

# Daylighting Project for British American Auto Care

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## Project Description

This project will bring the following to British American Auto Care, its workers, the electric grid, and the environment:

- Daylight into the auto repair work area,
- Daylight sensing to control electric lights in steps,
- More efficient and responsive lighting, and
- Occupancy sensing to keep lights off when a work section is vacant

These lead to the following benefits:

- Greater productivity from a naturally well-lit space,
- Lower energy bills,
- Lights will come on immediately and automatically as needed.
- Lights will turn off automatically when there is ample daylight or a section is vacant.
- Lower stress on the electric grid especially during bright sunny days, when the grid may be stressed due to high air-conditioning demand,
- Lower energy demand with its environmental benefits, and
- Customer appreciation of environmental stewardship.

## Existing Conditions and Base Case Description of the Shop Floor Area

- The British American Auto Care facility was built in 1999 (10 years ago).
- It is a single-story building of 134' by 100' or 13,400 square feet.
- The largest space is the shop floor of 97' by 100' with a cut-out of 28' by 38' for other rooms or 8636 square feet.
- There is no daylight into the shop floor working area with the exception of narrow garage door windows or the garage door opening (when weather permits).
- There are no controls (either by daylight or occupancy) for the electric lights.
- The space is illuminated by 22, 455-watt mercury vapor fixtures.
- Mercury vapor lamps require significant warm-up times and restrike times.
- Light output with this type of lamp falls off rapidly as these lamps age.

## Proposed conditions

- The project will add 22, 21" light tubes through the roof to bring daylight into the facility. You can view data on these at: <http://www.oriones.com/technology.php?type=apollolightpipe>
- 22 new electric fixtures will replace existing fixtures.
- Each new low-bay fixture will have 6 T8 fluorescent 32-watt lamps.
- Each fixture will have 2 program-start ballasts, one controlling 2 lamps and one controlling 4 lamps.
- There will be an open loop daylight-sensing control system that will keep all lamps off (for ample daylight), 2-lamps per fixture (for moderate daylight), 4-lamps per fixture (for low daylight), or all 6 lamps on (for nighttime).
- There will be occupancy sensors to ensure that lights in each of 4 work sections are off when that section is vacant.

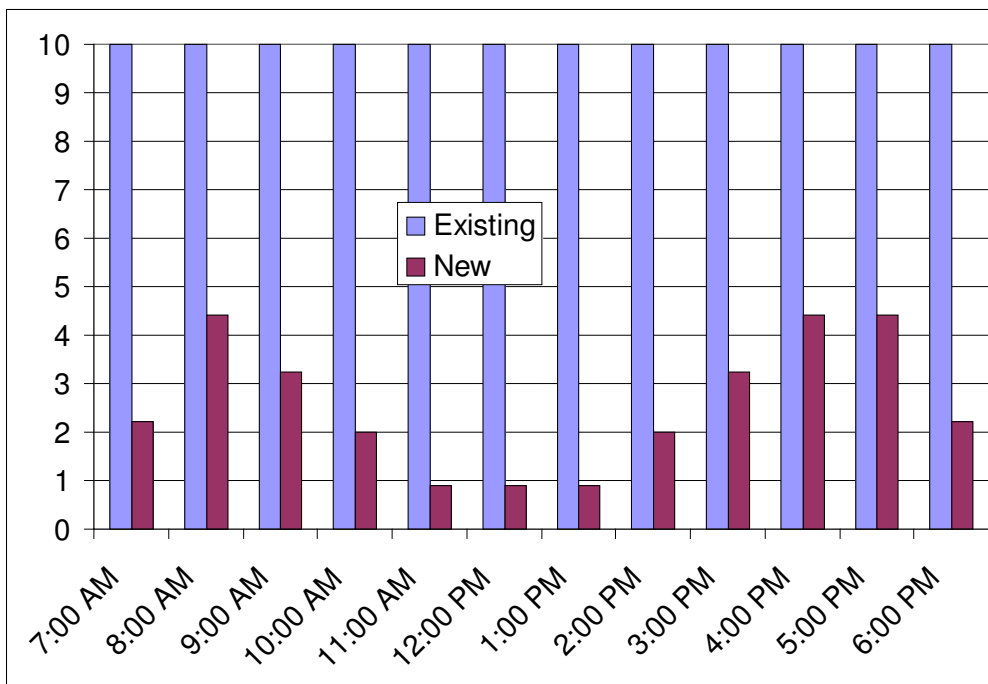
**Load Profile**

This facility is open 5 days a week and 52 weeks per year, less 5 holidays (equivalent to 51 5-day weeks per year). Now lights are simply turned on at 7 AM and off at 7 PM.

For planned conditions, we consider the effect of both daylight control and occupancy control. Since there is more daylight in the summer and less in the winter, we consider equinox conditions, April or September, as an average for the entire year. The daily weighted average assumes 4 bright (Br) days per week and one overcast (OC) day per week to account for sunny days, partial sun, and overcast days. For occupancy control, we conservatively just assume that the facility is only half occupied 7 to 8 AM and 6 to 7 PM, each workday.

Equinox Conditions				(March or September)							
Hr		Current		Average		Planned					
Start	End	/fixture	22-fixture	Energy	Daylight	/fixture	22-fixture	Br Energy	OC Energy	Wght Avg	
7 AM	8 AM	455	10010	10.01	2	201	4422	22	22	22	
8 AM	9 AM	455	10010	10.01	10.5	201	4422	4.4	4.4	4.4	
9 AM	10 AM	455	10010	10.01	26.5	134	2948	29	4.4	3.2	
10 AM	11 AM	455	10010	10.01	40.5	64	1408	1.4	4.4	20	
11 AM	12 PM	455	10010	10.01	51.5	0	0	0.0	4.4	0.9	
12 PM	1 PM	455	10010	10.01	53.5	0	0	0.0	4.4	0.9	
1 PM	2 PM	455	10010	10.01	51.5	0	0	0.0	4.4	0.9	
2 PM	3 PM	455	10010	10.01	40.5	64	1408	1.4	4.4	20	
3 PM	4 PM	455	10010	10.01	26.5	134	2948	29	4.4	3.2	
4 PM	5 PM	455	10010	10.01	10.5	201	4422	4.4	4.4	4.4	
5 PM	6 PM	455	10010	10.01	2	201	4422	4.4	4.4	4.4	
6 PM	7 PM	455	10010	10.01	0	201	4422	22	22	22	
				120.12							30.8
Days per week				5							5
Weeks/yr allowing for holidays				51							51
Annual Energy Use		(kWh)	30,631							7,866	

**Graphical Representation:**



Savings Calculations:

Existing Annual Energy Usage:	30,631	kWh
Projected Annual Energy Usage:	7,866	kWh
Annual Savings	22,765	kWh
Average cost	\$0.15	/ kWh
Annual Savings	\$3,414.75	

Note: These do not count the intangible items, such as better working conditions, less environmental impact, favorable publicity, and improved customer appreciation.

Total or Incremental Cost of the Project

Light Tubes including installation	\$18,690
New Fixtures	\$4,356
Daylight & Occupancy Control Circuitry	\$1,654
Labor to Install	\$4,752
Total Capital Cost	\$29,452
PayBack Interval (Capital_cost/Annual Savings)	9 years

Pay back interval without incentives (Capital Cost / Annual Savings): Approximately 9 years.