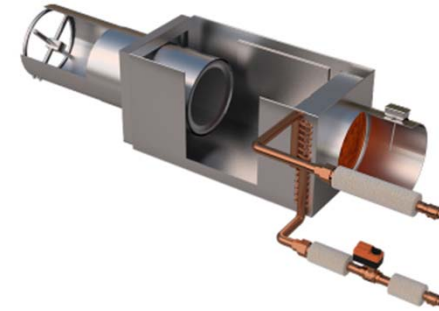
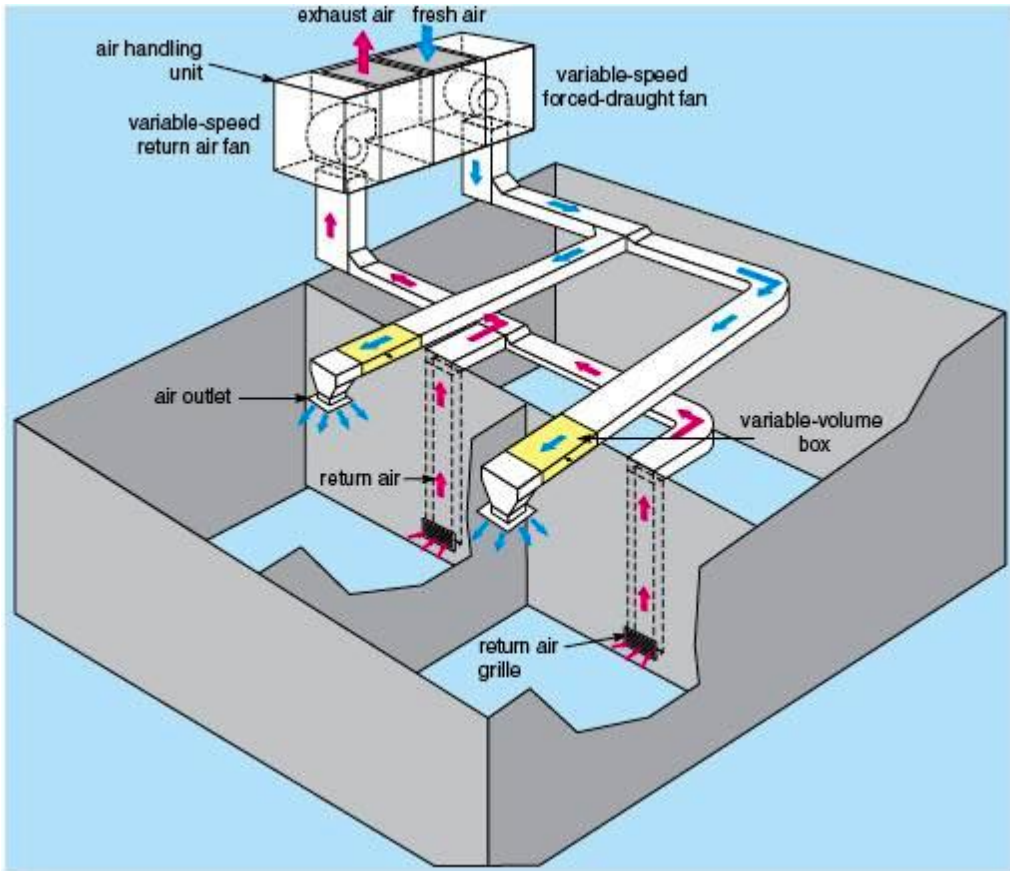


