Application Information

ASCO® Series 165 Automatic Transfer Switches

ASCO® Series 165 Automatic Transfer Switch
in Type 1 enclosure.

General Information

Equipment Approvals, Codes, and Safety

ASCO® Series 165 transfer switches are Listed under the Underwriters Laboratories, Inc.® (UL®) Standard for Safety for Transfer Switch Equipment, UL 1008.

These transfer switches are intended for use only in Optional Standby Systems in accordance with the National Fire Protection Association, Inc.® (NFPA®) sponsored National Electrical Code®, NEC® / NFPA 70, 1999, Article 702. Optional Standby Systems are intended to protect facilities or property where life safety does not depend on the performance of the system.

ASCO® Series 165 transfer switches are listed for and specifically intended for such service in residential and light commercial applications where standby power is needed. ASCO® also manufactures transfer switch equipment for other applications outside of this scope of service.

The NEC requires that all equipment in optional standby systems be approved for the intended purpose. The Series 165 transfer switches meet these requirements. The transfer switch is designed to positively prevent the inadvertent interconnection of the PREFERRED (utility) and ALTERNATE (generator) sources of supply in its operation.

Transfer Switch Design

The transfer switch provides electrical power to the selected loads from either the PREFERRED (utility) source or the ALTERNATE (generator) source but will never permit the two sources to be connected together because of the mechanical design of the transfer switch. This provides a safe method of transfer during utility power outages by preventing accidental connection of the generator to the utility power lines that could result in injury to utility workers servicing the lines or neighbors. It also protects the generator from possible damage after the utility service is restored and the transfer switch transfers the loads back to the PREFERRED (utility) source.

Automatic or Manual Operation

Series 165 transfer switches are available in either *automatic* or *manually* operated models. Both types serve the electrical loads in the same manner as described in the section titled *Transfer Switch Design*.

The **Series 165 automatic transfer switch** includes a digital controller that continuously monitors the PREFERRED (utility) source. When the PREFERRED (utility) source fails for 3 seconds (refer to the controller specifications in the *Owner's Manual* for voltage settings), the generator engine is signalled to start. When the generator's power output is acceptable (refer to the controller specifications in the *Owner's Manual* for voltage settings) and it has warmed up for 15 seconds, the controller signals the transfer switch to connect the loads to the ALTERNATE (generator) output. After the PREFERRED (utility) source returns to an acceptable voltage level for 5 minutes, the controller signals the transfer switch to connect the loads back to the PREFERRED (utility) source. The generator engine is then signalled to stop after 1 minute of unloaded operation by the controller.

> **NOTE**: *When installing the automatic transfer switch, the generator engine must be provided with electrical automatic starting controls including a battery, automatic choke, engine–cranking termination control, and over–cranking shutdown protection. Without these controls the generator will not be capable of providing the automatic starting functions required for an automatic standby power system.*

The **Series 165 *manual* transfer switch** uses the same power transfer switch as the *automatic* model. It does not have a digital controller because the switching operation is accomplished using the external operating handle. A *manual* transfer switch is used in *non–automatic* applications. When the PREFERRED (utility) source fails the user manually starts the generator engine. After it is running the user manually transfers the transfer switch to the ALTERNATE (generator) source using the operating handle on the outside of the switch enclosure. After the PREFERRED (utility) source is restored (which must be determined by the user's observations of loads only connected to the utility source) the user transfers the transfer switch to the PREFERRED (utility) source using the same operating handle. The user can then shut off the generator engine.

The decision in selecting an *automatic* or *manually* operated transfer switch, and thus an automatic or manual standby power system, is typically based on the level of importance that the user and possible occupants will place on continuity of electrical service to the selected loads. In general –

An *automatic* transfer switch should be used if –

- The user requires that the selected loads be provided standby power in the minimum period of time during a utility power outage.
- The user or any persons present during a utility power outage may not be knowledgeable or capable of the actions that must be taken to start the generator and manually operate the transfer switch.
- The selected loads must be provided electrical power even when the premises are unoccupied.

A *manual* transfer switch can be used if –

- There is no requirement to provide power to the selected loads immediately during a utility power outage.
- The user or any persons present during a utility power outage will be knowledgeable and capable of the actions that must be taken to start the generator and manually operate the transfer switch. This may have to be done during conditions of reduced lighting, total darkness, or other unfavorable conditions.
- There is no requirement to provide continuous power to the selected loads when premises are unoccupied.

