

Building Energy Performance Characteristics
For Compliance with Standard 90.1-2010

Project:

Project Location:

See the instructions and disclaimer for this spreadsheet.

	Element	ASHRAE/IESNA Standard 90.1-2010 Requirement	Values Incorporated Into This Design
Section 5			
Building Envelope (Climate Zone 5A)			
Prescriptive Building Envelope Option			
Space-Conditioning Category (Nonresidential, Residential, Semiheated)			
Gross Roof Area			
Air Leakage			
Continuous Air Barrier	Design		
	Installation		
	Materials & Assemblies		
Fenestration: Maximum Air Leakage Rates			
Door: Maximum Air Leakage Rates			
Loading Dock Weatherseals			
Vestibules			
Roofs: Maximum Assembly U-factor			
Minimum Insulation R-Value			
Skylight Curb: Minimum Insulation R-Value			
Walls: Above-Grade: Maximum Assembly U-factor			
Above-Grade: Minimum Insulation R-Value			
Below-Grade: Maximum Assembly C-factor			
Below-Grade: Minimum Insulation R-Value			
Floors: Maximum Assembly U-factor			
Minimum Insulation R-Value			
Slab-On-Grade Floors: Maximum Assembly F-factor			
Slab-On-Grade Floors: Minimum Insulation R-Value			
Opaque Doors: Maximum Assembly U-factor			
Gross Wall Area			
Total Vertical Fenestration Area			
Vertical Glazing: Percent of Wall Area			
Fenestration Area by Orientation ($A_s \geq A_w$ and $A_s \geq A_e$)			
South Orientation (A_s)			
North Orientation (A_n)			
West Orientation (A_w)			
East Orientation (A_e)			
Vertical Fenestration			
Maximum Assembly U-factor			
Maximum Assembly SHGC			
Visible Transmittance (VT)			
Total Skylight Area			
Required Minimum Skylight Fenestration Area with Daylight Control			
Skylight: Percent of Roof Area			
Skylight: Maximum Assembly U-factor			
Maximum Assembly SHGC			
Visible Light Transmittance (VT)			
Haze Value			
Eave Vent Baffle			
Insulation Protection Requirement			
Section 5			
Building Envelope (Climate Zone 5A)			
Building Envelope Trade-Off Option			
Envelope Performance Factor			
Section 6			
Heating, Ventilating and Air Conditioning			
Compliance Path (Simple Approach Option or Mandatory Provisions and Prescriptive Path)			

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	Element	ASHRAE/IESNA Standard 90.1-2010 Requirement	Values Incorporated Into This Design
Outdoor Air Quantity Supplied			
Calculated Load	Heating		
	Cooling		
Equipment Capacity	Heating		
	Cooling		
Calculated Pump Differential Pressure (Head) in Critical Circuit at Design Conditions			
HVAC Equipment Performance			
Unitary Air Conditioners, Electrically Operated, Minimum Efficiency	Air Cooled		
	Water Cooled		
	Evaporatively Cooled		
Condensing Units, Electrically Operated, Minimum Efficiency	Air Cooled		
	Water Cooled		
	Evaporatively Cooled		
Unitary and Applied Heat Pumps, Electrically Operated, Cooling Mode Minimum Efficiencies	Air Cooled		
	Water Source		
	Ground Source		
Unitary and Applied Heat Pumps, Electrically Operated, Heating Mode Minimum Efficiency	Air Cooled		
	Water Source		
	Ground Source		
Water Chilling Package, Air Cooled, Electrically Operated, Minimum Efficiency - Compliance Path A			
Water Chilling Package, Water Cooled, Electrically Operated, Positive Displacement, Maximum Efficiency - Compliance Path (A or B)			
Water Chilling Package, Water Cooled, Electrically Operated, Centrifugal, Maximum Efficiencies - Compliance Path (A or B)			
Water Chilling Package, Air Cooled Absorption, Single Effect, Minimum Efficiency - Compliance Path A			
Water Chilling Package, Water Cooled Absorption, Single Effect, Minimum Efficiency - Compliance Path A			
Water Chilling Package, Absorption, Double Effect, Indirect-Fired, Minimum Efficiency - Compliance Path A			
Water Chilling Package, Absorption, Double Effect, Direct-Fired, Minimum Efficiency - Compliance Path A			
Package Terminal Air Conditioners (Cooling Mode) Minimum Efficiency			
Package Terminal Heat Pumps (Cooling Mode) Minimum Efficiency			
Package Terminal Heat Pumps (Heating Mode) Minimum Efficiency			
Single-Package Vertical Air Conditioners (Cooling Mode), Minimum Efficiency			
Single-Package Vertical Heat Pumps (Cooling Mode), Minimum Efficiency			
Single-Package Vertical Heat Pumps (Heating Mode), Minimum Efficiency			
Room Air Conditioners, with Louvered Sides, Minimum Efficiency			
Room Air Conditioners, without Louvered Sides, Minimum Efficiency			
Room Air-conditioner Heat Pumps, with Louvered Sides, Minimum Efficiency			
Room Air-conditioner Heat Pumps, without Louvered Sides, Minimum Efficiency			
Room Air Conditioners, Casement Only, Minimum Efficiency			
Room Air Conditioners, Casement-slider, Minimum Efficiency			
Warm Air Furnaces and Combination Warm Air Furnaces/Air-conditioning Units, Minimum Efficiency			
Warm Air Duct Furnaces, Minimum Efficiency			
Warm Air Unit Heaters, Minimum Efficiency			
Boilers, Hot Water, Minimum Efficiency			
Boilers, Steam, Minimum Efficiency			