Oak Park D97 Administration Building
Building Systems
2015.04.02

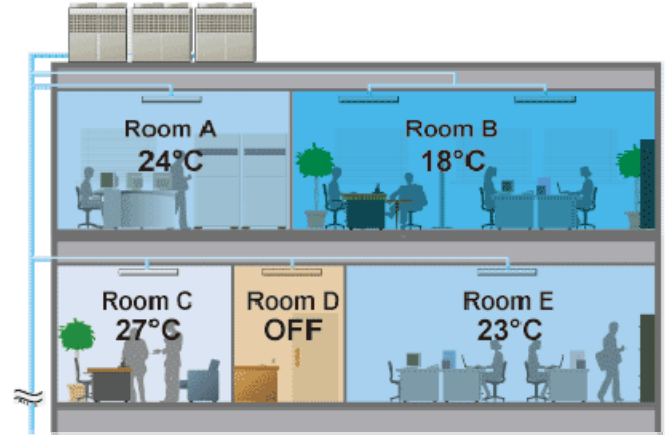
BUILDING SYSTEMS

MEP | Lighting Design

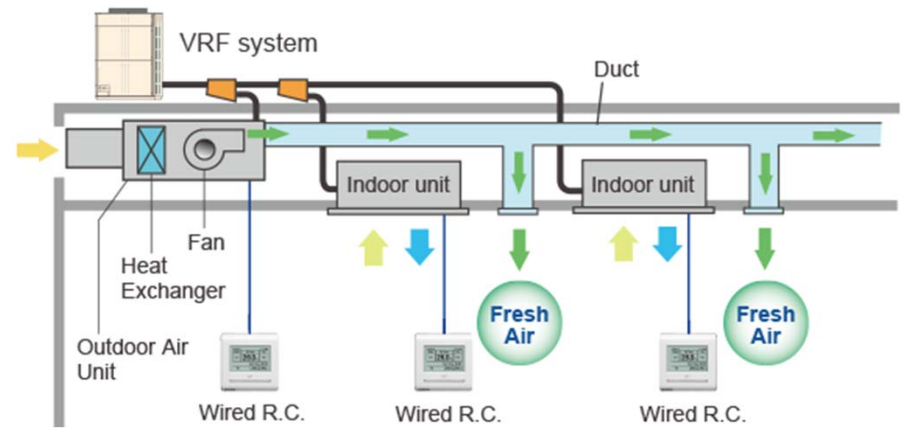


MECHANICAL DESIGN

OPTION 1: VARIABLE AIR VOLUME (VAV) ROOFTOP



Improved Indoor Comfort



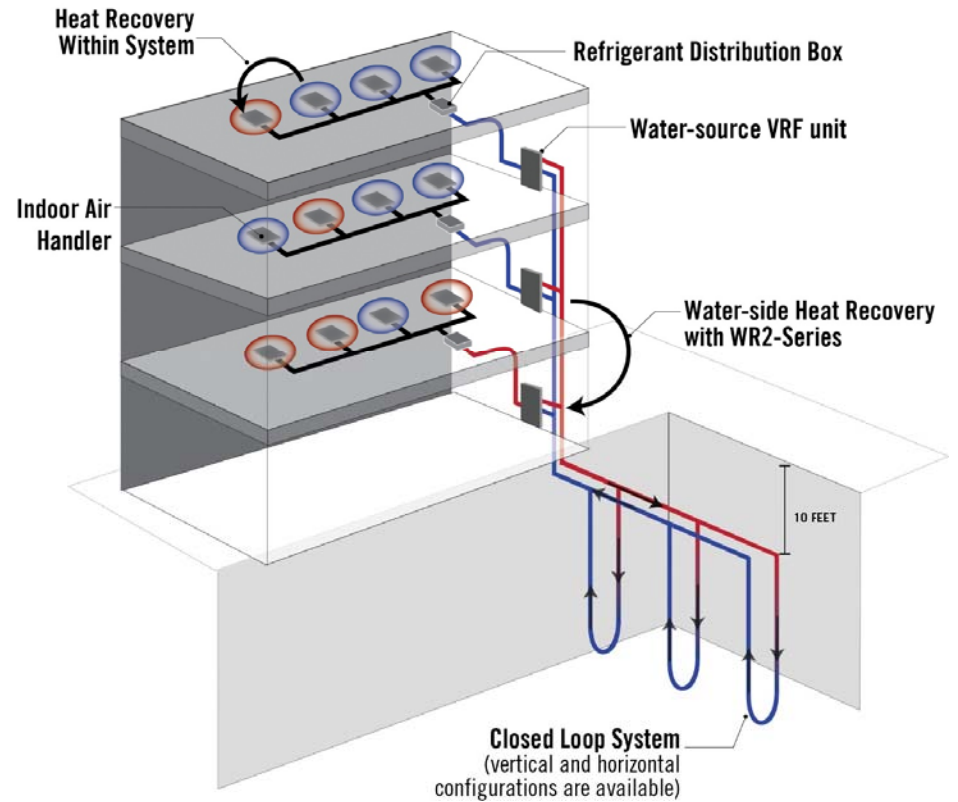
MECHANICAL DESIGN

OPTION 2: AIR-COOLED VARIABLE REFRIGERANT FLOW (VRF) UNIT WITH DEDICATED OUTSIDE AIR



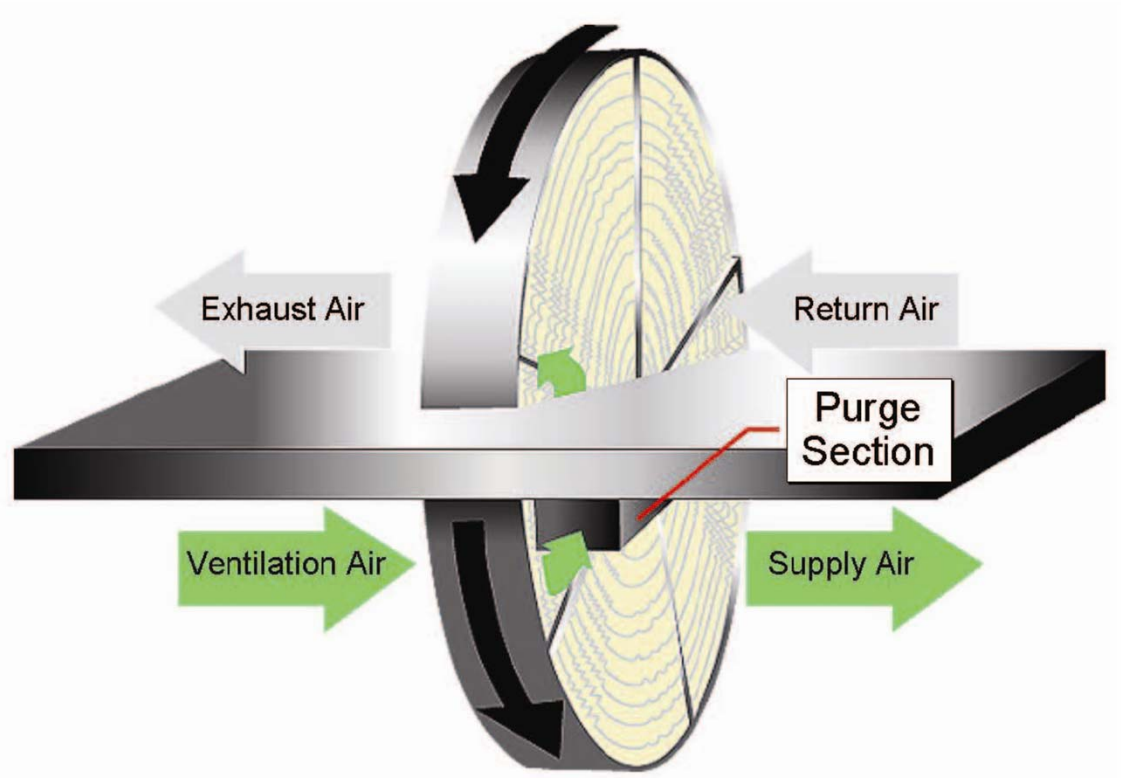


GEOTHERMAL COOLING AND HEATING WITH VRF



MECHANICAL DESIGN

OPTION 3: GROUND-SOURCE VARIABLE REFRIGERANT FLOW (VRF) UNIT WITH DEDICATED OUTSIDE AIR

