

Appendix D

Building Descriptions

APPENDIX D: Building Descriptions

The purpose of the *Building Descriptions* is to assist the user in selecting an appropriate type of building when using the Air Conditioning estimating tools. The selected building type should be the one that most closely matches the actual project. These summaries provide the user with the inputs for the typical buildings. Minor variations from these inputs will occur based on differences in building vintage and climate zone. The *Building Descriptions* are referenced from the *2004-2005 Database for Energy Efficiency Resources (DEER) Update Study*. It should be noted that the user is required to provide certain inputs for the user's specific building (e.g. actual conditioned area, city, operating hours, economy cycle, new AC system and new AC system efficiency). The remaining inputs are approximations of the building and are deemed acceptable to the user. If none of the typical building models are determined to be a fair approximation then the user has the option to use the *Custom Building* approach. The *Custom Building* option instructs the user how to initiate the Engage Software. The Engage Software is a stand-alone, DOE2 based modeling program.

Prototype	Source	Activity Area Type	Area	% Area	Simulation Model Notes
1. Assembly	DEER	Auditorium	33,235	97.8	<p>Thermal Zoning: One zone per activity area.</p> <p>Model Configuration: Matches 1994 DEER prototype</p> <p>HVAC Systems: The prototype uses Rooftop DX systems, which are changed to Rooftop HP systems for the heat pump efficiency measures.</p>
		Office	765	2.2	
		Total	34,000		
2. Education - Primary School	DEER	Classroom/Lecture	31,500	63.0	<p>Thermal Zoning: One zone per activity area.</p> <p>Model Configuration: 1994 DEER model consisted of one building. Current model consists of two identical models, each rotated 90 degrees to achieve reasonable distribution of solar gains.</p> <p>HVAC Systems: The prototype uses Rooftop DX systems. The system is changed to Rooftop HP for the heat pump efficiency measures.</p>
		Dining Area	7,500	15.0	
		Exercising Centers and Gymnasium	7,500	15.0	
		Kitchen and Food Preparation	3,500	7.0	
		Total	50,000		
3. Education - Secondary School	DEER	Classroom/Lecture	88,200	58.8	<p>Thermal Zoning: One zone per activity area.</p> <p>Model Configuration: 1994 DEER model consisted of one building. Current model consists of four identical models that comprise that include the classroom, computer room, kitchen, dining and office areas, each rotated 90 degrees to achieve reasonable distribution of solar gains. A fifth building represents the gym.</p> <p>HVAC Systems: The prototype uses Rooftop DX systems. The system is changed to Rooftop HP for the heat pump efficiency measures. For built-up system measures applicable to this prototype, the system is VAV, except for the kitchen areas, which are served by Rooftop DX systems that are changed to Rooftop HP.</p>
		Computer Room (Instructional/PC Lab)	3,082	2.1	
		Dining Area	22,500	15.0	
		Exercising Centers and Gymnasium	22,500	15.0	
		Kitchen and Food Preparation	10,500	7.0	
		Office (General)	3,218	2.1	
		Total	150,000		

Prototype	Source	Activity Area Type	Area	% Area	Simulation Model Notes
4. Education - Community College	DEER	Classroom/Lecture	150,825	50.3	<p>Thermal Zoning: One zone per activity area.</p> <p>Model Configuration: 1994 DEER model consisted of one building. Current model consists of two identical models that comprise that include the classroom, computer room, kitchen, dining and office areas, each rotated 90 degrees to achieve reasonable distribution of solar gains.</p> <p>HVAC Systems: The prototype uses VAV systems, except for the kitchen areas use Rooftop DX systems that are changed to Rooftop HP systems for the heat pump efficiency measures.</p>
		Computer Room (Instructional/PC Lab)	9,625	3.2	
		Dining Area	26,250	8.8	
		Kitchen and Food Preparation	5,625	1.9	
		Office (General)	70,175	23.4	
		Total	300,000		
5. Education - University	DEER	Classroom/Lecture	431,160	43.1	<p>Thermal Zoning: Main instructional buildings use generic thermal zones with all activity area characteristics averaged across the entire zone. The dormitory buildings are zoned by individual activity area.</p> <p>Model Configuration: 1994 DEER model consisted of two buildings: one instructional building and one dormitory. Current model consists of four identical instructional buildings each rotated 90 degrees to achieve reasonable distribution of solar gains. There are also two identical buildings representing dormitories, each rotated 90 degrees.</p> <p>HVAC Systems: The prototype uses VAV systems, except for the kitchen areas use Rooftop DX systems that are changed to Rooftop HP systems for the heat pump efficiency measures.</p>
		Comm/Ind Work (General Low Bay)	80,000	8.0	
		Computer Room (Instructional/PC Lab)	27,540	2.8	
		Corridor (Dormitory)	30,000	3.0	
		Dining Area	24,000	2.4	
		Hotel/Motel Guest Room (Dormitory)	170,000	17.0	
		Kitchen and Food Preparation	10,500	1.1	
		Office (General)	226,800	22.7	
		Total	1,000,000		

