorado AP	23	Santa Barbara MAP	36	St. Petersburg	40	Kankakee	1
Fayetteville AP	12	Santa Cruz	38	Sanford	38	LaSalle/Peru	-2
Fort Smith AP	17	Santa Maria AP	33	Sarasota	42	Macomb	0
Hot Springs	23	Santa Monica CO	43	Tallahassee AP	30	Moline AP	-4
Jonesboro	15	Santa Paula	35	Tampa AP	40	Mt. Vernon	5
Little Rock AP	20	Santa Rosa	29	West Palm Beach AP	45	Peoria AP	-4
Pine Bluff AP	22	Stockton AP	30	GEORGIA	ODT	Quincy AP	3
Texarkana AP	23	Ukiah	29	Albany, Turner AFB	29	Rantoul, Chanute AFB	1
CALIFORNIA	ODT	Visalia	30	Americus	25	Rockford	-4
Bakersfield AP	32	Yreka	17	Athens	22	Springfield AP	2
Blythe AP	33	Yuba City	31	Atlanta AP	22	Waukegan	-3
Burbank AP	39	COLORADO	ODT	Augusta AP	23	INDIANA	ODT
Chico	30	Alamosa AP	-6	Brunswick	32	Anderson	6
Concord	27	Boulder	0	Columbus, Lawson AFB	24	Bedford	5
Covina	35	Colorado Springs AP	2	Dalton	22	Bloomington	5
Crescent City AP	33	Denver AP	1	Dublin	25	Columbus, Bakalar AFB	7
Downey	40	Durango	-1	Gainesville	21	Crawfordsville	3
El Cajon	44	Fort Collins	1	Griffin	22	Evansville AP	9
El Centro AP	38	Grand Junction AP	7	La Grange	23	Fort Wayne AP	1
Escondido	41	Greeley	4	Macon AP	25	Goshen AP	1
Eureka/Arcata AP	33	LaJunta AP	3	Marietta, Dobbins AFB	21	Hobart	2

Table 10 Outdoor design temperatures (AP=airport; AFB=air force base; CO=city office) (continued)