Installation Requirements

Safe installation requires that a qualified electrical equipment installer install the necessary wiring and equipment. The transfer switch and associated equipment must be installed in accordance with the National Electrical Code and all applicable local codes. In addition, the equipment must be installed under any required building permits and be inspected prior to operation.

⚠ WARNING

Read and understand all instructions before installing, operating, or servicing. Failure to do so could result in serious personal injuries or property damage.

Equipment Ratings

Series 165 transfer switches are designed for 120/240 volts ac, 60 Hertz, single phase, 3 wire loads. They are provided in the following ampere ratings that are suitable for use with a standby generator up to the indicated maximum rating.

Ampere Rating (per phase)	**Maximum Generator Rating** Kilowatts (KW) at 240 volts
100 amps	24 KW
200 amps	48 KW

To determine the ampere rating of the transfer switch being installed, refer to the nameplate on the front of the unit using the explanation of nameplate data provided on the cover of the *Owner's Manual*. Refer to the generator manufacturer's nameplate data and generator manual to determine the generator voltage, ampere, and KW ratings. The voltage rating of the generator and the utility service must be the same as the transfer switch. The ampere ratings of the utility and generator feeders and circuit breakers must be equal to or less than the transfer switch rating. The transfer switch cannot be installed where it may be operated above its nameplate ampere rating.

To determine what type of transfer switch is being installed, *automatic* or *manual* (non–automatic), check the first line of the nameplate on the front of the product. **If installing an "automatic transfer switch" the generator must be capable of automatic starting**; refer to the note in the section titled *Automatic* or *Manual Operation* on page 2.

Installation Considerations

There are two basic methods that may be used to install a complete optional standby power system. In general, the selected generator's ampere rating as compared to the incoming utility service's ampere rating will determine which installation method should be used.

