

17 Remove Barriers to Backup & Natural Gas Generators

I. Summary

Issue:

Existing regulations require buildings that voluntarily provide backup, standby generators to supply backup power for at least one elevator in addition to whatever other loads the buildings may want to power. This increases generator size and costs, making backup generators too expensive for some buildings. Other regulations discourage natural gas generators, which are clean burning and can power buildings for extended periods without fuel deliveries.

Recommendation:

Only require buildings over 75 feet to power an elevator with the standby generator, and reduce the minimum requirements for generator size. For emergency generators, increase the allowed startup delay from 10 to 60 seconds, making more options available for generators operated by natural gas.

II. Proposed Legislation, Rule or Study

Amendments to Department of Buildings Technical Policy and Procedure Notice # 1/07:

1. Revise TPPN # 1/07 as follows:

Specifics:

Recognizing that the installation of emergency generators can be very beneficial to the building and in order to encourage [voluntary] standby installations, only the following life safety loads shall be required to be connected to such generators:

1. Emergency lighting (unless supported by battery packs of adequate capacity), including stairway lighting. For systems whose start time exceeds 10 seconds, power to emergency lighting shall be powered by battery backup during the interim.
2. Fire alarm system.
3. For buildings greater than 75 feet in height, one elevator serving all floors of the building.

Occupants' optional loads are permitted to be connected to the [voluntarily] standby installed generator. [Such generator shall be increased in capacity to supply the required

equipment at full design load and occupants' optional loads.] If an elevator is a required life safety load, such generator shall have the minimum capacity to supply the elevator after shedding all other loads through the use of manual transfer switch.

Fuel supply may be one of the following:

1. Fuel oil in compliance with [Article 17 of Subchapter 14] Section 1301 of the NYC Mechanical [Building] Code with tank capacity sufficient to supply the total emergency power load for a period of at least three (3) hours.
2. Dedicated gas line in compliance with [Subchapter 16 and Reference Standard RS 16] Chapter 4 of the 2008 NYC Fuel Gas Code. The dedicated gas line can originate upstream of an existing outside gas service line valve where acceptable to the commissioner and utility. The outside gas cut-off required by [RS16 §P115.5] Section E.6 of Appendix E, of the NYC Fuel Gas Code shall be installed prior to gas authorization.

All other applicable code requirements for emergency power (generator) installation shall be complied with.

Amendments to the New York City Building Code:

1. Amend Section BC 2702.1 as follows:

2702.1 Installation. Emergency systems shall be installed in accordance with the New York City Electrical Code, NFPA 110 and NFPA 111., and] Systems relying on fuel oil shall have an on-premises fuel supply sufficient for not less than 6-hour full-demand operation of the system. [However, for R-2 occupancies required to provide emergency power systems pursuant to the provisions of Section 403.11.2, and for voluntarily installed emergency power systems, n] Natural gas from the public utility street main shall be permitted as fuel supply.

Amendments to the New York City Electrical Code:

1. Amend 2008 NEC Section 700.12 as follows:

Section 700.12 General Requirements: Current supply shall be such that, in the event of failure of the normal supply to, or within, the building or group of buildings concerned, emergency lighting, emergency power, or both shall be available within the time required for the application but not to exceed [10] 60 seconds. For systems whose start time exceeds 10 seconds, emergency lighting shall be powered by battery backup in the interim.

2. Add Section 702 of 2008 NEC on Optional Standby Generators.

III. Supporting Information

Expanded Issue and Benefits:

During Superstorm Sandy large portions of New York City were left without power, making many residential buildings within the blackout zones uninhabitable. Greater backup or “standby” power in residential buildings could have mitigated the challenges of living in buildings without grid power.

Current NYC Building Code guidelines outlined in Technical Policy and Procedure Notice # 1/07 (TPPN #1/07) make the voluntary installation of backup power cost prohibitive for many building owners due to minimum load requirements that include egress lighting (where not powered by battery backup), the fire alarm system and one elevator serving all floors. The cost of the elevator requirement sometimes precludes building owners from installing generators, leaving all parties (owner, occupants, and emergency response personnel) at a disadvantage if grid power is lost, especially for extended periods of time. Eliminating the elevator requirement for buildings under 75 feet in height (about six floors) and giving building owners the option to isolate the elevator load from other loads during its use, increases the flexibility of system sizing and design without reducing the benefit of standby power to occupants and emergency response personnel.