Prototype	Source	Activity Area Type	Area	% Area	Simulation Model Notes
27. Education - Relocatable Classroom	HPCBS	Classroom/Lecture	1,920	100.0	<p>Thermal Zoning: One zone per activity area.</p> <p>Model Configuration: Matches HPCBS prototype.</p> <p>HVAC Systems: The prototype uses Rooftop DX systems, which are changed to Rooftop HP systems for the heat pump efficiency measures.</p>
6. Grocery	DEER/ Vacom	Comm/Ind Work (Loading Dock)	2,860	5.7	<p>Thermal Zoning: One zone per activity area.</p> <p>Model Configuration: Vacom developed the prototype based on their experience in providing energy efficiency services to grocery stores.</p> <p>HVAC Systems: The prototype uses Rooftop DX systems for the non-refrigerated spaces. These are switched to Rooftop DX systems for heat pump efficiency measures. The refrigerated spaces use detailed refrigeration systems developed using the eQUEST refrigeration version. A complete description of grocery refrigeration systems is included in Section 7.3 Grocery Refrigeration Measures.</p>
		Office (General)	3,500	7.0	
		Refrigerated (Food Preparation)	1,268	2.5	
		Refrigerated (Walk-in Cooler)	1,560	3.1	
		Refrigerated (Walk-in Freezer)	812	1.6	
		Retail Sales Grocery	40,000	80.0	
		Total	50,000		
7. Health/Medical - Hospital	DEER	Dining Area	4,375	1.8	<p>Thermal Zoning: One zone per activity area.</p> <p>Model Configuration: Matches 1994 DEER prototype.</p> <p>HVAC Systems: The prototype uses FPFC systems for the patient rooms. The kitchen uses a Rooftop DX system, which is changed to a Rooftop HP system for the heat pump efficiency measures. Except for the oldest vintage, VAV systems are used for all other spaces. The oldest vintage uses a CV Reheat system.</p>
		Kitchen and Food Preparation	1,875	0.8	
		Laboratory Medical	57,917	23.2	
		Medical and Clinical Care	95,000	38.0	
		Office (General)	90,833	36.3	
		Total	250,000		

Prototype	Source	Activity Area Type	Area	% Area	Simulation Model Notes
8. Health/Medical - Nursing Home	DEER	Corridor	3,333	5.6	<p>Thermal Zoning: One zone per activity area.</p> <p>Model Configuration: Matches 1994 DEER prototype</p> <p>HVAC Systems: The prototype uses FPFC systems for all spaces except the kitchen. The kitchen uses a Rooftop DX system, which is changed to a Rooftop HP system for the heat pump efficiency measures. FPFC systems are changed to a VAV system for any applicable measures for built-up systems.</p>
		Dining Area	6,300	10.5	
		Hotel/Motel Guest Room (incl. toilets) (Patient Rooms)	26,667	44.4	
		Kitchen and Food Preparation	2,700	4.5	
		Office (General)	21,000	35.0	
		Total	60,000		
9. Lodging - Hotel	DEER/ NCC	Bar Cocktail Lounge	800	0.4	<p>Thermal Zoning: One zone per activity area.</p> <p>Model Configuration: The building envelope and occupancy matches 1994 DEER Prototype. Guestroom areas are divided into unoccupied rooms (40,171 ft²/20%) and occupied rooms (120,511 ft²/60%). HVAC systems are based on NCC.</p> <p>HVAC Systems: The kitchen is served by a Rooftop DX system which is changed to a Rooftop HP system for the heat pump efficiency measures. The remaining public areas are served by a CV Reheat system for the oldest vintage, VAV systems for the second and third vintages and Rooftop VAV systems for the latest two vintages. Guestrooms are served by FPFC systems for the first three vintages and PTHP systems for the latest two vintages.</p>
		Corridor	20,085	10.0	
		Dining Area	1,250	0.6	
		Hotel/Motel Guest Room (incl. toilets)	160,682	80.3	
		Kitchen and Food Preparation	750	0.4	
		Laundry	4,108	2.1	
		Lobby (Hotel)	8,217	4.1	
		Office (General)	4,108	2.1	
Total	200,00				