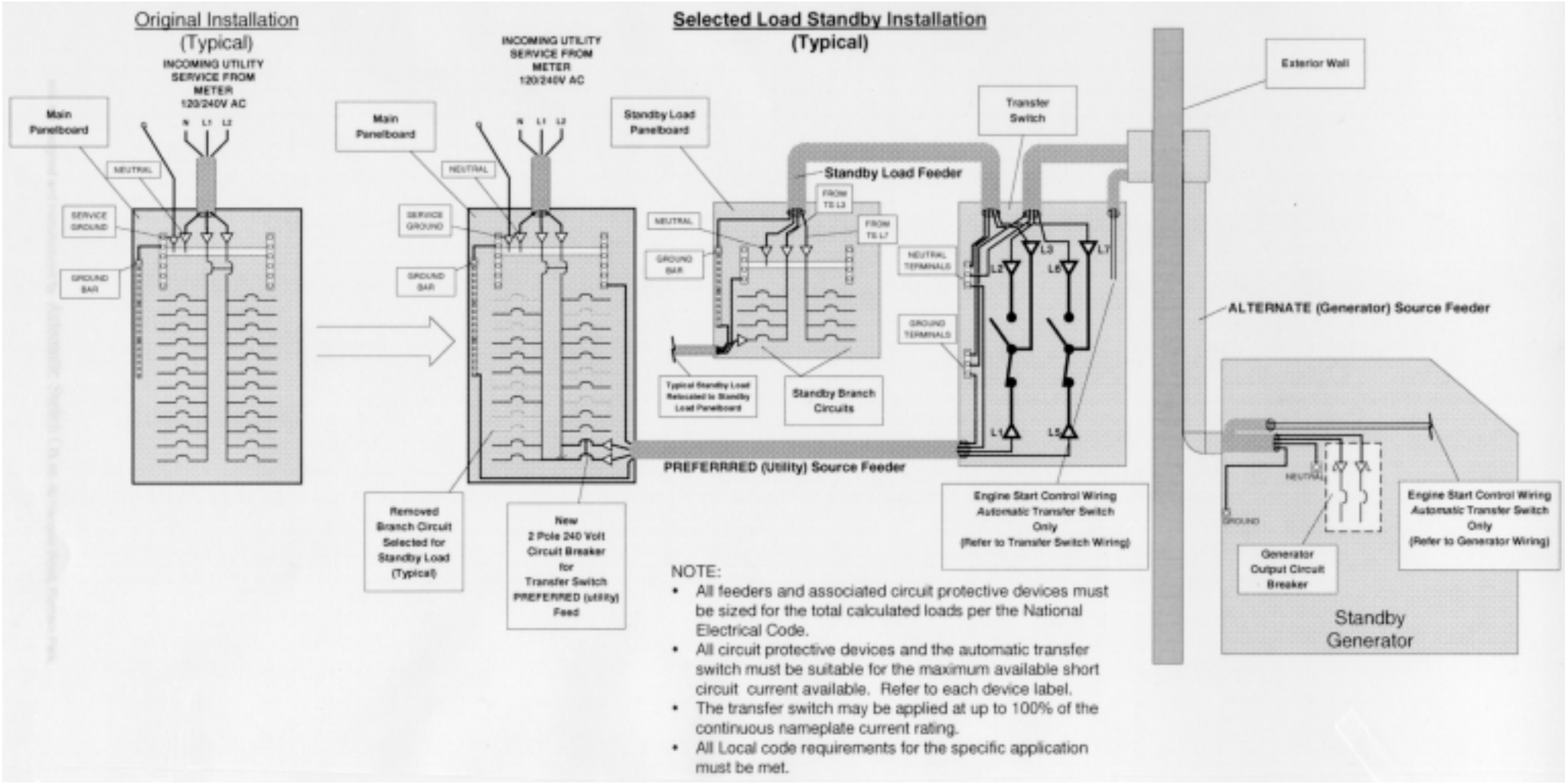


Figure 1. Selected Load Standby Installation.

