



Safety Codes Required by States and Major Cities

EGSA 109C 1994

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Electrical Generating Systems Association
1650 S. Dixie Highway, 4th Floor
Boca Raton, Florida 33432
Phone: (561) 750-5575 • Fax: (561) 395-8557

Preface

This is a revision of EGSA 109C. Engineers, distributors and manufacturers' representatives sometimes have difficulty obtaining information on what regulations apply in specific states or municipalities. There are over 40,000 municipalities in the United States and hundreds of safety codes and standards with a myriad of variations in the form of local amendments. No one could begin to tabulate the requirements in more than a few of those municipalities, and even that has to be in simplified form. In addition requirements change day by day. An additional complication involves what edition of a particular code is being enforced. Cities are frequently two to five years behind. We find cities still enforcing the 1987 National Electrical Code, two editions behind.

This revision is necessarily limited to states and about 55 major cities. The listing is limited to the building code, the electrical code and the life safety code in force when the survey was made. Further listing would complicate the chart beyond practicality. We do, however, give a listing of contact addresses and phone numbers. We believe that this is the most useful feature of this publication.

In addition, the text included with this revision gives a summary of the major requirements of other national safety codes that various localities may enforce. In determining compliance, this summary should not be used as a substitute for the actual standard. Also be aware that nothing is static. These standards are constantly being revised, usually on a three to five year cycle. Part of the reason for revising this publication at this time is that most of these standards have been recently revised.

An additional purpose of this publication is to encourage specifiers to list codes or standards that may not be required in a particular location. For example, if the municipality does not require compliance with NFPA 101, The Life Safety Code, the specifier's specification should list it. That is necessary to make the emergency power system criteria of the National Electrical Code a requirement.

Safety Codes Required by States and Major Cities

The Model Building Codes

Rather than having a single building code for the entire United States, usage has resulted in three major model building codes. States and cities have generally adopted one of these codes, often with amendments. The most important feature of the building codes for the on-site power industry is that in the absence of a life safety code requirement, the building code may be the source of a requirement for emergency power. That may be done by reference. Be aware also that the building code may prescribe the location and details of the emergency generating equipment. In the light of a half dozen disasters in the past year, we expect that somewhere tighter limitations will be applied to generator set installations.

The three major building codes and their sources are:

The National Building Codes (NBC)
Building Officials and Code Administrators
International (BOCA)
4051 West Flossmoor Road
Country Club Hills, IL 60478-4981
(708) 799-2300

The Uniform Building Codes (UBC)
International Conference of Building Officials
ICBO)
5360 South Workman Mill Road
Whittier, CA 90601
(213) 699-0541

The Standard Building Codes (SBC)
Southern Building Code Congress
International (SBCCI)
900 Montclair Road
Birmingham, AL 35213
(205) 592-1853

The general areas that have adopted these codes are:

NBC--Northeast and Midwest
UBC--West and Midwest
SBC--South

The umbrella organization that ensures coordination between these model code bodies is:

Council of American Building Officials
(CABO)

5203 Leesburg Pike, Suite 708
Falls Church, VA 22041
(703) 931-4533

The Safety to Life Committee of the National Fire Protection Association cooperates with CABO in coordinating life safety regulations.

The National Electrical Code, NFPA 70

The United States does not have nationally legislated or adopted codes. The nearest thing to a nationally adopted code is the National Electrical Code (NEC), NFPA 70. Almost every state and city has adopted the NEC. Often cities have not got around to adopting the latest edition and many have made certain amendments. On a local basis the user needs to find out what the amendments are and what edition applies.

The NEC applies to construction and installation criteria. There has been an attempt to remove items of performance, maintenance and testing from the NEC in favor of other special codes such as NFPA 99 and NFPA 110. However, most of those items remain in the NEC. A few articles such as Article 517, Health Care Facilities, retain the requirements but have the superscript "x" to show the primary source of the text. Appendix A of the NEC lists the sources. (For Article 517 the source of all the references is NFPA 99).

The NEC articles that specifically speak to the subject of on-site power generation are Articles 445-Generators, 700-Emergency

Systems, 701-Legally Required Standby Systems, 702-Optional Standby Systems and 705-Interconnected Electric Power Sources. Details of the requirements of those articles that relate to on-site power generation appear in the appendix p10.