Prototype	Source	Activity Area Type	Area	% Area	Simulation Model Notes
10. Lodging - Motel	DEER	Corridor	3,333	11.1	<p>Thermal Zoning: One zone per activity area.</p> <p>Model Configuration: Matches 1994 DEER configuration. Guestrooms are divided among 12 hour occupied (12,794 ft²/42.6%), 24-hour occupied (6,397 ft²/21.3%) and unoccupied rooms (6,397 ft²/21.3%).</p> <p>HVAC Systems: The oldest vintage uses PTAC systems with electric resistance heating. All other vintages use PTHP systems.</p>
		Hotel/Motel Guest Room (incl. toilets)	25,587	85.3	
		Laundry	480	1.6	
		Office (General)	600	2.0	
		Total	30,000		
11. Manufacturing - Bio/Tech	NCC	Comm/Ind Work (High Tech Bio Tech Lab)	90,669	45.3	<p>Thermal Zoning: The model uses generic thermal zones with all activity area characteristics averaged across the entire zone.</p> <p>Model Configuration: Matches NCC prototype.</p> <p>HVAC Systems: The prototype uses Rooftop DX systems, which are changed to Rooftop HP systems for the heat pump efficiency measures.</p>
		Computer Room (Mainframe/Server)	4,000	2.0	
		Conference Room	4,000	2.0	
		Corridor	40,001	20.0	
		Dining Area	6,000	3.0	
		Kitchen and Food Preparation	2,000	1.0	
		Office (General)	53,330	26.7	
		Total	200,000		
12. Manufacturing - Light Industrial	DEER	Comm/Ind Work (General High Bay)	80,000	80.0	<p>Thermal Zoning: One zone per activity area.</p> <p>Model Configuration: Matches 1994 DEER prototype</p> <p>HVAC Systems: The prototype uses Rooftop DX systems, which are changed to Rooftop HP systems for the heat pump efficiency measures.</p>
		Storage (Unconditioned)	20,000	20.0	
		Total	100,000		

Prototype	Source	Activity Area Type	Area	% Area	Simulation Model Notes
13. Office - Large	NCC	Conference Room	7,000	4.0	<p>Thermal Zoning: The model uses generic thermal zones with all activity area characteristics averaged across the entire zone.</p> <p>Model Configuration: Matches NCC prototype.</p> <p>HVAC Systems: The oldest vintage uses a CV Reheat systems, and all other vintages us VAV systems.</p>
		Copy Room (photocopying equipment)	3,500	2.0	
		Corridor	17,500	10.0	
		Lobby(Office Reception/Waiting)	8,750	5.0	
		Mechanical/Electrical Room	7,000	4.0	
		Office (Executive/Private)	43,750	25.0	
		Office (Open Plan)	78,750	45.0	
		Restrooms	8,750	5.0	
		Total	175,000		
14. Office - Small	NCC	Conference Room	400	4.0	<p>Thermal Zoning: The model uses generic thermal zones with all activity area characteristics averaged across the entire zone.</p> <p>Model Configuration: Matches NCC prototype.</p> <p>HVAC Systems: The prototype uses Rooftop DX systems, which are changed to Rooftop HP systems for the heat pump efficiency measures.</p>
		Copy Room (photocopying equipment)	200	2.0	
		Corridor	1,000	10.0	
		Lobby (Office Reception/Waiting)	500	5.0	
		Mechanical/Electrical Room	400	4.0	
		Office (Executive/Private)	7,000	70.0	
		Restrooms	500	5.0	
		Total	10,000		
15. Restaurant - Sit-Down	DEER	Dining Area	2,000	50.0	<p>Thermal Zoning: One zone per activity area.</p> <p>Model Configuration: Matches 1994 DEER prototype</p> <p>HVAC Systems: The prototype uses Rooftop DX systems, which are changed to Rooftop HP systems for the heat pump efficiency measures.</p>
		Kitchen and Food Preparation	1,200	30.0	
		Lobby (Main Entry and Assembly)	600	15.0	
		Restrooms	200	5.0	
		Total	4,000		