Huntington	1	Madisonville	10	Marquette CO	-8	Sedalia, Whiteman AFB	4
Indianapolis AP	2	Owensboro	10	Mt. Pleasant	4	Sikeston	15
Jeffersonville	10	Paducah	12	Muskegon AP	6	Springfield AP	9
Kokomo	0	LOUISIANA	ODT	Pontiac	4	MONTANA	ODT
Lafayette	3	Alexandria AP	27	Port Huron	4	Billings AP	-10
LaPorte	3	Baton Rouge AP	29	Saginaw AP	4	Bozeman	-14
Marion	0	Bogalusa	28	Sault Ste. Marie AP	-8	Butte AP	-17
Muncie	2	Houma	35	Traverse City AP	1	Cut Bank AP	-20
Peru, Bunker Hill AFB	-1	Lafayette AP	30	Ypsilanti	5	Glasgow AP	-18
Richmond AP	2	Lake Charles AP	31	MINNESOTA	ODT	Glasgow AP	-18
Shelbyville	3	Minden	25	Albert Lea	-12	Glenclive	-13
South Bend AP	1	Monroe AP	25	Alexandria AP	-16	Great Falls AP	-15
Terre Haute AP	4	Natchitoches	26	Bemidji AP	-26	Havre	-11
Valparaise	3	New Orleans AP	33	Brainerd	-16	Helena AP	-16
Vincennes	6	Shreveport AP	25	Duluth AP	-16	Kalispell AP	-7
IOWA	ODT	MAINE	ODT	Fairbault	-12	Lewiston AP	-16
Ames	-6	Augusta AP	-3	Fergus Falls	-17	Livingston AP	-14
Burlington AP	-3	Bangor, Dow AFB	-6	International Falls AP	-25	NEBRASKA	ODT
Cedar Rapids AP	-5	Caribou AP	-13	Mankato	-12	Beatrice	-2
Clinton	-3	Lewiston	-2	Minneapolis/St. Paul AP	-12	Chadron AP	-3
Council Bluffs	-3	Millinocket AP	-9	Rochester AP	-12	Columbus	-2
Des Moines AP	-5	Portland	-1	St. Cloud AP	-11	Fremont	-2
Debuque	-7	Waterville	-4	Virginia	-21	Grand Island AP	-3
Fort Dodge	-7	MARYLAND	ODT	Wilmar	-11	Hastings	-3
Iowa City	-6	Baltimore AP	13	Winona	-10	Kearney	-4
Keokuk	0	Baltimore CO	17	MISSISSIPPI	ODT	Lincoln CO	-2
Marshalltown	-7	Cumberland	10	Biloxi, Keesler AFB	31	McCook	-2
Mason City AP	-11	Frederick AP	12	Clarksdale	19	Norfolk	-4
Newton	-5	Hagerstown	12	Columbus AFB	20	North Platte AP	-4
Ottumwa AP	-4	Salisbury	16	Greenville AFB	20	Omaha AP	-3
Sioux City AP	-7	MASSACHUSETTS	ODT	Greenwood	20	Scottsbluff AP	-3
Waterloo	-10	Boston AP	9	Hattiesburg	27	Sidney AP	-3
KANSAS	ODT	Clinton	2	Jackson AP	25	NEVADA	ODT
Atchison	2	Fall River	9	Laurel	27	Carson City	9
Chanute AP	7	Framingham	6	McComb AP	26	Elko AP	-2
Dodge City AP	5	Gloucester	5	Meridian AP	23	Ely AP	-4
El Dorado	7	Greenfield	-2	Natchez	27	Las Vegas AP	28
Emporia	5	Lawrence	0	Tupelo	19	Lovelock AP	12
Garden City AP	4	Lowell	1	Vicksburg CO	26	Reno AP	10
Goodland AP	0	New Bedford	9			Reno CO	11
Great Bend	4	Pittsfield AP	-3			Tonapah AP	10
Hutchinson AP	8	Springfield, Westover AFB	0	MISSOURI	ODT	Winnemucca AP	3
Liberal	7	Tauton	9	Cape Girardeau	13		
Manhattan, Fort Riley	3	Worcester AP	4	Columbia AP	4		
Parsons	9	MICHIGAN	ODT	Farmington AP	8		
Russel AP	4	Adrian	3	Hannibal	3		
Salina	5	Alpena AP	-6	Jefferson City	7		
Topeka AP	4	Battle Creek AP	5	Joplin AP	10	NEW HAMPSHIRE	ODT
Parsons	9	Benton Harbor AP	5	Kansas City AP	6	Berlin	-9
KENTUCKY	ODT	Detroit	6	Kirksville AP	0	Claremont	-4
Ashland	10	Escanaba	-7	Mexico	4	Concord AP	-3
Bowling Green AP	10	Flint AP	1	Moberly	3	Keene	-7
Corbin AP	9	Grand Rapids AP	5	Poplar Bluff	16	Laconia	-5
Covington AP	6	Holland	6	Rolla	9	Manchester, Grenier AFB	-3
Hopkinsville, Campbell AFB	10	Jackson AP	5	St. Joseph AP	2	Portsmouth, Pease AFM	2
Lexington AP	8	Kalamazoo	5	St. Louis AP	6	NEW JERSEY	ODT
Louisville AP	10	Lansing AP	1	St. Louis CO	8	Atlantic City CO	13

Table 10 Outdoor design temperatures (AP=airport; AFB=air force base; CO=city office) (continued)