Superstorm Sandy highlighted the limitations of diesel generators which require significant quantities of fuel delivered by truck, and which negatively impact local air quality. However, the majority of existing backup generators in NYC are powered by diesel fuel and the allowable capacity of onsite fuel is limited by code. Currently the Building Code requires emergency generators to be diesel fuel powered with an onsite storage capacity equivalent to 6 hours of operation at full load, while residential buildings are permitted to utilize natural gas as a fuel source. The city’s natural gas supply, which has not been disrupted in decades, is an underutilized fuel source in times of greatest need. Natural gas does not face the onsite storage limitations and potential delivery issues of diesel and burns much cleaner than diesel. However, it is challenging for units above 1000 kW to energize within 10 seconds, the required start time for emergency generators in the Electrical Code. Increasing the maximum allowable start time will expand the market options available to building owners and ease the restrictions imposed on natural gas fired units.

This proposal will facilitate the development of a micro-grid system for use during periods of extended power outages. With the dense population of New York City, the low vacancy rate, the dependence of its habitants on their place of residence, and the year-round presence of huge numbers of visitors occupying hotels in all five boroughs, even small reductions in habitable space can place great strain on available resources. Standby power systems, supplied by a broad, existing distribution network of natural gas that can remain active during major storms and disasters, will greatly increase the resiliency of New York City.

Implementation:

All relevant technology is commercially available and is widely used in a variety of applications. The proposal will allow for an increase in available market products for building owners.

The proposed changes (once implemented) would have an immediate effect on the resiliency of a building.

Natural gas is not available throughout all areas of New York City.

Cost:

This proposal does not mandate building owners to perform any work. The cost for owners to voluntarily add backup generators is dependent on the characteristics of the building, the standby loads chosen by the building owner, and fuel choice (natural gas versus diesel). Owners that choose to install stand-by generators will see an increase in their annual operation and maintenance budget due to monthly testing and equipment maintenance.

No cost estimation was performed for this proposal.

Sources:

1. Technical Policy and Procedure Notice # 1/07
http://www.nyc.gov/html/dob/html/codes_and_reference_materials/tppn0107.shtml. Since TPPN #1/07 is an interpretation of the 1968 Building Code, the changes recommended in this proposal would modify the interpretation of a code that has been replaced. In the end, a new TPPN or modification of the 2008 building code should be prepared that will incorporate the changes proposed here.
2. 2008 NYC Building Code: Chapter 27 – Electrical
http://publicecodes.cyberregs.com/st/ny/ci-nyc/b200v08/st_ny_ci-nyc_b200v08_27_sec002.htm?bu=YC-P-2008-000006
3. Administrative Code of the City of New York, Title 27 Construction and Maintenance, Chapter 3 Electrical Code, Section 27-3025
http://www.nyc.gov/html/dob/downloads/pdf/admin_sec_2007_elec_code.pdf
4. 2008 NEC – Article 700 (Section 700.12 attached)
5. Email communication with John Viserto of H.O. Penn – Local Caterpillar Sales Representative

Supporting Documents:

700.12

ARTICLE 700 — EMERGENCY SYSTEMS

section, panelboard enclosure, or individual disconnect enclosure as emergency circuits.

(C) Wiring Design and Location. Emergency wiring circuits shall be designed and located so as to minimize the hazards that might cause failure due to flooding, fire, icing, vandalism, and other adverse conditions.

(D) Fire Protection. Emergency systems shall meet the additional requirements in 700.9(D)(1) and (D)(2) in assembly occupancies for not less than 1000 persons or in buildings above 23 m (75 ft) in height with any of the following occupancy classes: assembly, educational, residential, detention and correctional, business, and mercantile.

(1) Feeder-Circuit Wiring. Feeder-circuit wiring shall meet one of the following conditions:

- (1) Be installed in spaces or areas that are fully protected by an approved automatic fire suppression system
- (2) Be a listed electrical circuit protective system with a minimum 1-hour fire rating

FPN: UL guide information for electrical circuit protection systems (FHIT) contains information on proper installation requirements to maintain the fire rating.

- (3) Be protected by a listed thermal barrier system for electrical system components
- (4) Be protected by a listed fire-rated assembly that has a minimum fire rating of 1-hour and contains only emergency wiring circuits.
- (5) Be embedded in not less than 50 mm (2 in.) of concrete
- (6) Be a cable listed to maintain circuit integrity for not less than 1 hour when installed in accordance with the listing requirements

(2) Feeder-Circuit Equipment. Equipment for feeder circuits (including transfer switches, transformers, and panelboards) shall be located either in spaces fully protected by approved automatic fire suppression systems (including sprinklers, carbon dioxide systems) or in spaces with a 1-hour fire resistance rating.

FPN: For the definition of *Occupancy Classification*, see Section 6.1 of NFPA 101-2006, *Life Safety Code*.

(3) Generator Control Wiring. Control conductors installed between the transfer equipment and the emergency generator shall be kept entirely independent of all other wiring and shall meet the conditions of 700.9(D)(1).