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	Element	ASHRAE/IESNA Standard 90.1-2010 Requirement	Values Incorporated Into This Design
Heat Rejection Equipment, Minimum Performance			
Heat Transfer Equipment			
Variable Refrigerant Flow (VRF) Air Conditioners, Electrically Operated, Multi-Split System, Minimum Efficiency	Air Cooled		
Variable Refrigerant Flow (VRF) Heat Pumps, Electrically Operated, Multi-Split System, (Cooling Mode), Minimum Efficiency	Air Cooled		
	Water Source		
	Groundwater Source		
	Ground Source		
Variable Refrigerant Flow (VRF) Heat Pumps, Electrically Operated, Multi-Split System, (Heating Mode), Minimum Efficiency	Air Cooled		
	Water Source		
	Source		
	Ground Source		
Air Conditioners and Condensing Units Serving Computer Rooms, Minimum Efficiency	Air Cooled		
	Water Cooled		
	Water Cooled with Fluid Economizer		
	Glycol Cooled		
	Glycol Cooled with Fluid Economizer		
Zone Thermostatic Control	One per Zone		
Independent Perimeter System Thermostatic Control			
Dead Band			
Setpoint Overlap Restriction for Separate Controls			
Automatic Off-Hour Shutdown/Setback Control			
Optimum Start Controls			
Automatic Zone Isolation			
Ventilation System Controls			
Stair and Shaft Vent Automatic Motorized Damper Control			
Air Intake and Exhaust System Automatic Motorized Shutoff Damper Control			
Automatic Ventilation Fan Shutdown Controls			
Enclosed Parking Garage Ventilation Controls			
Demand Control Ventilation			
Maximum Damper Leakage Rate	Motorized Damper		
	Backdraft Damper		
HVAC System Controls			
Heat Pump Auxiliary Heat Control			
Humidifier Preheat Control			
Simultaneous Humidification and Dehumidification Prevention Control			
Simultaneous Heating & Cooling Limitation Control			
Supply Air Temperature Reheat Limit Control			
Single Zone Variable-Air-Volume Control			
Freeze Protection and Snow/Ice Melting Systems Control			
HVAC System Construction and Insulation			
Supply Duct Insulation Minimum R-Value			
Return Duct Insulation Minimum R-Value			
Pipe Insulation for Heating Systems, Conductivity / Minimum Thickness			
Pipe Insulation for Cooling Systems, Conductivity / Minimum			
Sensible Heating Panel Insulation, Minimum R-Value			
Radiant Floor Heating Insulation, Minimum R-Value			
Duct Sealing			
Duct Sealing Testing Requirement			
Economizers			
Air Economizer	Capacity		
	Control		
	High-Limit Shutoff		

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	Element	ASHRAE/IESNA Standard 90.1-2010 Requirement	Values Incorporated Into This Design
Water Economizer	Capacity		
	Pressure Drop		
	Integrated Control		
Air System Design and Control			
Fan System Power Limitation (Nameplate Horsepower Option or Break Horsepower Option)			
Variable-Air-Volume Controls	Variable Flow Control		
	DDC Static Pressure Reset		
	DDC Ventilation Optimization		
	Temperature Reset		
Hydronic System Design and Controls			
Total Pump System Power			
Two-Pipe System Changeover Controls			
Hydronic Heat Pump & Water Cooled Unitary Air Conditioner Systems	Two Position Valve on Each Unit		
Hydronic (Water Loop) Heat Pump Systems	Dead Band		
	Pump Variable Flow Control		
	Isolation of Cooling Tower When Not		
Variable Flow Systems	Pump Variable Flow Control		
	Automatic Chiller Isolation		
	Automatic Boiler Isolation		
	Water Temperature Reset		
Pipes			
Heat Rejection Equipment			
Fan Speed Control			
Minimum Efficiency Performance			
Exhaust Air Energy Recovery			
Heat Recovery for Service Water Heating			
Kitchen Exhaust Systems with Volume Control			
Laboratory Exhaust Systems with Volume Control or Direct Makeup Air Temperature Control			
Cooling System Hot Gas Bypass Limitation: Maximum Percentage of Total			
Radiant Heating Systems for Unenclosed Spaces			
Radiant Heating Systems for Enclosed Spaces			
Completion Requirements			
As-Built Record Drawing Submittal Requirement			
Operation Manuals Requirement			
Maintenance Manuals Requirement			
Air System Balancing Requirement			
Hydronic System Balancing Requirement			
HVAC System Commissioning Requirement			
Section 7			
Service Water Heating			
Service Water Heating System			
	Equipment Sizing	Calculated Load	

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	Element	ASHRAE/IESNA Standard 90.1-2010 Requirement	Values Incorporated Into This Design
	Equipment Total Capacity		
	Storage Water Heater, Minimum Performance		
	Instantaneous Water Heater, Minimum Performance		
	Hot Water Supply Boilers, Minimum Performance		
	Pool Heater, Minimum Performance		
	Unfired Storage Tank, Minimum Insulation R-Value		
	Pipe Insulation for Domestic and Service Hot-Water Systems, Conductivity / Minimum Thickness		
	Service Water Storage Temperature Control Switch		
	Public Restroom Service Water Outlet Temperature Control Switch		
	Pool Heater On-Off Switch		
	Pool Cover for Heated Pools		
	Swimming Pool Heater and Pump Time Switch		
	Service Water Heater Inlet & Outlet Heat Traps		
	Space & Water Heating Boiler System Requirement		
Section 8			
Power			
	Low Voltage Dry-Type Distribution Transformer, Minimum Efficiency		
	Feeder Voltage Drop		
	Branch Circuit Voltage Drop		
	Automatic Receptacle Control		
	Submittals		
	As-Built Record Drawing Submittal Requirement		
	Operation Manuals Submission Requirement		
	Maintenance Manuals Submission Requirement		
	Intended Operation Narrative Submission Requirement		
Section 9			
Lighting			
	Interior Lighting System Calculation Method (Building Area or Space-by-Space)		
	Gross Lighted Floor Area		
	Equivalent Interior Lighting Power Density		
	Interior Lighting Power	Allowance	
		Connected	
	Interior Lighting Controls		
	Automatic Building Interior Lighting Shutoff		
	Enclosed Space Control for General Lighting with Intermediate Power Step		
	Automatic Interior Space Shutoff Control in Required Spaces		
	Parking Garage Lighting Control		
	Automatic Daylighting Controls	For Primary Side Lighted Areas	
		For Toplighting	
	Additional Controls for Other Lighting		
	Exit Sign: Maximum Wattage per Face		
	Exterior Lighting		
	Total Exterior Lighting Power	Allowance	
		Connected	
	Tradable Surface Exterior Lighting Power	Allowance	
		Connected	
	Non-Tradable Surface Exterior Lighting Power	Allowance	
		Connected	

