

F.1 GLAZING AREAS FOR PASSIVE SOLAR BUILDINGS

TABLE F.1 Design Guidelines for Passive Solar Glazing Area

Location	Area of Solar Glazing ^a as Ratio of Floor Area		Approximate SSF Values			
	Low	High	Standard Performance ^b		Superior Performance ^c	
			Low	High	Low	High
Birmingham, Alabama	0.09	0.18	22	37	34	58
Mobile, Alabama	0.06	0.12	26	44	34	60
Montgomery, Alabama	0.07	0.15	24	41	34	59
Phoenix, Arizona	0.06	0.12	37	60	48	75
Prescott, Arizona	0.10	0.20	29	48	44	72
Tucson, Arizona	0.06	0.12	35	57	45	73
Winslow, Arizona	0.12	0.24	30	47	48	74
Yuma, Arizona	0.04	0.09	43	66	51	78
Fort Smith, Arkansas	0.10	0.20	24	39	38	64
Little Rock, Arkansas	0.10	0.19	23	38	37	62
Bakersfield, California	0.08	0.15	31	50	42	67
Daggett, California	0.07	0.15	35	56	46	73
Fresno, California	0.09	0.17	29	46	41	65
Long Beach, California	0.05	0.10	35	58	44	72
Los Angeles, California	0.05	0.09	36	58	44	72
Mount Shasta, California	0.11	0.21	24	38	42	67
Needles, California	0.06	0.12	39	61	49	76
Oakland, California	0.07	0.15	35	55	46	72
Red Bluff, California	0.09	0.18	29	46	41	65
Sacramento, California	0.09	0.18	29	47	41	66
San Diego, California	0.04	0.09	37	61	46	74
San Francisco, California	0.06	0.13	34	54	45	71
Santa Maria, California	0.05	0.11	31	53	42	69
Colorado Springs, Colorado	0.12	0.24	27	42	47	74
Denver, Colorado	0.12	0.23	27	43	47	74
Eagle, Colorado	0.14	0.29	25	35	53	77
Grand Junction, Colorado	0.13	0.27	29	43	50	76
Pueblo, Colorado	0.11	0.23	29	45	48	75
Hartford, Connecticut	0.17	0.35	14	19	40	64
Wilmington, Delaware	0.15	0.29	19	30	39	63
Washington, DC	0.12	0.23	18	28	37	61
Apalachicola, Florida	0.05	0.10	28	47	36	61
Daytona Beach, Florida	0.04	0.08	30	51	36	63
Jacksonville, Florida	0.05	0.09	27	47	35	62
Miami, Florida	0.01	0.02	27	48	31	54
Orlando, Florida	0.03	0.06	30	52	37	63
Tallahassee, Florida	0.05	0.11	26	45	35	60
Tampa, Florida	0.03	0.06	30	52	36	63
West Palm Beach, Florida	0.01	0.03	30	51	34	59
Atlanta, Georgia	0.08	0.17	22	36	34	58
Augusta, Georgia	0.08	0.16	24	40	35	60
Macon, Georgia	0.07	0.15	25	41	35	59
Savannah, Georgia	0.06	0.13	25	43	35	60
Boise, Idaho	0.14	0.28	27	38	48	71
Lewiston, Idaho	0.15	0.29	22	29	44	65
Pocatello, Idaho	0.13	0.26	25	35	51	74
Chicago, Illinois	0.17	0.35	17	23	43	67
Moline, Illinois	0.20	0.39	17	22	46	70
Springfield, Illinois	0.15	0.30	19	28	42	67
Evansville, Indiana	0.14	0.27	19	29	37	61
Fort Wayne, Indiana	0.16	0.33	13	17	37	60
Indianapolis, Indiana	0.14	0.28	15	21	37	60
South Bend, Indiana	0.18	0.35	12	15	39	61
Burlington, Iowa	0.18	0.36	20	27	47	71
Des Moines, Iowa	0.21	0.43	19	25	50	75
Mason City, Iowa	0.22	0.44	18	19	56	79
Sioux City, Iowa	0.23	0.46	20	24	53	76
Dodge City, Kansas	0.12	0.23	27	42	46	73
Goodland, Kansas	0.13	0.27	26	39	47	74
Topeka, Kansas	0.14	0.28	24	35	45	71
Wichita, Kansas	0.14	0.28	26	41	45	72
Lexington, Kentucky	0.13	0.27	17	26	35	58
Louisville, Kentucky	0.13	0.27	18	27	35	59
Baton Rouge, Louisiana	0.06	0.12	26	43	34	59