Long Branch	13	Syracuse AP	2	Warren	5	Williamsport AP	7
Newark AP	14	Utica	-6	Wooster	6	York	12
New Brunswick	10	Watertown	-6	Youngstown AP	4	RHODE ISLAND	ODT
Paterson	10	NORTH CAROLINA	ODT	Zanesville AP	7	Newport	9
Phillipsburg	6	Ashville AP	14	OKLAHOMA	ODT	Providence AP	9
Trenton CO	14	Charlotte AP	22	Ada	14	SOUTH CAROLINA	ODT
Vineland	11	Durham	20	Altus AFB	16	Anderson	23
NEW MEXICO	ODT	Elizabeth City AP	19	Ardmore	17	Charleston AFB	27
Alamogordo, Holloman AFB	19	Fayetteville, Pope AFB	20	Bartlesville	10	Charleston CO	28
Albuquerque AP	16	Goldsboro, Seymour-Johnson AFM	21	Chickasha	14	Columbia AP	24
Artesia	19	Greensboro AP	18	Enid-Vance AFB	13	Florence AP	25
Carlsbad AP	19	Greenville	21	Lawton AP	16	Georgetown	26
Clovis AP	13	Henderson	15	McAlester	19	Greenville AP	22
Farmington AP	6	Hickory	18	Muskogee AP	15	Greenwood	22
Gallup	5	Jacksonville	24	Norman	13	Orangeburg	24
Grants	4	Lumberton	21	Oklahoma City AP	13	Rock Hill	23
Hobbs AP	18	New Bern AP	24	Ponca City	9	Spartanburg AP	22
Las Cruces	20	Raleigh/Durham AP	20	Seminole	15	Sumter-Shaw AFB	25
Los Alamos	9	Rocky Mount	21	Stillwater	13	SOUTH DAKOTA	ODT
Raton AP	1	Wilmington AP	26	Tulsa AP	13	Aberdeen AP	-15
Roswell, Walker AFB	18	Winston-Salem AP	20	Woodward	10	Brookings	-13
Santa Fe CO	10	NORTH DAKOTA	ODT	OREGON	ODT	Huron AP	-14
Silver City AP	10	Bismark AP	-19	Albany	22	Mitchel	-10
Socorro AP	17	Devil's Lake	-21	Astoria AP	29	Pierre AP	-10
Tucumcari AP	13	Dickinson AP	-17	Baker AP	6	Rapid City AP	-7
NEW YORK	ODT	Fargo AP	-18	Bend	4	Sioux Falls AP	-11
Albany AP	-1	Grands Forks AP	-22	Corvallis	22	Watertown AP	-15
Albany CO	1	Jamestown AP	-18	Eugene AP	22	Yankton	-7
Auburn	2	Minot AP	-20	Grants Pass	24	TENNESSEE	ODT
Batavia	5	Williston	-21	Klamath Falls AP	9	Athens	18
Binghamton AP	1	OHIO	ODT	Medford AP	23	Bristol-Tri City AP	14
Buffalo AP	6	Akron-Canton AP	6	Pendleton AP	5	Chattanooga AP	18
Cortland	0	Ashtabula	9	Portland AP	23	Clarksville	12
Dunkirk	9	Athens	6	Portland CO	24	Columbia	15
Elmira AP	1	Bowling Green	2	Roseburg AP	23	Dyersburg	15
Geneva	2	Cambridge	7	Salem AP	23	Greenville	16
Glen Falls	-5	Chillicothe	6	The Dallas	19	Jackson AP	16
Gloversville	-2	Cincinnati CO	6	PENNSYLVANIA	ODT	Knoxville AP	19
Hornell	0	Cleveland AP	5	Allentown AP	9	Memphis AP	18
Ithaca	0	Columbus AP	5	Altoona CO	5	Murfreesboro	14
Jamestown	3	Dayton AP	4	Butler	6	Nashville AP	14
Kingston	2	Def lance	4	Chambersburg	8	Tullahoma	13
Lockport	7	Findlay AP	3	Erie AP	9	TEXAS	ODT
Massena AP	-8	Fremont	1	Harrisburg AP	11	Abilene AP	20
Newburg-Stewart AFB	4	Hamilton	5	Johnstown	2	Alice AP	34
NYC-Central Park	15	Lancaster	5	Lancaster	8	Amarillo AP	11
NYC-Kennedy AP	15	Lima	4	Meadville	4	Austin AP	28
NYC-La Guardia AP	15	Mansfield AP	5	New Castle	7	Bay City	33
Niagra Falls ANYC-LaP	7	Marion	5	Philadelphia AP	14	Beaumont	31
Olean	2	Middletown	5	Pittsburgh AP	5	Beeville	33
Oneonta	-4	Newark	5	Pittsburgh GO	7	Big Springs AP	20
Oswego CO	7	Norwalk	1	Reading CO	13	Brownsville AP	39
Plattsburg AFB	-8	Portsmouth	10	Scranton/Wilkes-Barre	5	Brownwood	22
Poughkeepsie	6	Sandusky GO	6	State College	7	Bryan AP	29
Rochester AP	5	Springfield	3	Sunbury	7	Corpus Christ! AP	35
Rome-Griffiss AFB	-5	Stubenville	5	Uniontown	9	Corsicana	25
Schenectady	1	Toledo AP	1	Warren	4	Dallas AP	22
Suffolk County AFB	10			West Chester	13	Del Rio, Laughlin AFB	31

Table 10 Outdoor design temperatures (AP=airport; AFB=air force base; CO=city office) (continued)