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	Element	ASHRAE/IESNA Standard 90.1-2010 Requirement	Values Incorporated Into This Design
Minimum Lamp Efficacy			
Automatic Exterior Lighting Control			
Lighting System Functional Testing			
Completion Requirements			
As-Built Record Drawing Submittal Requirement			
Operation Manuals Requirement			
Maintenance Manuals Requirement			
Lighting Control System Narrative			
Section 10			
Other Equipment			
Minimum Motor Efficiency Requirement			
Service Water Pressure Booster System Requirements			
Elevator Requirements			
Cab Lighting, Minimum Lamp Efficacy			
Maximum Ventilation Power			
Standby Mode			

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		Element	ASHRAE/IESNA Standard 90.1-2010 Requirement	Values Incorporated Into This Design	
Section 5					
Building Envelope (Climate Zone 5A)					
Prescriptive Building Envelope Option					
Space-Conditioning Category (Nonresidential, Residential, Semiheated)					
Gross Roof Area					
Air Leakage					
Continuous Air Barrier	Design	Over All Surfaces			
		Details			
		Resist Positive & Negative Pressure			
	Installation (Wrapped, Sealed, Caulked, Gasketed or Taped)	Joints Around Fenestration and Door Frames			
		Junctions Between Walls & Floors, Between Walls & Roof/Ceiling and Walls @ Corners			
		Penetrations Through Air Barrier			
		Assemblies Used as Ducts or Plenums			
		Joints, Seams, Connections Between Planes & Changes in Materials			
	Acceptable Material	Plywood			
		Oriented Strand Board			
		Extruded Polystyrene Insulation Board			
		Urethane Insulation Board			
		Gypsum Sheeting or Gypsum Board			
		Cement Board			
		Roof Membrane			
		Plaster, Stucco or Parge			
		Concrete			
		Sheet Metal			
		Spray Polyurethane Foam			
		Acceptable Assemblies of Materials and Components	Concrete Masonry Walls		
Maximum Air Leakage Rates		Glazed Swinging Entrance Door			
	Revolving Door				
	Curtainwall				
	Storefront Glazing				

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	Skylights with Condensation Weepage Openings		
	Nonswinging Opaque Door		
	All Other Products		
	Loading Dock Weatherseals		
	Vestibules		
Roofs: Maximum Assembly U-factor	Insulation Entirely Above Deck		
	Metal Building		
	Attic & Other		
Minimum Insulation R-Value	Insulation Entirely Above Deck		
	Metal Building		
	Attic & Other		
Skylight Curb: Minimum Insulation R-Value			
Walls: Above-Grade: Assembly Maximum U-factor	Mass		
	Metal Building		
	Steel Framed		
	Wood Framed & Other		
Above-Grade: Minimum Insulation R-Value	Mass		
	Metal Building		
	Steel Framed		
	Wood Framed & Other		
Below-Grade: Assembly Maximum C-factor			
Below-Grade: Minimum Insulation R-Value			
Floors: Assembly Maximum U-factor	Mass		
	Steel Joist		
	Wood Framed & Other		
Minimum Insulation R-Value	Mass		
	Steel Joist		
	Wood Framed & Other		
Slab-On-Grade Floors: Assembly Maximum F-factor	Unheated		
	Heated		
Slab-On-Grade Floors: Minimum Insulation R-Value	Unheated		
	Heated		
Opaque Doors: Assembly Maximum U-factor	Swinging		
	Nonswinging		
Gross Wall Area			
Total Vertical Fenestration Area			
Vertical Glazing: Percent of Wall Area			
Fenestration Area by Orientation ($A_s \geq A_w$ and $A_s \geq A_e$)			
South Orientation (A_s)			
North Orientation (A_n)			
West Orientation (A_w)			
East Orientation (A_e)			
Vertical Fenestration			
Assembly (Overall Product) Maximum U-factor	Nonmetal Framing (All)		

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	Element	ASHRAE/IESNA Standard 90.1-2010 Requirement	Values Incorporated Into This Design
	Metal Framing (Curtainwall / Storefront)		
	Metal Framing (Entrance Door)		
	Metal Framing (All Other)		
Maximum Assembly (Overall Product) SHGC			
Projection Factor SHGC Multiplier			
Visible Transmittance (VT)			
Total Skylight Area			
Required Minimum Skylight Area			
Space $\geq 5,000$ sq. ft. & > 15 ft. Ceiling height and used as Office, Lobby, Atrium, Concourse, Corridor, Non-refrigerated Warehouse or Storage, Gymnasium/Exercise Center, Automobile Service, Manufacturing, Retail, Distribution/Sorting Area, Transportation, or Workshop.	Daylight Zone Under Skylight $\geq 50\%$ Floor Area		
	Daylight Zone $\geq 3\%$ Skylight VT or $\geq 1\%$ Effective Aperture		
Skylight: Percent of Roof Area			
Skylight: Maximum Assembly (Overall Product) U-factor	% of Roof		
with Curb and Glass Glazing	0% - 2.0%		
	2.1% - 5.0%		
with Curb and Plastic Glazing	0% - 2.0%		
	2.1% - 5.0%		
without Curb	0% - 2.0%		
	2.1% - 5.0%		
Maximum Assembly (Overall Product) SHGC	% of Roof		
with Curb and Glass Glazing	0% - 2.0%		
	2.1% - 5.0%		
with Curb and Plastic glazing	0% - 2.0%		
	2.1% - 5.0%		
without Curb All Glazing	0% - 2.0%		
	2.1% - 5.0%		
Visible Transmittance (VT)			
Haze Value			
Eave Vent Baffle Requirement			
Insulation Protection Requirement			
Section 5			
Building Envelope (Climate Zone 5A)			
Building Envelope Trade-Off Option			
Envelope Performance Factor			
Section 6			
Heating, Ventilating and Air Conditioning			
Compliance Path (Simple Approach Option or Mandatory Provisions and Prescriptive Path)			
Outdoor Air Quantity Supplied			
Calculated Load	Heating		
	Cooling		
Equipment Capacity	Heating		
	Cooling		
Calculated Pump Differential Pressure (Head) in Critical Circuit at Design Conditions			
HVAC Equipment Performance			
Unitary Air Conditioners, Electrically Operated, Minimum Efficiency			
Air Conditioners, Air Cooled	Split System $< 65,000$ Btu/h		