III. Sources of Power

700.12 General Requirements. Current supply shall be such that, in the event of failure of the normal supply to, or within, the building or group of buildings concerned, emergency lighting, emergency power, or both shall be available

within the time required for the application but not to exceed 10 seconds. The supply system for emergency purposes, in addition to the normal services to the building and meeting the general requirements of this section, shall be one or more of the types of systems described in 700.12(A) through (E). Unit equipment in accordance with 700.12(F) shall satisfy the applicable requirements of this article.

In selecting an emergency source of power, consideration shall be given to the occupancy and the type of service to be rendered, whether of minimum duration, as for evacuation of a theater, or longer duration, as for supplying emergency power and lighting due to an indefinite period of current failure from trouble either inside or outside the building.

Equipment shall be designed and located so as to minimize the hazards that might cause complete failure due to flooding, fires, icing, and vandalism.

Equipment for sources of power as described in 700.12(A) through (E) where located within assembly occupancies for greater than 1000 persons or in buildings above 23 m (75 ft) in height with any of the following occupancy classes — assembly, educational, residential, detention and correctional, business, and mercantile — shall be installed either in spaces fully protected by approved automatic fire suppression systems (sprinklers, carbon dioxide systems, and so forth) or in spaces with a 1-hour fire rating.

FPN No. 1: For the definition of *Occupancy Classification*, see Section 6.1 of NFPA 101-2006, *Life Safety Code*.

FPN No. 2: Assignment of degree of reliability of the recognized emergency supply system depends on the careful evaluation of the variables at each particular installation.

(A) Storage Battery. Storage batteries used as a source of power for emergency systems shall be of suitable rating and capacity to supply and maintain the total load for a minimum period of 1½ hours, without the voltage applied to the load falling below 87½ percent of normal.

Batteries, whether of the acid or alkali type, shall be designed and constructed to meet the requirements of emergency service and shall be compatible with the charger for that particular installation.

For a sealed battery, the container shall not be required to be transparent. However, for the lead acid battery that requires water additions, transparent or translucent jars shall be furnished. Automotive-type batteries shall not be used.

An automatic battery charging means shall be provided.

(B) Generator Set.

(1) Prime Mover-Driven. For a generator set driven by a prime mover acceptable to the authority having jurisdiction and sized in accordance with 700.5, means shall be provided for automatically starting the prime mover on failure of the normal service and for automatic transfer and

70-598

Copyright National Fire Protection Association
Provided by IHS under license with NFPA
No reproduction or networking permitted without license from IHS

NATIONAL ELECTRICAL CODE 2008 Edition



Licensee=Aramco HQ9900755100
Not for Resale, 09/23/2007 23:20:41 MDT

701.17 Ground-Fault Protection of Equipment. The alternate source for legally required standby systems shall not be required to have ground-fault protection of equipment.

701.18 Coordination. Legally required standby system(s) overcurrent devices shall be selectively coordinated with all supply side overcurrent protective devices.

Exception: Selective coordination shall not be required in (1) or (2):

- (1) *Between transformer primary and secondary overcurrent protective devices, where only one overcurrent protective device or set of overcurrent protective devices exists on the transformer secondary,*
- (2) *Between overcurrent protective devices of the same size (ampere rating) in series.*

ARTICLE 702 Optional Standby Systems

I. General

702.1 Scope. The provisions of this article apply to the installation and operation of optional standby systems.

The systems covered by this article consist of those that are permanently installed in their entirety, including prime movers, and those that are arranged for a connection to a premises wiring system from a portable alternate power supply.

702.2 Definition.

Optional Standby Systems. Those systems intended to supply power to public or private facilities or property where life safety does not depend on the performance of the system. Optional standby systems are intended to supply on-site generated power to selected loads either automatically or manually.

FPN: Optional standby systems are typically installed to provide an alternate source of electric power for such facilities as industrial and commercial buildings, farms, and residences and to serve loads such as heating and refrigeration systems, data processing and communications systems, and industrial processes that, when stopped during any power outage, could cause discomfort, serious interruption of the process, damage to the product or process, or the like.

702.3 Application of Other Articles. Except as modified by this article, all applicable articles of this Code shall apply.

702.4 Equipment Approval. All equipment shall be approved for the intended use.

702.5 Capacity and Rating.

(A) Available Short-Circuit Current. Optional standby system equipment shall be suitable for the maximum available short-circuit current at its terminals.

(B) System Capacity. The calculations of load on the standby source shall be made in accordance with Article 220 or by another approved method.

(1) Manual Transfer Equipment. Where manual transfer equipment is used, an optional standby system shall have adequate capacity and rating for the supply of all equipment intended to be operated at one time. The user of the optional standby system shall be permitted to select the load connected to the system.

(2) Automatic Transfer Equipment. Where automatic transfer equipment is used, an optional standby system shall comply with (2)(a) or (2)(b):

(a) Full Load. The standby source shall be capable of supplying the full load that is transferred by the automatic transfer equipment.