TABLE F.1 Design Guidelines for Passive Solar Glazing Area (Continued)

Location	Area of Solar Glazing ^a as Ratio of Floor Area		Approximate SSF Values			
	Low	High	Standard Performance ^b		Superior Performance ^c	
			Low	High	Low	High
Lake Charles, Louisiana	0.06	0.11	24	41	32	57
New Orleans, Louisiana	0.05	0.11	27	46	35	61
Shreveport, Louisiana	0.08	0.15	26	43	36	61
Caribou, Maine	0.25	0.50	—	NR ^c	—	53
Portland, Maine	0.17	0.34	14	17	45	69
Baltimore, Maryland	0.14	0.27	19	30	38	62
Boston, Massachusetts	0.15	0.29	17	25	40	64
Alpena, Michigan	0.21	0.42	—	NR	—	47
Detroit, Michigan	0.17	0.34	13	17	39	61
Flint, Michigan	0.15	0.31	11	12	40	62
Grand Rapids, Michigan	0.19	0.38	12	13	39	61
Sault Ste. Marie, Michigan	0.25	0.50	—	NR	—	50
Traverse City, Michigan	0.18	0.36	—	NR	—	42
Duluth, Minnesota	0.25	0.50	—	NR	—	50
International Falls, Minnesota	0.25	0.50	—	NR	—	47
Minneapolis–St. Paul, Minnesota	0.25	0.50	—	NR	—	55
Rochester, Minnesota	0.24	0.49	—	NR	—	54
Jackson, Mississippi	0.08	0.15	24	40	34	59
Meridian, Mississippi	0.08	0.15	23	39	34	58
Columbia, Missouri	0.13	0.26	20	30	41	66
Kansas City, Missouri	0.14	0.29	22	32	44	70
Saint Louis, Missouri	0.15	0.29	21	33	41	65
Springfield, Missouri	0.13	0.26	22	34	40	65
Billings, Montana	0.16	0.32	24	31	53	76
Cut Bank, Montana	0.24	0.49	22	23	62	81
Dillon, Montana	0.16	0.32	24	32	54	77
Glasgow, Montana	0.25	0.50	—	NR	—	55
Great Falls, Montana	0.18	0.37	23	28	56	77
Helena, Montana	0.20	0.39	21	25	55	77
Lewistown, Montana	0.19	0.38	21	25	54	76
Miles City, Montana	0.23	0.47	21	23	60	80
Missoula, Montana	0.18	0.36	15	16	47	68
Grand Island, Nebraska	0.18	0.36	24	33	51	76
North Omaha, Nebraska	0.20	0.40	21	29	51	76
North Platte, Nebraska	0.17	0.34	25	36	50	76
Scotts Bluff, Nebraska	0.16	0.31	24	36	49	74
Elko, Nevada	0.12	0.25	27	39	52	76
Ely, Nevada	0.12	0.23	27	41	50	77
Las Vegas, Nevada	0.09	0.18	35	56	48	75
Lovelock, Nevada	0.13	0.25	32	48	53	78
Reno, Nevada	0.11	0.22	31	48	49	76
Tonopah, Nevada	0.11	0.23	31	48	51	77
Winnemucca, Nevada	0.13	0.26	28	42	49	75
Concord, New Hampshire	0.17	0.34	13	15	45	68
Newark, New Jersey	0.13	0.25	19	29	39	64
Albuquerque, New Mexico	0.11	0.22	29	47	46	73
Clayton, New Mexico	0.10	0.20	28	45	45	73
Farmington, New Mexico	0.12	0.24	29	45	49	76
Los Alamos, New Mexico	0.11	0.22	25	40	44	72
Roswell, New Mexico	0.10	0.19	30	49	45	73
Truth or Consequences, New Mexico	0.09	0.17	32	51	46	73
Tucumcari, New Mexico	0.10	0.20	30	48	45	73
Zuñi, New Mexico	0.11	0.21	27	43	45	73
Albany, New York	0.21	0.41	13	15	43	66
Binghamton, New York	0.15	0.30	—	NR	—	35
Buffalo, New York	0.19	0.37	—	NR	—	36
Massena, New York	0.25	0.50	—	NR	—	50
New York (Central Park), New York	0.15	0.30	16	25	36	59
Rochester, New York	0.18	0.37	—	NR	—	37
Syracuse, New York	0.19	0.38	—	NR	—	37
Asheville, North Carolina	0.10	0.20	21	35	36	61
Cape Hatteras, North Carolina	0.09	0.17	24	40	36	60
Charlotte, North Carolina	0.08	0.17	23	38	36	60
Greensboro, North Carolina	0.10	0.20	23	37	37	63