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	Element	ASHRAE/IESNA Standard 90.1-2010 Requirement	Values Incorporated Into This Design
	Single Package <65,000 Btu/h		
Through-the-Wall, Air Cooled	Split System ≤30,000 Btu/h		
	Single Package ≤30,000 Btu/h		
Air Conditioners, Air Cooled with Electric Resistance Heating or None	≥65,000 Btu/h and <135,000 Btu/h		
	≥135 Btu/h and <240,000 Btu/h and <760,000 Btu/h		
	≥760,000 Btu/h		
Air Conditioners, Air Cooled with Other Than Electric Heat	≥65,000 Btu/h and <135,000 Btu/h		
	≥135 Btu/h and <240,000 Btu/h and <760,000 Btu/h		
	≥760,000 Btu/h		
Air Conditioners, Water Cooled with Electric Resistance Heating or None	<65,000 Btu/h		
	≥65,000 Btu/h and <135,000 Btu/h		
	≥135 Btu/h and <240,000 Btu/h and <760,000 Btu/h		
	≥760,000 Btu/h		
Air Conditioners, Water Cooled with Other Than Electric Heat	<65,000 Btu/h		
	≥65,000 Btu/h and <135,000 Btu/h		
	≥135 Btu/h and <240,000 Btu/h and <760,000 Btu/h		
	≥760,000 Btu/h		
Air Conditioners, Evaporatively Cooled with Electric Resistance Heating or None	<65,000 Btu/h		
	≥65,000 Btu/h and <135,000 Btu/h		
	≥135 Btu/h and <240,000 Btu/h and <760,000 Btu/h		
	≥760,000 Btu/h		
Air Conditioners, Evaporatively Cooled with Other Than Electric Heat	<65,000 Btu/h		
	≥65,000 Btu/h and <135,000 Btu/h		
	≥135 Btu/h and <240,000 Btu/h and <760,000 Btu/h		
	≥760,000 Btu/h		
Condensing Units, Electrically Operated, Minimum Efficiency			
Air Cooled	≥135,000 Btu/h		
Water Cooled	≥135,000 Btu/h		
Evaporatively Cooled	≥135,000 Btu/h		
Unitary and Applied Heat Pumps, Electrically Operated, Cooling Mode Minimum Efficiencies			
Air Cooled	Split System <65,000 Btu/h		

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	Element	ASHRAE/IESNA Standard 90.1-2010 Requirement	Values Incorporated Into This Design
	Single Package <65,000 Btu/h		
Through-the-Wall, Air Cooled	Split System ≤30,000 Btu/h		
	Single Package ≤30,000 Btu/h		
Air Cooled with Electric Resistance Heating or None	≥65,000 Btu/h and <135,000 Btu/h		
	≥135 Btu/h and <240,000 Btu/h		
	≥240,000 Btu/h		
Air Cooled with Other Than Electric Heat	≥65,000 Btu/h and <135,000 Btu/h		
	≥135 Btu/h and <240,000 Btu/h		
	≥240,000 Btu/h		
Water Source	<17,000 Btu/h		
	≥17,000 Btu/h and 65,000 Btu/h		
	≥65,000 Btu/h and <135,000 Btu/h		
Groundwater Source	(59° Entering Water)		
Ground Source	(77° Entering Water)		
Water Source Water to Water	(86° Entering Water)		
Groundwater Source Water to Water	(59° Entering Water)		
Groundwater Source Brine to Water	(77° Entering Water)		
Unitary and Applied Heat Pumps, Electrically Operated, Heating Mode Minimum Efficiency			
Air Cooled	Split System (Cooling Capacity) <65,000 Btu/h		
	Single Package (Cooling Capacity) <65,000 Btu/h		
Through-the-Wall, Air Cooled	Split System (Cooling Capacity) ≤30,000 Btu/h		
	Single Package (Cooling Capacity) ≤30,000 Btu/h		
Air Cooled	(Cooling Capacity) ≥65,000 Btu/h and <135,000 Btu/h (47° db / 43° wb Outdoor Air)		
	(Cooling Capacity) ≥65,000 Btu/h and <135,000 Btu/h (17° db / 15° wb Outdoor Air)		
	(Cooling Capacity) ≥135,000 Btu/h (47° db / 43° wb Outdoor Air)		

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	Element	ASHRAE/IESNA Standard 90.1-2010 Requirement	Values Incorporated Into This Design
	(Cooling Capacity) ≥135,000 Btu/h (17° db / 15° wb Outdoor Air)		
Water Source	<135,000 Btu/h (68° Entering Water)		
Groundwater Source	<135,000 Btu/h (50° Entering Water)		
Ground Source	<135,000 Btu/h (32° Entering Water)		
Water Source Water to Water	<135,000 Btu/h (68° Entering Water)		
Groundwater Source Water to Water	<135,000 Btu/h (50° Entering Water)		
Ground Source Brine to Water	<135,000 Btu/h (32° Entering Water)		
Water Chilling Package, Electrically Operated, Minimum Efficiency			
Air Cooled, Compliance Path	<150 tons		
	≥150 tons		
Air Cooled without Condenser			
Water Cooled, Reciprocating			
Water Cooled, Positive Displacement, Compliance Path (A or B)	<75 tons		
	≥75 tons and <150 tons		
	≥150 tons and <300 tons		
	≥300 tons		
Water Cooled, Centrifugal, Compliance Path (A or B)	<150 tons		
	≥150 tons and <300 tons		
	≥300 tons and <600 tons		
	≥600 tons		
Water Chilling Package, Absorption, Compliance Path A			
Air Cooled, Single Effect			
Water Cooled, Single Effect			
Double Effect, Indirect Fired			
Double Effect, Direct Fired			
Package Terminal Air Conditioners (Cooling Mode) Minimum Efficiency			
	Standard Size		
	Nonstandard Size		
Package Terminal Heat Pumps (Cooling Mode) Minimum Efficiency			
	Standard Size		
	Nonstandard Size		
Package Terminal Heat Pumps (Heating Mode) Minimum Efficiency			
	Standard Size		
	Nonstandard Size		
Single-Package Vertical Air Conditioners (Cooling Mode) Minimum Efficiency			
	<65,000 Btu/h		
	≥65,000 Btu/h and <135,000 Btu/h		
	and <240,000 Btu/h		
Single-Package Vertical Heat Pumps (Cooling Mode) Minimum Efficiency			
	<65,000 Btu/h		
	≥65,000 Btu/h and <135,000 Btu/h		