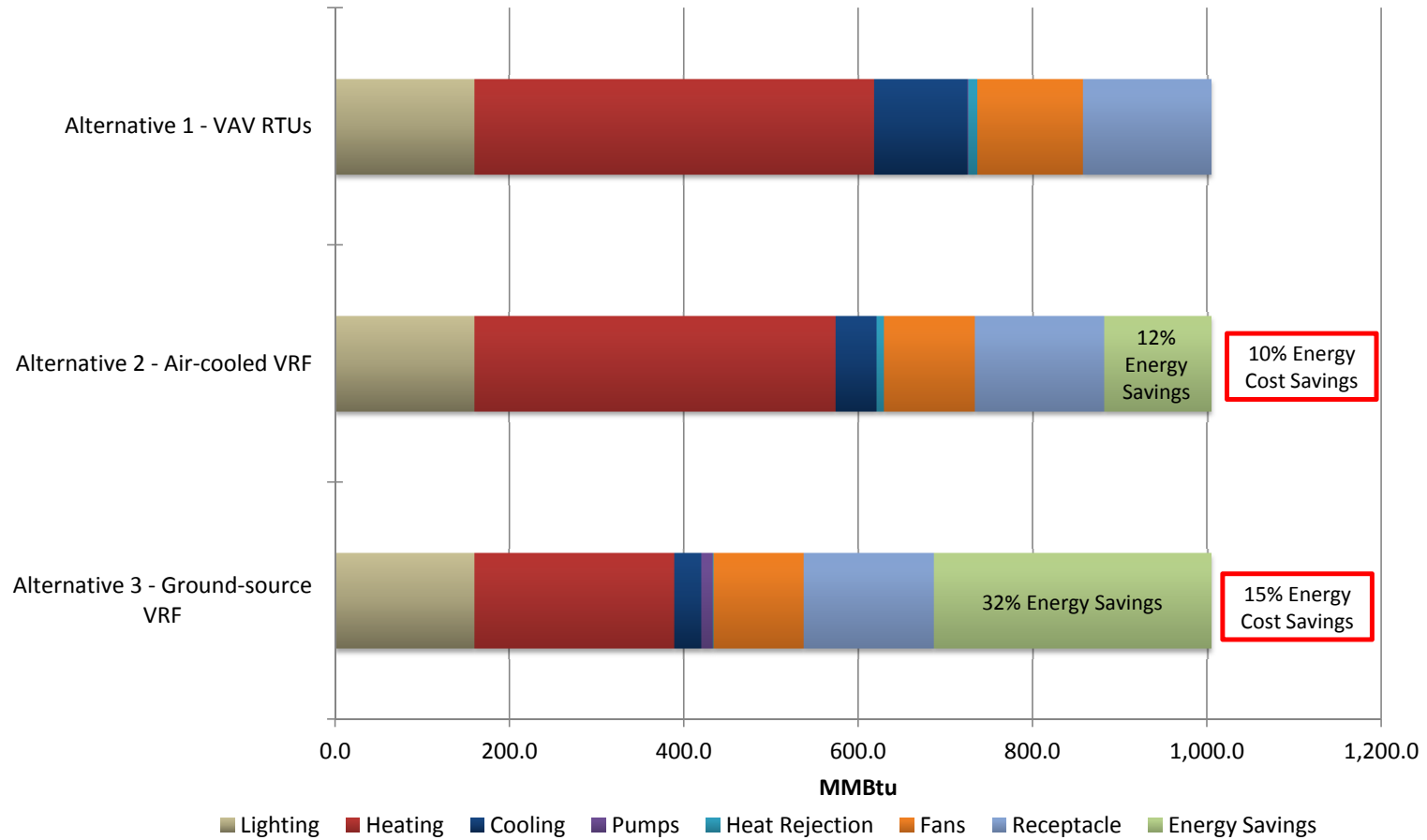


VENTILATION ENERGY RECOVERY

	VAV RTUs	VRF	GSHPs
HVAC Description	Variable volume rooftop units, DX cooling, HW heating & reheat, high efficiency condensing boiler	Air-cooled variable refrigerant flow (VRF) in-ceiling cassette units, condensing units in mechanical penthouse, rooftop dedicated outdoor air unit w/ energy recovery for ventilation	Ground-source variable refrigerant flow (VRF) in-ceiling cassette units, rooftop dedicated outdoor air unit w/ energy recovery for ventilation, tied to geothermal boreholes, supplemental high efficiency condensing boiler
Operational Comparisons			
Acoustics	Fair	Good	Good
Comfort	Fair	Fair	Fair
Efficiency	Fair	Good	Good
Maintenance	Fair	Good	Good
Life Expectancy (years)	VAV RTUs: 15 Boiler: 15	Indoor Units: 20-25 Outdoor Units: 15 DOAS: 20	Indoor Units: 20-25 DOAS: 20
Space	Larger plenum space for distribution and VAV boxes	Reduced plenum space for distribution and in-ceiling units	Reduced plenum space for distribution and in-ceiling units
Total MEPFP Cost Estimates			
Mecanical	\$44 /sf	\$34 /sf	\$49 /sf
Electrical	\$27 /sf	\$27 /sf	\$27 /sf
Plumbing	\$10 /sf	\$10 /sf	\$10 /sf
Fire Protection	\$5 /sf	\$5 /sf	\$5 /sf
MEPFP Total	\$86 /sf	\$76 /sf	\$91 /sf