TABLE F.1 Design Guidelines for Passive Solar Glazing Area (Continued)

Location	Area of Solar Glazing ^a as Ratio of Floor Area		Approximate SSP Values				
	Low	High	Standard Performance ^b		Superior Performance ^c		
			Low	High	Low	High	
Raleigh–Durham, North Carolina	0.09	0.19	22		37	36	61
Bismarck, North Dakota	0.25	0.50	—	NR	—	56	77
Fargo, North Dakota	0.25	0.50	—	NR	—	51	72
Minot, North Dakota	0.25	0.50	—	NR	—	52	72
Akron–Canton, Ohio	0.15	0.31	12		16	35	57
Cincinnati, Ohio	0.12	0.24	15		23	35	57
Cleveland, Ohio	0.15	0.31	11		14	34	55
Columbus, Ohio	0.14	0.28	13		18	35	57
Dayton, Ohio	0.14	0.28	14		20	36	59
Toledo, Ohio	0.17	0.34	13		17	38	61
Youngstown, Ohio	0.16	0.32	—	NR	—	34	54
Oklahoma City, Oklahoma	0.11	0.22	25		41	41	67
Tulsa, Oklahoma	0.11	0.22	24		38	40	65
Astoria, Oregon	0.09	0.19	21		34	37	60
Burns, Oregon	0.13	0.25	23		32	47	71
Medford, Oregon	0.12	0.24	21		32	38	60
North Bend, Oregon	0.09	0.17	25		42	38	64
Pendleton, Oregon	0.14	0.27	22		30	43	64
Portland, Oregon	0.13	0.26	21		31	38	60
Redmond, Oregon	0.13	0.27	26		38	47	71
Salem, Oregon	0.12	0.24	21		32	37	59
Allentown, Pennsylvania	0.15	0.29	16		24	39	63
Erie, Pennsylvania	0.17	0.34	—	NR	—	35	55
Harrisburg, Pennsylvania	0.13	0.26	17		26	38	62
Philadelphia, Pennsylvania	0.15	0.29	19		29	38	62
Pittsburgh, Pennsylvania	0.14	0.28	12		16	33	55
Wilkes Barre–Scranton, Pennsylvania	0.16	0.32	13		18	37	60
Providence, Rhode Island	0.15	0.30	17		24	40	64
Charleston, South Carolina	0.07	0.14	25		41	34	59
Columbia, South Carolina	0.08	0.17	25		41	36	61
Greenville–Spartanburg, South Carolina	0.08	0.17	23		38	36	60
Huron, South Dakota	0.25	0.50	—	NR	—	58	79
Pierre, South Dakota	0.22	0.43	21		23	58	80
Rapid City, South Dakota	0.15	0.30	23		32	51	76
Sioux Falls, South Dakota	0.22	0.45	18		19	57	79
Chattanooga, Tennessee	0.09	0.19	19		32	33	56
Knoxville, Tennessee	0.09	0.18	20		33	33	56
Memphis, Tennessee	0.09	0.19	22		36	36	60
Nashville, Tennessee	0.10	0.21	19		30	33	55
Abilene, Texas	0.09	0.18	29		47	41	68
Amarillo, Texas	0.11	0.22	29		46	45	72
Austin, Texas	0.06	0.13	27		46	37	63
Brownsville, Texas	0.03	0.06	27		46	32	57
Corpus Christi, Texas	0.05	0.09	29		49	36	63
Dallas, Texas	0.08	0.17	27		44	38	64
Del Rio, Texas	0.06	0.12	30		50	39	66
El Paso, Texas	0.09	0.17	32		53	45	72
Fort Worth, Texas	0.09	0.17	26		44	38	64
Houston, Texas	0.06	0.11	25		43	34	59
Laredo, Texas	0.05	0.09	31		52	39	64
Lubbock, Texas	0.09	0.19	30		49	44	72
Lufkin, Texas	0.07	0.14	26		43	35	61
Midland–Odessa, Texas	0.09	0.18	32		52	44	72
Port Arthur, Texas	0.06	0.11	26		44	34	60
San Angelo, Texas	0.08	0.15	29		48	40	67
San Antonio, Texas	0.06	0.12	28		48	38	64
Sherman, Texas	0.10	0.20	25		41	38	64
Waco, Texas	0.08	0.15	27		45	38	64
Wichita Falls, Texas	0.10	0.20	27		45	41	67
Bryce Canyon, Utah	0.13	0.25	26		39	52	78
Cedar City, Utah	0.12	0.24	28		43	48	75
Salt Lake City, Utah	0.13	0.26	27		39	48	72
Burlington, Vermont	0.22	0.43	—	NR	—	46	68