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	and <240,000 Btu/h		
Single-Package Vertical Heat Pumps (Heating Mode) Minimum Efficiency	<65,000 Btu/h		
	≥65,000 Btu/h and <135,000 Btu/h		
	and <240,000 Btu/h		
Room Air Conditioners, with Louvered Sides, Minimum Efficiency	<6,000 Btu/h		
	≥6,000 Btu/h and <8,000 Btu/h		
	≥8,000 Btu/h and <14,000 Btu/h		
	≥14,000 Btu/h and <20,000 Btu/h		
	≥20,000 Btu/h		
Room Air Conditioners, without Louvered Sides, Minimum Efficiency	<8,000 Btu/h		
	≥8,000 Btu/h and <20,000 Btu/h		
	≥20,000 Btu/h		
Room Air-conditioner Heat Pumps, with Louvered Sides, Minimum Efficiency	<20,000 Btu/h		
	≥20,000 Btu/h		
Room Air-conditioner Heat Pumps, without Louvered Sides, Minimum Efficiency	<14,000 Btu/h		
	≥14,000 Btu/h		
Room Air Conditioners, Casement Only, Minimum Efficiency			
Room Air Conditioners, Casement-slider, Minimum Efficiency			
Warm Air Furnaces and Combination Warm Air Furnaces/Air-conditioning Units Minimum Efficiency			
Gas Fired	<225,000 Btu/h		
	≥225,000 Btu/h		
Oil Fired	<225,000 Btu/h		
	≥225,000 Btu/h		
Warm Air Duct Furnaces, Gas Fired, Minimum Efficiency			
Warm Air Unit Heaters Minimum Efficiency			
Gas Fired			
Oil Fired			
Boilers, Hot Water, Minimum Efficiency			
Gas Fired	<300,000 Btu/h and ≤2,500,000 Btu/h		
	>2,500,000 Btu/h		
Oil Fired	<300,000 Btu/h and ≤2,500,000 Btu/h		
	>2,500,000 Btu/h		
Boilers, Steam, Minimum Efficiency			
Gas Fired	<300,000 Btu/h		
Gas Fired, Except Natural Draft	and ≤2,500,000 Btu/h		
	>2,500,000 Btu/h		
Gas Fired, Natural Draft	and ≤2,500,000 Btu/h		
	>2,500,000 Btu/h		
Oil Fired	<300,000 Btu/h and ≤2,500,000 Btu/h		
	>2,500,000 Btu/h		

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	Element	ASHRAE/IESNA Standard 90.1-2010 Requirement	Values Incorporated Into This Design
Heat Rejection Equipment Minimum Performance			
	Propeller or Axial Fan, Open Circuit Cooling Tower		
	Centrifugal Fan, Open Circuit Cooling Tower		
	Propeller or Axial Fan, Closed Circuit Cooling Tower		
	Centrifugal Fan, Closed Circuit Cooling Tower		
	Air Cooler Condensers		
Heat transfer Equipment			
	Plate Type Liquid-to-Liquid		
Variable Refrigerant Flow (VRF) Air Conditioners, Electrically Operated, Air Cooled, Multi-Split System, Minimum Efficiency			
	All Heating Section Types	<65,000 Btu/h	
	Electric Resistance Heating or None	≥65,000 Btu/h and <135,000 Btu/h	
		≥135 Btu/h and <240,000 Btu/h	
		≥240,000 Btu/h	
Variable Refrigerant Flow (VRF) Heat Pumps, Electrically Operated, Air Cooled (Cooling Mode), Multi-Split System, Minimum Efficiency			
	All Heating Section Types	<65,000 Btu/h	
	Electric Resistance Heating or None	≥65,000 Btu/h and <135,000 Btu/h	
		≥135 Btu/h and <240,000 Btu/h	
		≥240,000 Btu/h	
	Electric Resistance Heating or None with Heat Recovery	≥65,000 Btu/h and <135,000 Btu/h	
		≥135 Btu/h and <240,000 Btu/h	
		≥240,000 Btu/h	
Variable Refrigerant Flow (VRF) Heat Pumps, Electrically Operated, Water Source (Cooling Mode), Multi-Split System, Minimum			
	All Heating Section Types	<65,000 Btu/h	
	All Heating Section Types with Heat Recovery	<65,000 Btu/h	
	All heating Section Types	≥65,000 Btu/h and <135,000 Btu/h	
		≥135,000 Btu/h	
	All Heating Sections with Heat Recovery	≥65,000 Btu/h and <135,000 Btu/h	
		≥135,000 Btu/h	
Variable Refrigerant Flow (VRF) Heat Pumps, Electrically Operated, Groundwater Source (Cooling Mode), Multi-Split System, Minimum Efficiency			
	All Heating Section Types	<135,000 Btu/h	
		≥135,000 Btu/h	
	All Heating Section Types with Heat Recovery	<135,000 Btu/h	
		≥135,000 Btu/h	
Variable Refrigerant Flow (VRF) Heat Pumps, Electrically Operated, Ground Source (Cooling Mode), Multi-Split System, Minimum			

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See the instructions and disclaimer for this spreadsheet.