Denton	22	Staunton	16	Rock Springs AP	-3	Truro CO	-5
Eagle Pass	32	Winchester	10	Sheridan AP	-8	Yarmouth AP	9
El Paso AP	24	WASHINGTON	ODT	Torrington	-8	ONTARIO	ODT
Fort Worth AP	22	Aberdeen	28	CANADA		Belleville	-7
Galveston AP	36	Bellingham AP	15	ALBERTA	ODT	Chatham	3
Greenville	22	Bremerton	25	Calgary AP	-23	Cornwall	-9
Harlingen	39	Ellensburg AP	6	Edmonton AP	-25	Hamilton	1
Houston AP	32	Everett-Paine AFB	25	Grande Prairie AP	-33	Kaupuskasing AP	-28
Houston CO	33	Kennewick	11	Jasper	-26	Kenora AP	-28
Huntsville	27	Longview	24	Lethbridge AP	-22	Kingston	-7
Killeen-Gray AFB	25	Moses Lake, Larson AFB	7	McMurray AP	-38	Kitchener	-2
Lamesa	17	Olympia AP	22	Medicine Hat AP	-24	London AP	0
Laredo AFB	36	Port Angeles	27	Red Deer AP	-26	North Bay AP	-18
Longview	24	Seattle-Boeing Fld	26	BRITISH COLUMBIA	ODT	Oshawa	-3
Lubbock AP	15	Seattle CO	27	Dawson Creek	-33	Ottawa AP	-13
Lufkin AP	29	Seattle-Tacoma AP	26	Fort Nelson AP	-40	Owen Sound	-2
McAllen	39	Spokane AP	2	Kamloops CO	-15	Peterborough	-9
Midland AP	21	Tacoma-McChord AFB	24	Nanaimo	20	St. Catharines	3
Palestine CO	27	Walla Walla AP	7	New Westminster	18	Sarnia	3
Pampa	12	Wenatchee	11	Penticton AP	4	Sault Ste. Marie AP	-13
Pecos	21	Yakima AP	5	Prince George AP	-28	Sudbury AP	-19
Plainview	13	WEST VIRGINIA	ODT	Prince Rupert CO	2	Thunder Bay AP	-24
Port Arthur AP	31	Beckley	4	Trail	0	Timmins AP	-29
San Angelo, Goodfellow AFB	22	Bluefield AP	4	Vancouver AP	19	Toronto AP	-1
San Antonio AP	30	Charleston AP	11	Victoria CO	23	Windsor AP	4
Sherman-Perrin AFB	20	Clarksburg	10	MANITOBA	ODT	PRINCE EDWARD ISLAND	ODT
Snyder	18	Elkins AP	6	Brandon	-27	Charlottetown AP	-4
Temple	27	Huntington CO	10	Churchill AP	-39	Summerside AP	-4
Tyler AP	24	Martinsburg AP	10	Dauphin AP	-28	QUEBEC	ODT
Vernon	17	Morgantown AP	8	Flin Flon	-37	Bagotville AP	-23
Victoria AP	32	Parkersburg CO,	11	Portage [a Prairie AP	-24	Chicoutimi	-22
Waco AP	26	Wheeling	5	The Pas AP	-33	Drummondville	-14
Wichita Falls AP	18	WISCONSIN	ODT	Winnipeg AP	-27	Granby	-14
UTAH	ODT	Appleton	-9	NEW BRUNSWICK	ODT	Hull	-14
Cedar City AP	5	Ashland	-16	Campbellton CO	-14	Megantic AP	-16
Logan	2	Beloit	-3	Chatham AP	-10	Montreal AP	-10
Moab	11	Eau Claire AP	-11	Edmundston CO	-16	Quebec AP	-14
Ogden AP	5	Fond du Lac	-8	Fredericton AP	-11	Rimouski	-12
Price	5	Green Bay AP	-9	Moncton AP	-8	St. Jean	-11
Provo	6	LaCrosse AP	-9	Saint John AP	-8	St. Jeirome	-13
Richfield	5	Madison AP	-7	NEWFOUNDLAND	ODT	Sept. Iles AP	-21
St. George CO	21	Manitowoc	-7	Corner Brook	0	Shawinigan	-14
Salt Lake City AP	8	Marinette	-11	Gander AP	-1	Sherbrooke CO	-21
Vernal AP	0	Milwaukee AP	-4	Goose Bay AP	-24	Thetford Mines	-14
VERMONT	ODT	Racine	-2	St. John's AP	7	Trois Rivieres	-13
Barre	-11	Sheboygan	-6	Stephenville AP	4	Val d'Or AP	-27
Burlington AP	-7	Stevens Point	-11	NORTHWEST TERR.	ODT	Valleyfield	-10
Rutland	-8	Waukesha	-5	Fort Smith AP	-45	SASKATCHEWAN	ODT
VIRGINIA	ODT	Wausau AP	-12	Frobisher AP	-41	Estevan AP	-25
Charlottesville	18	WYOMING		Inuvik	-53	Moose Jaw AP	-25
Danville AP	16	Casper AP	-5	Resolute AP	-47	North Battleford AP	-30
Fredericksburg	14	Cheyene AP	-1	Yellowknife AP	-46	Prince Albert AP	-35
Harrisonburg	16	Cody AP	-13	NOVA SCOTIA	ODT	Regina AP	-29
Lynchburg AP	16	Evanston	-3	Amherst	-6	Saskatoon AP	-31
Norfolk AP	22	Lander AP	-11	Halifax AP	5	Swift Current AP	-25
Petersburg	17	Laramie AP	-6	Kentville	1	Yorkton AP	-30
Richmond AP	17	Newcastle	-12	New Glasgow	-5	YUKON TERRITORY	ODT
Roanoke AP	16	Rawlins	-4	Sydney AP	3	Whitehorse AP	-43

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