TABLE F.1 Design Guidelines for Passive Solar Glazing Area (Continued)

Location	Area of Solar Glazing ^a as Ratio of Floor Area		Approximate SSF Values			
			Standard Performance ^b		Superior Performance ^c	
	Low	High	Low	High	Low	High
Norfolk, Virginia	0.09	0.19	23	38	37	62
Richmond, Virginia	0.11	0.22	21	34	37	61
Roanoke, Virginia	0.11	0.23	21	34	37	61
Olympia, Washington	0.12	0.23	20	29	38	59
Seattle-Tacoma, Washington	0.11	0.22	21	30	39	59
Spokane, Washington	0.20	0.39	20	24	48	68
Yakima, Washington	0.18	0.36	24	31	49	70
Charleston, West Virginia	0.13	0.25	16	24	32	54
Huntington, West Virginia	0.13	0.25	17	27	34	57
Eau Claire, Wisconsin	0.25	0.50	—	NR	—	75
Green Bay, Wisconsin	0.23	0.46	—	NR	—	75
La Crosse, Wisconsin	0.21	0.43	—	NR	—	75
Madison, Wisconsin	0.20	0.40	15	17	51	74
Milwaukee, Wisconsin	0.18	0.35	15	18	48	71
Casper, Wyoming	0.13	0.26	27	39	53	78
Cheyenne, Wyoming	0.11	0.21	25	39	47	74
Rock Springs, Wyoming	0.14	0.28	26	38	54	79
Sheridan, Wyoming	0.16	0.31	22	30	52	75
CANADA						
Edmonton, Alberta	0.25	0.50	—	NR	—	72
Suffield, Alberta	0.25	0.50	28	30	67	85
Nanaimo, British Columbia	0.13	0.26	26	35	45	66
Vancouver, British Columbia	0.13	0.26	20	28	40	60
Winnipeg, Manitoba	0.25	0.50	—	NR	—	74
Dartmouth, Nova Scotia	0.14	0.28	17	24	45	70
Moosonee, Ontario	0.25	0.50	—	NR	—	67
Ottawa, Ontario	0.25	0.50	—	NR	—	80
Toronto, Ontario	0.18	0.36	17	23	44	68
Normandin, Quebec	0.25	0.50	—	NR	—	74

Source: Adapted from J. D. Balcomb et al. (1980). *Passive Solar Design Handbook*, Vol. 2 (Passive Solar Design Analysis), U.S. Department of Energy, Washington, DC.

NR = not recommended.

^aDue south-facing openings are assumed.

^bDouble-glazed, clear glass (approximately equal to window 3, Table E.15).

^cEither movable window insulation of R-9, in place from 5:30 P.M. to 7:30 A.M., solar time, or superwindows with an overall U-factor near 0.30 (approximately equal to windows 7 or 12, Table E.15).