	Element	ASHRAE/IESNA Standard 90.1-2010 Requirement	Values Incorporated Into This Design	
All Heating Section Types	<135,000 Btu/h			
	≥135,000 Btu/h			
All Heating Section Types with Heat Recovery	<135,000 Btu/h			
	≥135,000 Btu/h			
Variable Refrigerant Flow (VRF) Heat Pumps, Electrically Operated, Air Cooled (Heating Mode), Multi-Split Systems, Minimum Efficiency	(Cooling Capacity) <65,000 Btu/h			
	(Cooling Capacity) ≥65,000 Btu/h and <135,000 Btu/h (47° db / 43° wb Outdoor Air)			
	(Cooling Capacity) ≥65,000 Btu/h and <135,000 Btu/h (17° db / 15° wb Outdoor Air)			
	(Cooling Capacity) ≥135,000 Btu/h (47° db / 43° wb Outdoor Air)			
	(Cooling Capacity) ≥135,000 Btu/h (17° db / 15° wb Outdoor Air)			
	(Cooling Capacity) ≥135,000 Btu/h			
Variable Refrigerant Flow (VRF) Heat Pumps, Electrically Operated, Water Source (Heating Mode), Multi-Split Systems, Minimum Efficiency	<135,000 Btu/h (68° Entering Water)			
	≥135,000 Btu/h (68° Entering Water)			
Variable Refrigerant Flow (VRF) Heat Pumps, Electrically Operated, Groundwater Source (Heating Mode), Multi-Split Systems, Minimum Efficiency	<135,000 Btu/h (50° Entering Water)			
	≥135,000 Btu/h (50° Entering Water)			
Variable Refrigerant Flow (VRF) Heat Pumps, Electrically Operated, Ground Source (Heating Mode), Multi-Split Systems, Minimum Efficiency	<135,000 Btu/h (32° Entering Water)			
	≥135,000 Btu/h (32° Entering Water)			
Air Conditioners and Condensing Units Serving Computer Rooms, Minimum Efficiency				
	Air Cooled (Downflow or Upflow Units)	<65,000 Btu/h		
		≥65,000 Btu/h and <240,000 Btu/h		
		≥240,000 Btu/h		
	Water Cooled (Downflow or Upflow Units)	<65,000 Btu/h		
		≥65,000 Btu/h and <240,000 Btu/h		
		≥240,000 Btu/h		
	Water Cooled with Fluid Economizer (Downflow or Upflow Units)	<65,000 Btu/h		
		≥65,000 Btu/h and <240,000 Btu/h		
		≥240,000 Btu/h		
	Glycol Cooled (Downflow or Upflow Units)	<65,000 Btu/h		
		≥65,000 Btu/h and <240,000 Btu/h		
≥240,000 Btu/h				

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	Element	ASHRAE/IESNA Standard 90.1-2010 Requirement	Values Incorporated Into This Design		
Glycol Cooled with Fluid Economizer (Downflow or Upflow Units)	<65,000 Btu/h				
	≥65,000 Btu/h and <240,000 Btu/h				
	≥240,000 Btu/h				
	One per Zone				
Zone Thermostatic Control					
<u>Independent Perimeter System Thermostatic Control</u>					
<u>Dead Band</u>					
<u>Setpoint Overlap Restriction for Separate Controls</u>					
<u>Automatic Off-Hour Shutdown/Setback Control</u>					
<u>Optimum Start Controls</u>					
<u>Automatic Zone Isolation</u>					
Ventilation System Controls					
<u>Stair and Shaft Vent Automatic Motorized Damper Control</u>					
<u>Air Intake and Exhaust System Automatic Motorized Shutoff Damper Control</u>					
<u>Automatic Ventilation Fan Shutdown Controls</u>					
<u>Enclosed Parking Garage Ventilation Controls</u>					
<u>Demand Control Ventilation</u>					
Maximum Damper Leakage Rate	Ventilation Air Intakes	Motorized Damper			
	Exhaust / Relief	Motorized Damper Nonmotorized Damper			
HVAC System Controls					
<u>Heat Pump Auxiliary Heat Control</u>					
<u>Humidifier Preheat Control</u>					
<u>Simultaneous Humidification and Dehumidification Prevention Control</u>					
<u>Simultaneous Heating & Cooling Limitation Control</u>					
<u>Supply Air Temperature Reheat Limit Control</u>					
<u>Single Zone Variable-Air-Volume Control</u>					
Freeze Protection and Snow/Ice Melting Systems Control					
HVAC System Construction and Insulation					
<u>Duct Insulation, Minimum R-Value</u>					
Heating-Only Ducts		Exterior			
		Ventilated Attic			
		Unvented Attic Above Insulated Ceiling			
		with Roof Insulation			
		Unconditioned Space			
		Indirectly Conditioned Space			
		Buried			
		Cooling-Only Ducts		Exterior	
				Ventilated Attic	
				Unvented Attic Above Insulated Ceiling	
with Roof Insulation					
Unconditioned Space					
Indirectly Conditioned Space					
Buried					
Cooling and Heating Only Return Ducts				Exterior	
				Ventilated Attic	

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See the instructions and disclaimer for this spreadsheet.

	Element	ASHRAE/IESNA Standard 90.1-2010 Requirement	Values Incorporated Into This Design	
Combined Heating & Cooling Supply Ducts	Unvented Attic Above Insulated Ceiling			
	with Roof Insulation			
	Unconditioned Space			
	Indirectly Conditioned Space			
	Buried			
	Exterior			
	Ventilated Attic			
	Unvented Attic Above Insulated Ceiling			
	with Roof Insulation			
	Unconditioned Space			
	Indirectly Conditioned Space			
	Buried			
	Combined Heating & Cooling Return Ducts	Exterior		
		Ventilated Attic		
		Unvented Attic Above Insulated Ceiling		
with Roof Insulation				
Unconditioned Space				
Indirectly Conditioned Space				
Pipe Insulation for Heating and Hot Water Systems, Conductivity / Minimum Thickness	Buried			
	Fluid Operating Temperature (°F) / Nominal Pipe Size			
	>350° / <1"			
	>350° / 1" to <1½"			
	>350° / 1½" to <4"			
	>350° / 4" to <8"			
	>350° / ≥8"			
	251° - 350° / <1"			
	251° - 350° / 1" to <1½"			
	251° - 350° / 1½" to <4"			
	251° - 350° / 4" to <8"			
	251° - 350° / ≥8"			
	201° - 250° / <1"			
	201° - 250° / 1" to <1½"			
	201° - 250° / 1½" to <4"			
	201° - 250° / 4" to <8"			
	201° - 250° / ≥8"			
	141° - 200° / <1"			
	141° - 200° / 1" to <1½"			
	141° - 200° / 1½" to <4"			
	141° - 200° / 4" to <8"			
	141° - 200° / ≥8"			
	105° - 140° / <1"			

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See the instructions and disclaimer for this spreadsheet.