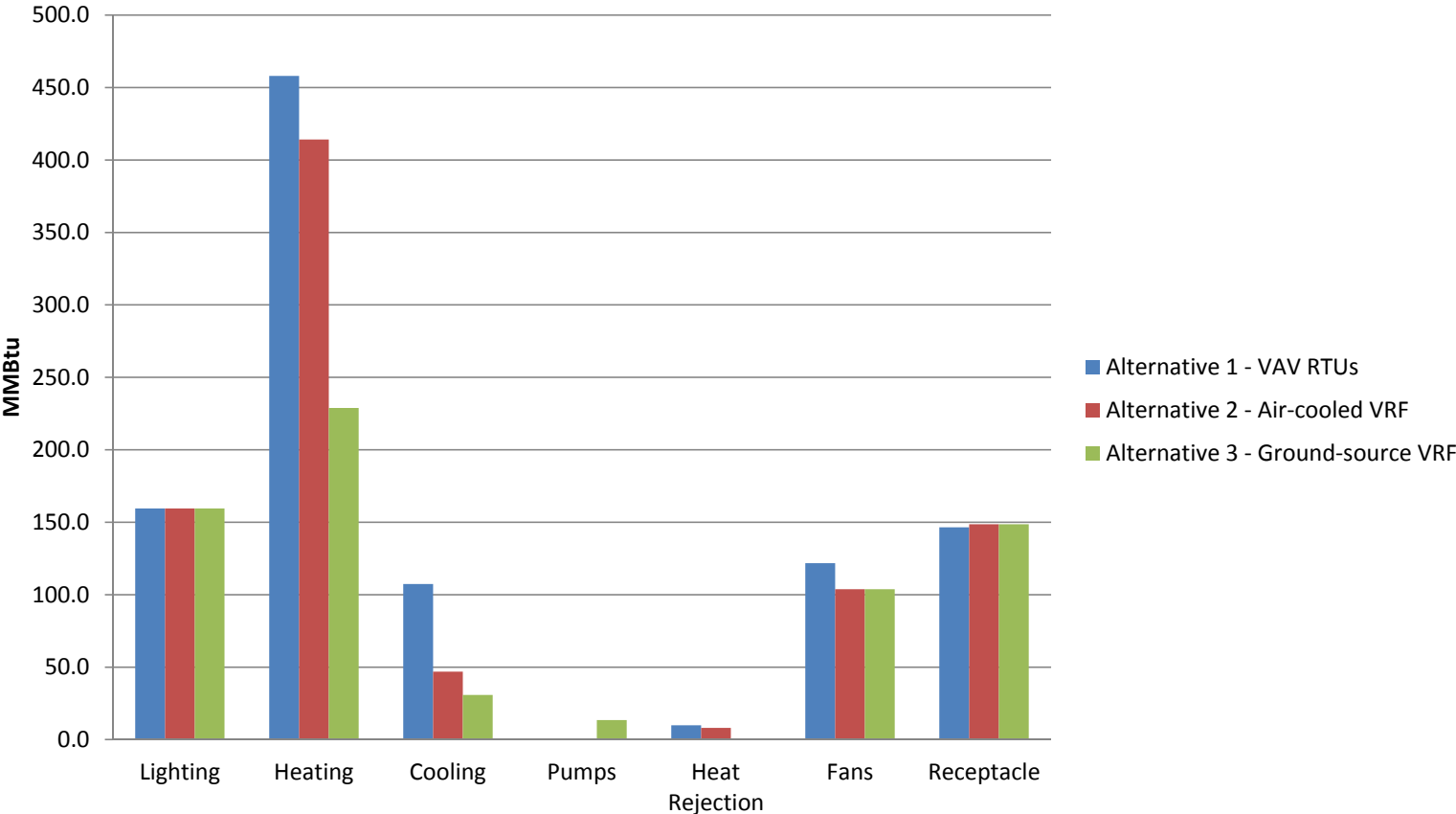
HVAC SYSTEM COMPARISON

Alternate Comparison - Total Energy Usage



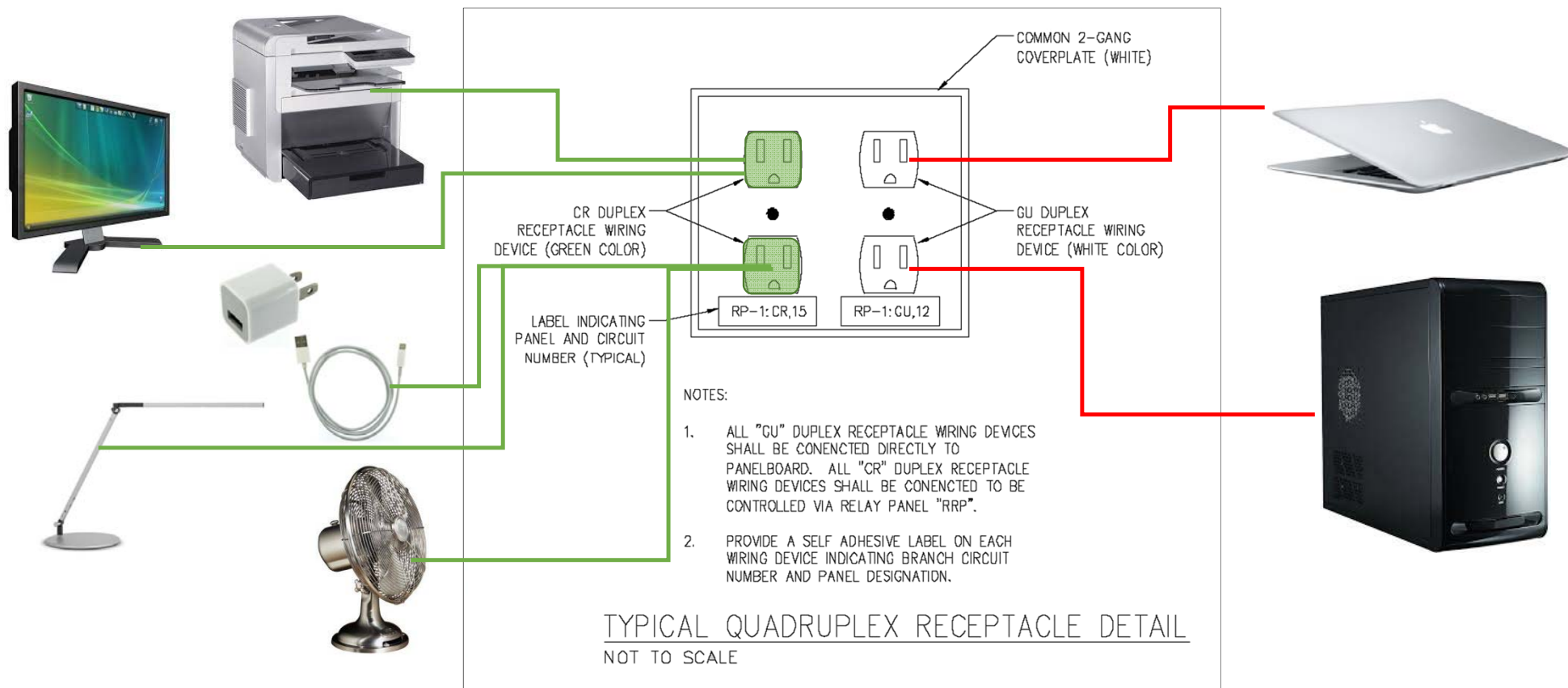
TOTAL ENERGY USAGE COMPARISON