Prototype	Source	Activity Area Type	Area	% Area	Simulation Model Notes
16. Restaurant - Fast-Food	DEER	Dining Area	1,000	50.0	Thermal Zoning: One zone per activity area. Model Configuration: Matches 1994 DEER prototype HVAC Systems: The prototype uses Rooftop DX systems, which are changed to Rooftop HP systems for the heat pump efficiency measures.
		Kitchen and Food Preparation	300	15.0	
		Lobby (Main Entry and Assembly)	600	30.0	
		Restrooms	100	5.0	
		Total	2,000		
17. Retail - 3-Story Large	DEER	Office (General)	6,000	5.0	Thermal Zoning: One zone per activity area. Model Configuration: Matches 1994 DEER prototype HVAC Systems: The oldest vintage uses a CV Reheat systems, and all other vintages us VAV systems.
		Retail Sales and Wholesale Showroom	96,000	80.0	
		Storage (Conditioned)	18,000	15.0	
		Total	120,000		
18. Retail - Single-Story Large	NCC	Auto Repair Workshop	5,165	4.0	Thermal Zoning: One zone per activity area. Model Configuration: Matches NCC prototype. HVAC Systems: The prototype uses Rooftop DX systems, which are changed to Rooftop HP systems for the heat pump efficiency measures.
		Kitchen and Food Preparation	1,462	1.1	
		Office (General)	4,698	3.6	
		Retail Sales and Wholesale Showroom	107,273	82.2	
		Storage (Conditioned)	11,902	9.1	
		Total	130,000		
19. Retail - Small	DEER	Retail Sales and Wholesale Showroom	6,400	80.0	Thermal Zoning: One zone per activity area. Model Configuration: Matches 1994 DEER prototype HVAC Systems: The prototype uses Rooftop DX systems, which are changed to Rooftop HP systems for the heat pump efficiency measures.
		Storage (Conditioned)	1,600	20.0	
		Total	8,000		

Prototype	Source	Activity Area Type	Area	% Area	Simulation Model Notes
20. Storage - Conditioned	NCC	Storage (Conditioned)	500,000	100.0	<p>Thermal Zoning: The model uses generic thermal zones with all activity area characteristics averaged across the entire zone.</p> <p>Model Configuration: Matches NCC prototype.</p> <p>HVAC Systems: The prototype uses Rooftop DX systems, which are changed to Rooftop HP systems for the heat pump efficiency measures.</p>
21. Storage - Unconditioned	NCC	Storage (Unconditioned)	500,000	100.0	<p>Thermal Zoning: The model uses generic thermal zones with all activity area characteristics averaged across the entire zone.</p> <p>Model Configuration: Matches NCC prototype.</p> <p>HVAC Systems: The prototype uses UH systems only for freeze protection.</p>
22. Storage - Refrigerated Warehouse	Vacom	Comm/Ind Work (Loading Dock)	8,000	8.0	<p>Thermal Zoning: One zone per activity area.</p> <p>Model Configuration: Vacom developed the prototype based on their experience in providing energy efficiency services to refrigerated warehouses.</p> <p>HVAC Systems: The prototype uses Rooftop DX systems for the non-refrigerated spaces. These are switched to Rooftop DX systems for heat pump efficiency measures. The refrigerated spaces use detailed refrigeration systems developed using the eQUEST refrigeration version. A complete description of grocery refrigeration systems is included in Section 7.4 Refrigerated Warehouse Measures.</p>
		Office (Executive/Private)	2,000	2.0	
		Refrigerated (Cooled Storage)	49,950	50.0	
		Refrigerated (Food Preparation)	40,050	40.1	
		Total	100,000		