	Element	ASHRAE/IESNA Standard 90.1-2010 Requirement	Values Incorporated Into This Design	
Pipe Insulation for Cooling Systems, Conductivity / Minimum Thickness	105° - 140° / 1" to <1½"			
	105° - 140° / 1½" to <4"			
	105° - 140° / 4" to <8"			
	105° - 140° / ≥8"			
	Fluid Operating Temperature (°F) / Nominal Pipe Size			
	40° - 60° / <1"			
	40° - 60° / 1" to <1½"			
	40° - 60° / 1½" to <4"			
	40° - 60° / 4" to <8"			
	40° - 60° / ≥8"			
	<40° / <1"			
	<40° / 1" to <1½"			
	<40° / 1½" to <4"			
<40° / 4" to <8"				
<40° / ≥8"				
Sensible Heating Panel Insulation, Minimum R-Value				
Radiant Floor Heating Insulation, Minimum R-Value				
Duct Sealing Requirements				
Duct Sealing Testing Requirement				
Economizers				
Air Economizer	Capacity			
	Control			
	High-Limit Shutoff			
Water Economizer	Supply Capacity			
	Pressure Drop			
	Integrated Control			
Air System Design and Control				
Fan System Power Limitation (Nameplate Horsepower Option or Break Horsepower Option)				
Variable-Air-Volume Controls	Variable Flow Control			
	DDC Static Pressure Reset			
	DDC Ventilation Optimization			
	Temperature Reset			
Hydronic System Design and Controls				
Total Pump System Power				
Two-Pipe System Changeover Controls				
Hydronic Heat Pump and Water Cooled Unitary Air Conditioner System	Two Position Valve on Each Unit			
Hydronic (Water Loop) Heat Pump Systems	Dead Band			
	Pump Flow Rate Control			
	Automatic Isolation of Cooling Tower When Not Required	Closed Circuit		
		Open Circuit		
	Variable Flow Hydronic Systems	Pump Flow Rate Control		
		Water Temperature Reset		
Automatic Equipment Isolation		Chiller Plant		
	Boiler Plant			
Maximum Design Flow Rates	Chilled Water			
	Condenser Water			
Heat Rejection Equipment				
Fan Speed Control				
Minimum Efficiency Performance				

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See the instructions and disclaimer for this spreadsheet.

		Element	ASHRAE/IESNA Standard 90.1-2010 Requirement	Values Incorporated Into This Design
<u>Exhaust Air Energy Recovery</u>				
Percentage Outdoor Air at Full Design Supply Fan Airflow Rate		≥30% and <40% @ ≥5,500 cfm		
		≥40% and <50% @ ≥4,500 cfm		
		≥50% and <60% @ ≥3,500 cfm		
		≥60% and <70% @ ≥2,000 cfm		
		≥70% and <80% @ ≥1,000 cfm		
		≥80% @ >0%		
<u>Heat Recovery for Service Water Heating</u>				
<u>Exhaust Systems</u>				
Kitchen	Introduced Directly into Hood as Percentage of Hood Flow Rate			
	Conditioned Supply Air Delivered to Space with Hood (Greater of)	Flow to Meet Space Heating or Cooling Loads		
		Flow Minus Available Transfer Air from Adjacent Space		
	Maximum Net Exhaust Hood Flow Rate			
	One of Other Requirements	≥50% Replacement Air Is Transfer Air That Would Otherwise Be Exhausted		
		Ventilation System(s)		
		Energy Recover Devices		
Laboratory	Volume Control or Direct Makeup Air Temperature Control			
<u>Cooling System Hot Gas Bypass Limitation: Maximum Percentage of Total</u>				
<u>Radiant Heating Systems</u>		Unenclosed Spaces		
		Enclosed Spaces		
<u>Completion Requirements</u>				
As-Built Record Drawing Submittal Requirement				
Operation Manuals Requirement				
Maintenance Manuals Requirement				
Air System Balancing Requirement				
Hydronic System Balancing Requirement				
HVAC System Commissioning Requirement				
Section 7				
Service Water Heating				
Service Water Heating System				
Equipment Sizing		Calculated Load		
		Equipment Total Capacity		
Water Heating Equipment, Minimum Performance				

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See the instructions and disclaimer for this spreadsheet.

	Element	ASHRAE/IESNA Standard 90.1-2010 Requirement	Values Incorporated Into This Design
Electric Resistance Table Top	≤12 kW & ≥20 gal		
Electric Resistance	≤12 kW & ≥20 gal		
	>12 kW & ≥20 gal		
Electric Heat Pump	≤24 Amps & ≤250 Volts		
Gas Storage	≤75,000 Btu/h & ≥20 gal		
	>75,000 Btu/h & <4,000 (Btu/h)/gal		
Gas Instantaneous	>50,000 Btu/h and <200,000 Btu/h & ≥4,000 (Btu/h)/gal & <2 gal		
	≥200,000 Btu/h & ≥4,000 (Btu/h)/gal & <10 gal		
	≥200,000 Btu/h & ≥4,000 (Btu/h)/gal & ≥10 gal		
Oil Storage	≤105,000 Btu/h & ≥20 gal		
	>105,000 Btu/h & <4,000 (Btu/h)/gal		
Oil Instantaneous	≤210,000 Btu/h & ≥4,000 (Btu/h)/gal & <2 gal		
	>210,000 Btu/h & ≥4,000 (Btu/h)/gal & <10 gal		
	>210,000 Btu/h & ≥4,000 (Btu/h)/gal & ≥10 gal		
Hot Water Supply Boilers	Gas & Oil, ≥300,000 Btu/h and <12,500,000 Btu/h & ≥4,000 (Btu/h)/gal & <10 gal		
	Gas, ≥4,000 (Btu/h)/gal & ≥10 gal		
	Oil, ≥4,000 (Btu/h)/gal & ≥10 gal		
Pool Heaters	Oil & Gas		
	Heat Pump		
Unfired Storage Tank, Minimum Insulation R-Value			
Pipe Insulation for Domestic and Service Hot-Water Systems (Same as HVAC Section), Conductivity / Minimum Thickness	Recirculating Systems		
	First 8' Nonrecirculating Systems		
	Inlet Pipe Between Storage Tank & Heat Trap		
	Externally Heated Pipes		
Service Water Storage Temperature Control			
Service Water Temperature Maintenance System Automatic Time			

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See the instructions and disclaimer for this spreadsheet.