Alternate Comparison - Energy by End Use



ENERGY BY END USE COMPARISON





ELECTRICAL DESIGN

PLUG LOAD REDUCTION

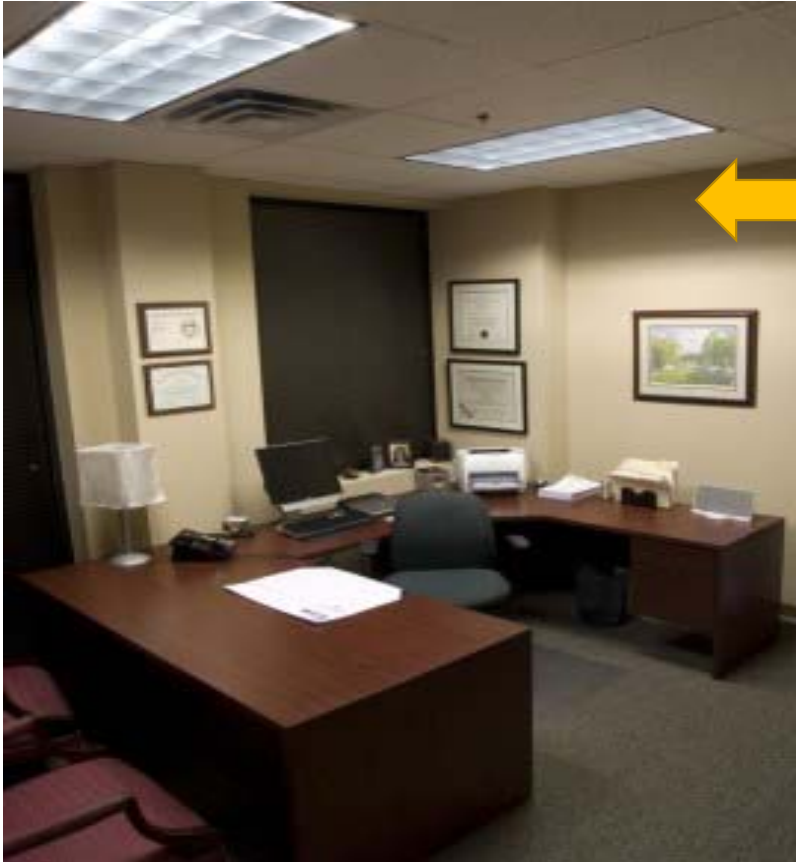


- 30% BETTER THAN ASHRAE 90.1 USING ENERGY EFFICIENT SOURCES AND FIXTURES WITH HIGH EFFICACIES.
- REDUCE MAINTENANCE COSTS BY USING LONG LIFE SOURCES.
- DECREASE ENERGY USAGE BY UTILIZING VACACNY SENSORS
- USE DAYLIGHT AND DAYLIGHT HARVESTING TO REDUCE ENERGY USAGE