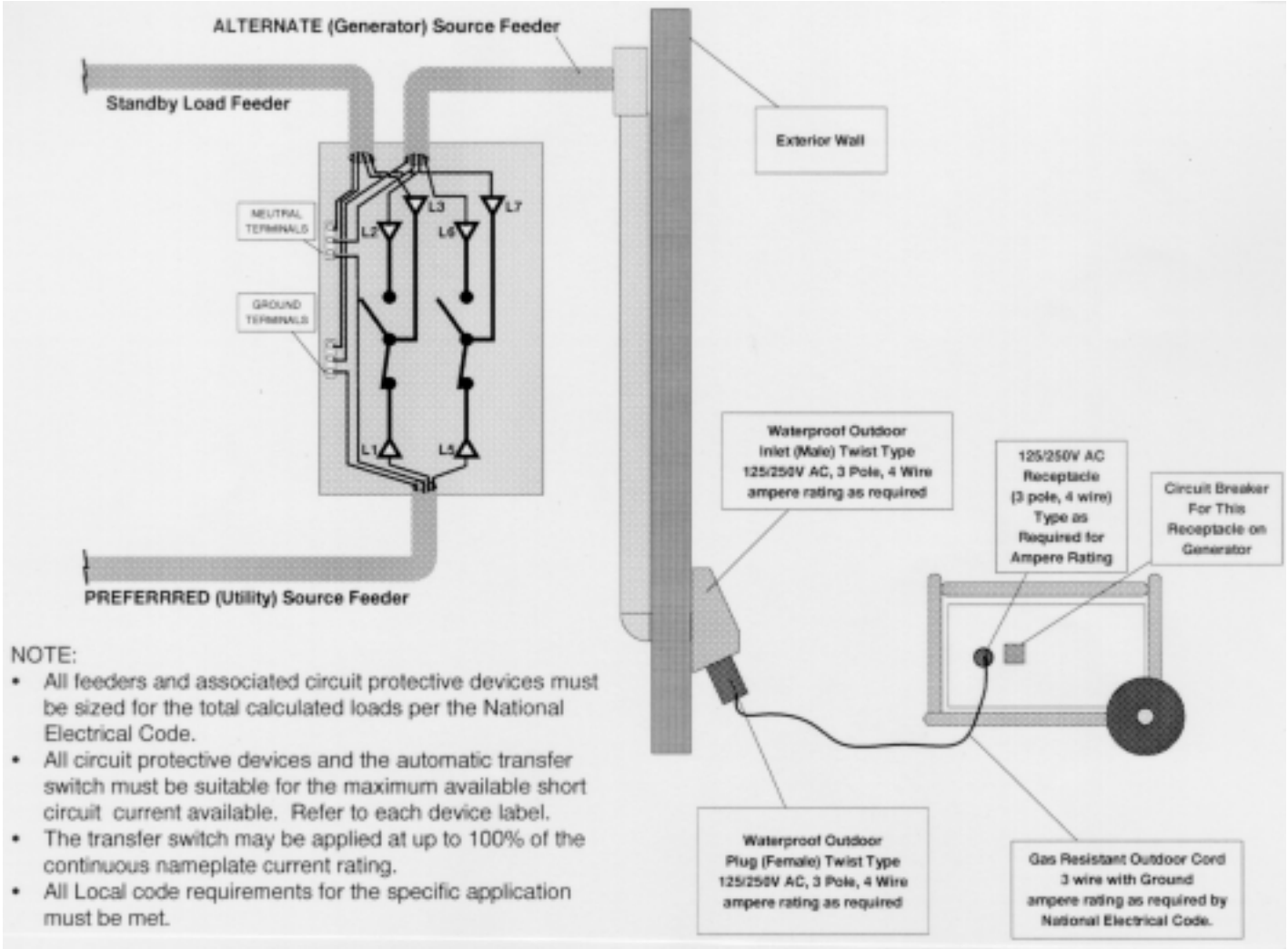
Selected Load Standby Installation

Selected Load Standby installations are the most common type. This type of installation is based on the pre–selection of the loads that will require standby power. The generator and transfer switch are sized by their ampere ratings based on the total computed load of the pre–selected standby branch circuits as defined in the National Electrical Code, NEC/NFPA 70, 1999, Article 220. The transfer switch may be either an *automatic* or *manual* model.

The advantage of this type of installation is that a generator that has an ampere rating less than the utility feeder can feed selected loads during a utility outage. In existing premises, the *main panelboard* remains connected to the incoming utility service. A second circuit breaker panelboard is installed to feed the selected loads that will be provided with standby power. This becomes the *standby load panelboard*. The transfer switch position determines which source; PREFERRED (utility) or ALTERNATE (generator) provides power to the loads connected to the standby load panelboard. Figure 1 on page 4 shows a typical Selected Load Standby Installation diagram.

In the example of the Selected Load Standby Installation (Figure 1), the branch circuit from the *main panelboard* provides the PREFERRED (utility) feed to the transfer switch. Typically, the PREFERRED (utility) and ALTERNATE (generator) circuit breaker ratings would be equal to the output of the generator with appropriately sized feeders to the transfer switch. The rating of the *standby load panelboard* would have the same rating as the generator. The maximum load that can be connected to the *standby load panelboard* is then based on this rating as defined in the National Electrical Code.

The Selected Load Standby Installation is also well suited for use with portable generators and a manual transfer switch since the *standby load panelboard* is selected based on the output of the generator. The primary difference is in the method used to connect the exterior wiring for the ALTERNATE (generator) feeder to the transfer switch into the permanent wiring system of the premises. The following diagram (Figure 2) shows a typical connection method for the portable generator.



Male inlets and female plugs are available in various ampere sizes. Note that when using portable generators, Article 702 of the National Electrical Code (Optional Standby Systems) does not apply.

Figure 2. Connection method for the portable generator.