	Element	ASHRAE/IESNA Standard 90.1-2010 Requirement	Values Incorporated Into This Design
Public Restroom Service Water Outlet Temperature Control			
Service Water Heater Storage Circulating Pump Automatic Time Limit			
Service Water Heater Inlet & Outlet Heat Traps			
Pools			
Pool Heater Accessible On-Off Switch			
Pool Cover (Heated Pools).	Vapor Retardant Insulation R-Value (>90°)		
Swimming Pool Heater and Pump Time Switch			
Space & Water Heating Boiler System Requirement			
Section 8			
Power			
Low Voltage Dry-Type Distribution Transformer, Minimum Efficiency			
Single Phase	15 kVA		
	25 kVA		
	37.5 kVA		
	50 kVA		
	75 kVA		
	100 kVA		
	167 kVA		
	250 kVA		
	333 kVA		
Three Phase	15 kVA		
	30 kVA		
	45 kVA		
	75 kVA		
	112.5 kVA		
	150 kVA		
	225 kVA		
	300 kVA		
	500 kVA		
	750 kVA		
	1,000 kVA		
Maximum Voltage Drop	Feeder Circuit		
	Branch Circuit		
Automatic Receptacle Control	Private Offices		
	Open Offices		
	Computer		
	Classrooms		
Submittals			
As-Built Record Drawing Submittal Requirement			
Operation Manuals Submission Requirement			
Maintenance Manuals Submission Requirement			
Intended Operation Narrative Submission Requirement			
Section 9			
Lighting			
Interior Lighting System Calculation Method (Building Area or Space-by-Space)			
Gross Lighted Floor Area			
Equivalent Interior Lighting Power Density			
Interior Lighting Power Allowance	Allowance		
	Connected		
Interior Lighting Controls			
Automatic Building Interior Lighting Shutoff			

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See the instructions and disclaimer for this spreadsheet.

	Element	ASHRAE/IESNA Standard 90.1-2010 Requirement	Values Incorporated Into This Design
<u>Enclosed Space Control for General Lighting with Intermediate Power Step</u>			
Automatic Interior Space Shutoff Control in Required Spaces	Required Spaces		
	Classrooms & Lecture Halls		
	Meeting and Training Rooms		
	Employee Lunch & Break Rooms		
	Storage and Supply Rooms Between 50 sf and 1,000 sf		
	Copy and Printing Rooms		
	Offices <250 sf		
	Restrooms		
	Dressing, Locker and Fitting Rooms		
	<hr/>		
Parking Garage Lighting Control	Automatic Shutoff		
	Automatic Power Reduction Based on No Activity		
	Daylight Transition Zone Lighting		
	Automatic Power Reduction Based on Daylight		
<hr/>			
Automatic Daylighting Controls	For Primary Side Lighted Areas		
	For Toplighting		
Additional Controls for	Display/Accent Lighting		
	Case Lighting		
	Guest Room Lighting		
	Task Lighting		
	Nonvisual Lighting		
	Demonstration Lighting		
	Stairwell Lighting		
<hr/>			
Exit Sign: Maximum Wattage per Face			
<hr/>			
<u>Exterior Lighting</u>			
Total Exterior Lighting Power Allowance	Allowance		
	Connected		
Tradable Surface Exterior Lighting Power Allowance	Allowance		
	Connected		
Non-Tradable Surface Exterior Lighting Power Allowance	Allowance		
	Connected		
<u>Minimum Lamp Efficacy</u>			
Automatic Exterior Lighting Control	Building Façade & Landscape Lighting		

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See the instructions and disclaimer for this spreadsheet.

		Element	ASHRAE/IESNA Standard 90.1-2010 Requirement	Values Incorporated Into This Design
		Power Reduction Based on Activity for Other Lighting & Signage		
Lighting System Functional Testing	Lighting Controls	Calibrated		
		Adjusted		
		Programmed		
	Occupancy Sensors	In Proper Working Condition		
		Placement		
		Sensitivity		
		Time-Out Adjustment		
	Time Switches, Programmable Schedule Controls	Confirm Turn Off		
	Photosensors	Confirm reduction in Light Levels Based on Available Daylight		
	Completion Requirements			
<u>As-Built Record Drawing Submittal Requirement</u>				
<u>Operation Manuals Requirement</u>				
<u>Maintenance Manuals Requirement</u>				
<u>Lighting Control System Narrative</u>				
Section 10 Other Equipment				
Minimum Motor Efficiency	Open Drip Proof General Purpose Subtype I (Random Wound) Motors Rated ≤600	3600 rpm		
		1800 rpm		
		1200 rpm		
	Totally Enclosed General Purpose Subtype I (Random Wound) Motors Rated ≤600	3600 rpm		
		1800 rpm		
		1200 rpm		
	Open Drip Proof General Purpose Subtype II & Design B Motors Rated ≤600 Volts	3600 rpm		
		1800 rpm		
		1200 rpm		
	Totally Enclosed General Purpose Subtype II & Design B Motors Rated ≤600 Volts	3600 rpm		
1800 rpm				
1200 rpm				
Service Water Pressure Booster System	Speed Control and/or Start & Stop Pumps			
	No Pressure Reducing Device			
	Only Operate When Water Flowing			
Elevators Requirements				
<u>Cab Lighting, Minimum Lamp Efficacy</u>				
<u>Maximum Ventilation Power</u>				
<u>Standby Mode</u>				