

Automatic Receptacle Control

Introduction

Automatic receptacle control, also known as plug-load control, reduces building energy use and is required by ANSI/ASHRAE/IES Standard 90.1-2019: Energy Standard for Buildings Except Low-Rise Residential Buildings, as well as NIH DRM 10.5.3. It also helps federal buildings meet Executive Order 13834, Efficient Federal Operations. The benefit of implementing automatic receptacle control is limiting energy consumption at the electrical receptacles during non-occupied times, which reduces unnecessary energy usage and cost and supports sustainability efforts. In addition, many states require automatic controlled receptacles as part of their code requirement. NEC-2020 406.3(E) has recognized the need for identifying these controlled receptacles with a permanent marking of "CONTROLLED," which is now required on the contact device(s). See Figure 1 below for examples.



Figure 1: Marking of "Controlled" on Plug-Load Receptacles

Key Elements for Consideration

Automatic receptacle control was introduced in ASHRAE Standard 90.1-2010 and expanded on in later editions. Based on ANSI/ASHRAE/IES Standard 90.1-2019, Section 8.4.2, at least 50% of all 125V, 15- and 20-amp receptacles should be automatically controlled by a device that turns power on and off based on a schedule, occupancy sensor, or an automated signal from another control or alarm system. These automatic control devices may be in private offices, conference rooms, rooms used primarily for printers/copiers, break rooms, classrooms, and individual workstations. ASHRAE 90.1-2019, Section 8.4.2 also states that at least 25% of branch circuit feeders installed for modular furniture must be automatically controlled.

Even though ASHRAE 90.1 has recommended receptacle control for several revision cycles, controlling plug loads are typically the last energy conservation measure to be considered as part of project design. On average, General Services Administration (GSA) has found that plug loads account for approximately 30% of electricity in the office environment, while Department of Energy (DoE) data shows that performing a plug load inventory and implementing automatic receptacle controls can reduce energy use by 20-50%. Controlling plug loads stand to have an increasingly significant impact on energy conservation measures moving forward as

well: The DoE forecasts that overall energy consumption in a commercial environment will increase 24% by 2030 and plug and process loads will increase twice as much to 49%. Project engineers must therefore recognize the potential benefits of automatic receptacle control implementation to reduce energy use and meet EO 13834.

Design Principles

There are three types of automatic receptacle controlling methods specified in the ANSI/ASHRAE/IES Standard 90.1-2019, Section 8.4.2:

- Schedule-based/timer-based – This method turns receptacles off at specific programmed times. This standard requires an independent program schedule for controlled areas of no more than 5,000 ft² and not more than one floor. In addition, the occupant shall be able to manually override this device for up to two hours.
- Occupancy-based – An occupancy sensor must turn off electrical outlets within 20 minutes of all occupants leaving a space.
- System-based – A signal from another control or alarm system must turn off electrical outlets within 20 minutes after determining that the area is unoccupied.

Section 8.4.2 also indicates three exceptions that do not require an automatic control device:

- Plug-in devices in place of hardwired controls.
- Equipment required to be in continuous operation (24 hours a day, 365 days a year).
- Spaces where automatic control would risk the safety or security of room or building occupants.

Besides the 2020 NEC 406.3(E) requirements, ASHRAE 90.1-2019 also requires controlled receptacle marking.

NIH DRM Section 10.5.3, Wiring Device, requires that occupancy-based and schedule-based electrical outlets shall be considered for office cubicles and private workstations.

Conclusion

With EO 13834 mandating building energy use reduction and reduced electrical costs, project designers should follow the ANSI/ASHRAE/IES Standard 90.1-2019, Section 8.4.2. This will help achieve maximum energy conservation using properly marked automatic control devices in open workstations, conference rooms, printer/copier devices, break areas, classrooms, and individual offices.

Reference for Further Reading

1. Implementing Instructions for EO 13834, Efficient Federal Operations
https://www.sustainability.gov/pdfs/eo13834_instructions.pdf
2. ANSI/ASHRAE/IES Standard 90.1-2019, Energy Standard for Buildings Except Low-Rise Residential Buildings
<https://www.ashrae.org/technical-resources/bookstore/standard-90-1>
3. Energy Efficiency in Separate Tenant Spaces – A Feasibility Study
https://www.energy.gov/sites/prod/files/2016/04/f30/DOE%20-%20Energy%20Efficiency%20in%20Separate%20Tenant%20Spaces_0.pdf
4. Plug Load Frequently Asked Questions
<https://www.gsa.gov/about-us/organization/office-of-governmentwide-policy/office-of-federal-highperformance-buildings/resource-library/energy-water/plug-load-frequently-asked-questions-faq#6>
5. NREL – Assessing and Reducing Plug and Process Loads in Office Buildings
<https://www.nrel.gov/docs/fy13osti/54175.pdf>