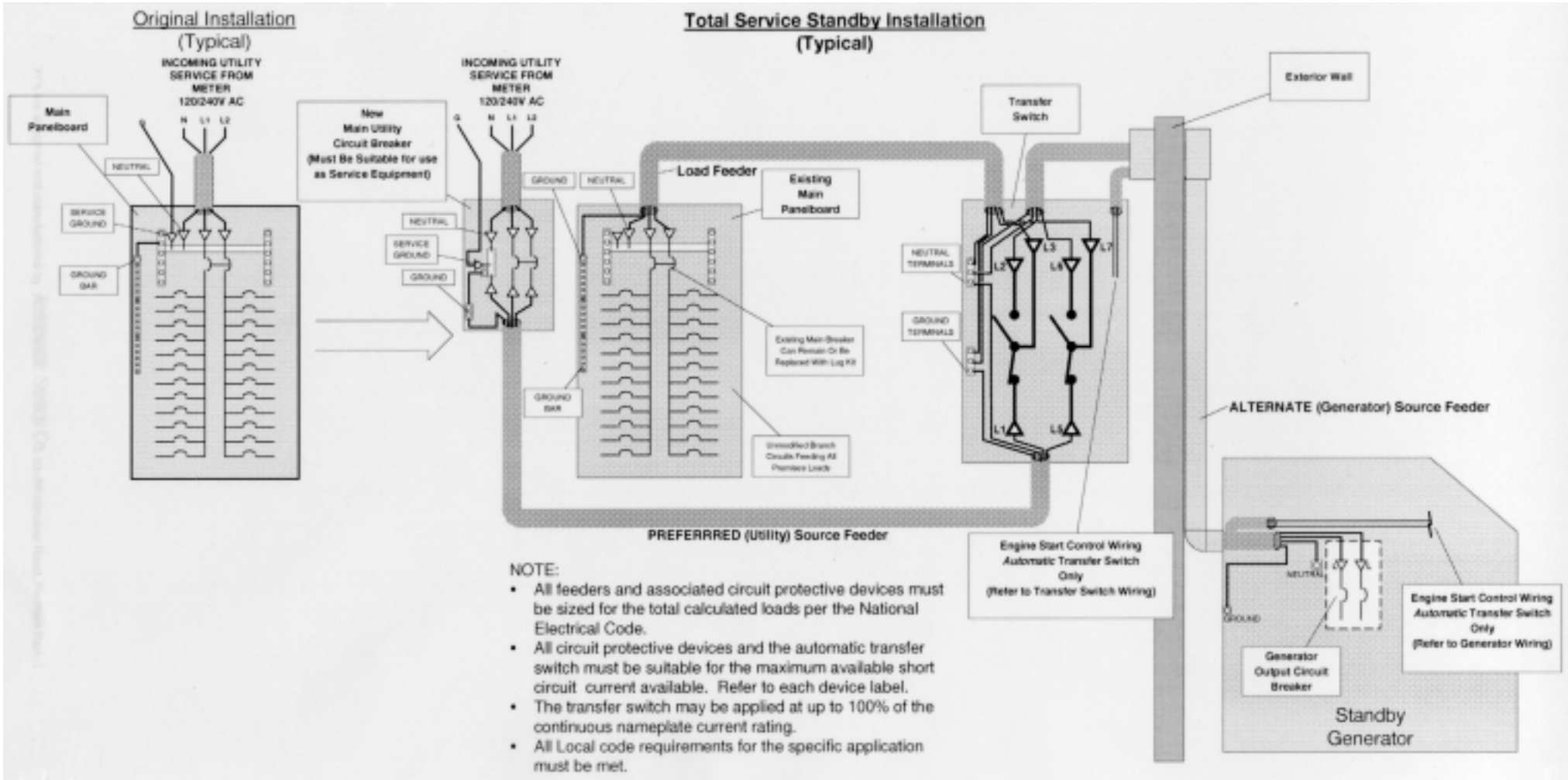


Figure 3. Total Service Standby Installation.

Total Service Standby Installation

When the generator ampere rating is, at least, equal to the total computed load of the *main panelboard* as defined in the National Electrical Code, NEC/NFPA 70, 1999, Article 220, a Total Service Standby installation can be implemented. The transfer switch may be either an *automatic* or *manual* model.

Total Service Standby power system installations utilize a single circuit breaker panelboard to distribute power to all premise loads. This is the *main panelboard*. The ”main” terminals of the *main panelboard* are connected to the LOAD terminals of the transfer switch. The transfer switch position determines which source; PREFERRED (utility) or ALTERNATE (generator) provides power to the loads connected to the branch circuits of the *main panelboard*.

The advantage of this installation is that only a single circuit breaker panelboard is required. In existing premises, the original main panelboard can be utilized without rewiring of the branch circuits. The following diagram in Figure 3 shows a typical Total Service Standby Installation.

In the example of the Total Service Standby Installation above, a separate *main utility circuit breaker* is added for the incoming utility service for the transfer switch PREFERRED (utility) source feeder. Typically, this would be the same size as the main circuit breaker in the existing *main panelboard*. The main circuit breaker in the *main panelboard* may remain or it can be removed and replaced with main terminal lugs if a kit is available from the panelboard manufacturer. The generator output must be at least equal in size to the incoming utility feeder and *main panelboard* rating so that it has sufficient capacity to supply the loads and any other loads which may be added to the *main panelboard*, based on its rating, in the future. The output breaker of the generator and the feeder from it would be equal to those of the *main utility circuit breaker*.