LIGHTING DESIGN STRATEGIES

30% REDUCTION TARGET



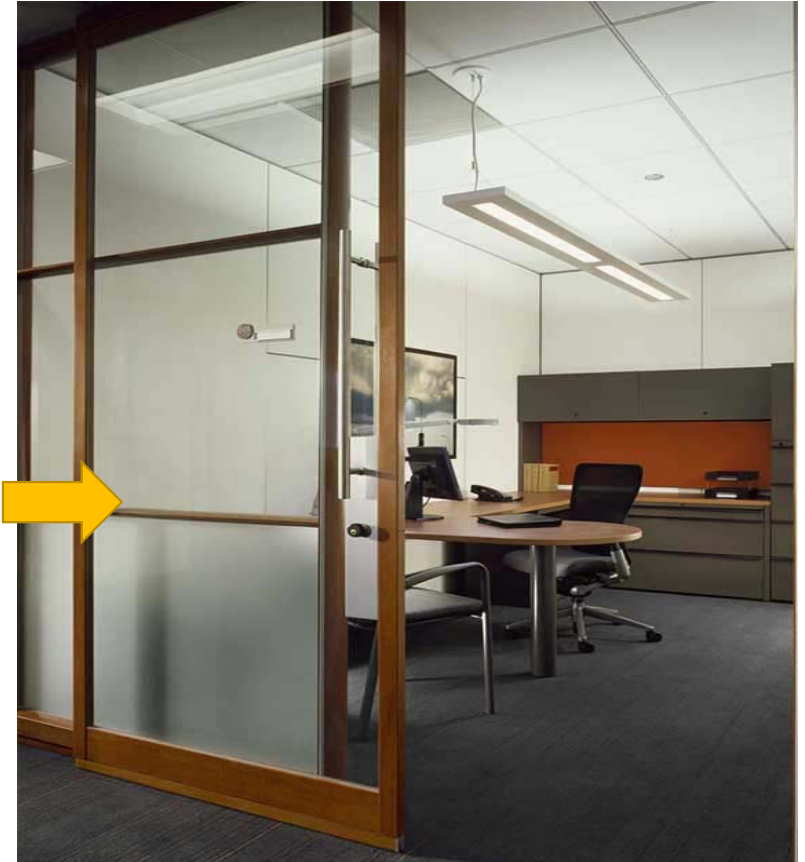


PARABOLIC LIGHTING:

- LOW EFFICACY
- LOW PERCEIVED BRIGHTNESS
- HIGHER WATTAGE
- 1.1W/Sq.ft.

DIRECT/INDIRECT LIGHTING WITH DAYLIGHT:

- HIGH EFFICACY
- HIGHER PERCEIVED BRIGHTNESS
- LOWER WATTAGE
- 0.7W/Sq.ft.



OFFICE LIGHTING STRATEGIES

TRADITIONAL DESIGN VS. NEWER TRENDS



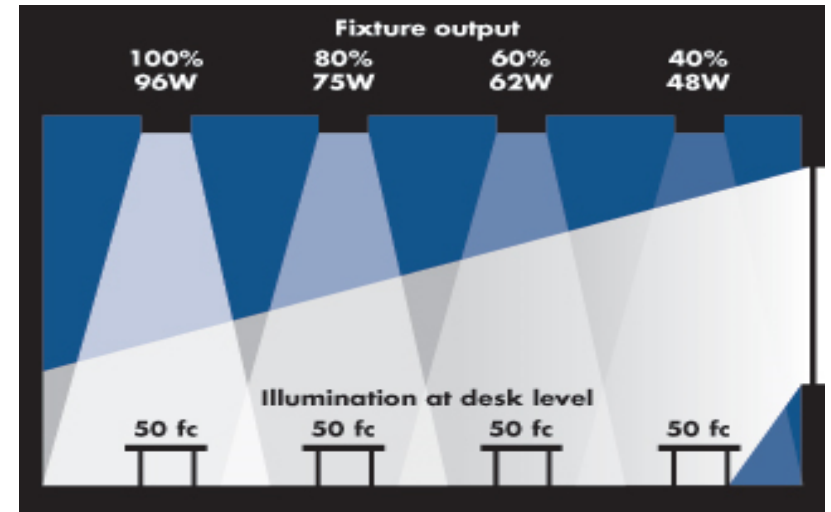
Occupancy/vacancy sensing turns lights on when occupants are in a space and off when they vacate the space. We recommend manual on, auto off (vacancy sensor strategy).



Daylight harvesting dims electric lights when daylight is available to light the space. Switching ILO dimming is also an option.



Scheduling provides pre-programmed changes in light levels based on time of day. Manual overrides are still possible.



DAYLIGHT HARVESTING

AUTOMATED CONTROLS



WIRELESS SENSORS



INTEGRATED SENSOR & FIXTURE



STAND ALONE SENSOR

LIGHTING CONTROL STRATEGIES

AUTOMATED AND MANUAL



AUTO-CONTROL FAUCETS WITH 0.35 GPM
AERATORS



MANUAL OR AUTOMATIC
DUAL-FLUSH OPTIONS FOR 1.6/1.1 GPF



LOW-FLOW TOILETS



0.125 GPF URINALS

PLUMBING DESIGN

LOW-FLOW FIXTURES