(b) Load Management. Where a system is employed that will automatically manage the connected load, the standby source shall have a capacity sufficient to supply the maximum load that will be connected by the load management system.

702.6 Transfer Equipment. Transfer equipment shall be suitable for the intended use and designed and installed so as to prevent the inadvertent interconnection of normal and alternate sources of supply in any operation of the transfer equipment. Transfer equipment and electric power production systems installed to permit operation in parallel with the normal source shall meet the requirements of Article 705.

Transfer equipment, located on the load side of branch circuit protection, shall be permitted to contain supplemental overcurrent protection having an interrupting rating sufficient for the available fault current that the generator can deliver. The supplementary overcurrent protection devices shall be part of a listed transfer equipment.

Transfer equipment shall be required for all standby systems subject to the provisions of this article and for which an electric utility supply is either the normal or standby source.

Exception: Temporary connection of a portable generator without transfer equipment shall be permitted where conditions of maintenance and supervision ensure that only qualified persons service the installation and where the normal supply is physically isolated by a lockable disconnecting means or by disconnection of the normal supply conductors.

702.7 Signals. Audible and visual signal devices shall be provided, where practicable, for the following purposes.

701.17 Ground-Fault Protection of Equipment. The alternate source for legally required standby systems shall not be required to have ground-fault protection of equipment.

701.18 Coordination. Legally required standby system(s) overcurrent devices shall be selectively coordinated with all supply side overcurrent protective devices.

Exception: Selective coordination shall not be required in (1) or (2):

- (1) *Between transformer primary and secondary overcurrent protective devices, where only one overcurrent protective device or set of overcurrent protective devices exists on the transformer secondary,*
- (2) *Between overcurrent protective devices of the same size (ampere rating) in series.*

ARTICLE 702 Optional Standby Systems

I. General

702.1 Scope. The provisions of this article apply to the installation and operation of optional standby systems.

The systems covered by this article consist of those that are permanently installed in their entirety, including prime movers, and those that are arranged for a connection to a premises wiring system from a portable alternate power supply.

702.2 Definition.

Optional Standby Systems. Those systems intended to supply power to public or private facilities or property where life safety does not depend on the performance of the system. Optional standby systems are intended to supply on-site generated power to selected loads either automatically or manually.

FPN: Optional standby systems are typically installed to provide an alternate source of electric power for such facilities as industrial and commercial buildings, farms, and residences and to serve loads such as heating and refrigeration systems, data processing and communications systems, and industrial processes that, when stopped during any power outage, could cause discomfort, serious interruption of the process, damage to the product or process, or the like.

702.3 Application of Other Articles. Except as modified by this article, all applicable articles of this Code shall apply.

702.4 Equipment Approval. All equipment shall be approved for the intended use.

702.5 Capacity and Rating.

(A) Available Short-Circuit Current. Optional standby system equipment shall be suitable for the maximum available short-circuit current at its terminals.

(B) System Capacity. The calculations of load on the standby source shall be made in accordance with Article 220 or by another approved method.

(1) Manual Transfer Equipment. Where manual transfer equipment is used, an optional standby system shall have adequate capacity and rating for the supply of all equipment intended to be operated at one time. The user of the optional standby system shall be permitted to select the load connected to the system.

(2) Automatic Transfer Equipment. Where automatic transfer equipment is used, an optional standby system shall comply with (2)(a) or (2)(b):

(a) Full Load. The standby source shall be capable of supplying the full load that is transferred by the automatic transfer equipment.

(b) Load Management. Where a system is employed that will automatically manage the connected load, the standby source shall have a capacity sufficient to supply the maximum load that will be connected by the load management system.

702.6 Transfer Equipment. Transfer equipment shall be suitable for the intended use and designed and installed so as to prevent the inadvertent interconnection of normal and alternate sources of supply in any operation of the transfer equipment. Transfer equipment and electric power production systems installed to permit operation in parallel with the normal source shall meet the requirements of Article 705.

Transfer equipment, located on the load side of branch circuit protection, shall be permitted to contain supplemental overcurrent protection having an interrupting rating sufficient for the available fault current that the generator can deliver. The supplementary overcurrent protection devices shall be part of a listed transfer equipment.

Transfer equipment shall be required for all standby systems subject to the provisions of this article and for which an electric utility supply is either the normal or standby source.

Exception: Temporary connection of a portable generator without transfer equipment shall be permitted where conditions of maintenance and supervision ensure that only qualified persons service the installation and where the normal supply is physically isolated by a lockable disconnecting means or by disconnection of the normal supply conductors.

702.7 Signals. Audible and visual signal devices shall be provided, where practicable, for the following purposes.