NFPA 101, Life Safety Code

The third listing in our Table 1 is the Life Safety Code, NFPA 101. The current edition is NFPA 101-1994. Although this code is extremely important to human safety, only about half of the fifty states have adopted it. In some states the Life Safety Code is in effect by reference through the fire codes or the model building codes.

The code has 32 chapters. The first seven are of general nature and the next 23 cover requirements for specific classifications of occupancies. As we mentioned in the preface, if a government unit has a requirement for emergency power, it is usually the Life Safety Code that spells out that requirement. Details of those requirements appear in the appendix.

Like the NEC, the Life Safety Code is written and administered by:
National Fire Protection Association (NFPA)
One Batterymarch Park
P.O. Box 9101
Quincy, MA 02269-9101
(617) 770-3000

Table 1 lists all 50 states and the District of Columbia and more than 50 major cities. The second column lists the adopted building code and whether it is modified for that jurisdiction. Column 3 lists whether the government unit enforces the NEC and whether it uses an amended version. Such amendments are usually minor but nevertheless important to know about. The third column lists how life safety is handled. The fourth and fifth columns give an address and phone number for a contact with the enforcement officer. Such contact is very important as regulations change day by day. The officer can tell the inquirer what amendments are in effect, what edition is recognized if not the current one and what

other codes and standards he can expect to encounter. Most locations will also enforce a mechanical and a plumbing code. Most of those will not affect the generator set but could have certain requirements for the installation. Six or ten other NFPA codes or standards may have electrical requirements. The appendix contains information on what those requirements may be.

Table 1

Codes of States and Major Cities

	Building	Electrical	Life Safety	Enforcement	Phone
Alabama	SBC	NEC	NFPA 101	State Fire Marshal's Office., PO Box 303352, Montgomery, AL 36130-3352	(205) 269 3575
Birmingham	SBC amend	NEC amend	NFPA 101	Chief Electrical Inspector, City Hall, Rm 207, 710 N. 20th St., Birmingham, AL 35203	(205) 254-2219
Alaska	UBC amend	NEC	None	State Fire Marshal, 5700 E. Tudor St., Anchorage, AK 99507-1225	(907) 269-5604
Anchorage	UBC amend	NEC amend	None	Building Official, PO Box 196650, Anchorage, AK 99519-6650	(907) 786-8307
Arizona	None	NEC	Ariz Fire Code	Asst Fire Marshall, Dept of Bldg & Fire Safety, 1540 W VanBuren, Phoenix, AZ 85007	(602)255-4072
Phoenix	UBC amend	NEC amend	Ref in Bldg & Fire	Assistant Director, Development Services Dept,125 E Washington, Phoenix, AZ 85004	(602) 262-6901
Arkansas	SBC amend	NEC	NFPA 101	Elec. Administrator, 10421 W Markham, Rm. 301, Little Rock, AR 72205	(501) 682-4500
Little Rock	SBC	NEC	None	Dept of Neighborhood Planning, 723 W Markham St, Little Rock, AR 72201	(501) 371-4826
California	UBC amend	NEC amend	None	State Fire Marshal, 7171 Bowling Dr, Suite 600, Sacramento, CA 95823	(916) 262-1875
Los Angeles	UBC amend	NEC amend	None	Chief, Mechanical. Bureau, Rm 485 City Hall, 200 N Spring St, Los Angeles, CA 90012	(213) 485-2301
San Diego	UBC amend	NEC amend	NFPA 101	Deputy Dir Field Insp. Services, 4995 Murphy Canyon Rd, Ste 200, San Diego, CA 92123	(619) 492-5070
San Francisco	UBC amend	NEC amend	None	Supt, Bureau of Building Insp, 450 McAllister St, Rm 202, San Francisco, CA 94102	(415) 558-6087
San Jose	UBC amend	NEC suplmt	None	Director, Dept Neighborhood Preservation, 801 N 1st St, Rm 200, San Jose, CA 95110	(408) 277-4541
Colorado	UBC	NEC	None	Lester Fields, Div of Housing, 1313 Sherman St, RM 323, Denver, CO 80203	(303) 866-2033
Denver	UBC amend	NEC suplmt	NFPA 101	Director, Building Inspection Div, 200 W 14th Ave, Denver, CO 80204-2700	(303) 640-5843
Connecticut	NBC amend	NEC	NFPA 101 amend	Public Safety Building Official, PO Box 2794,Middletown, CT 06457-9294	(203) 238-6011
Delaware	None	NEC	NFPA 101amend	State Fire Marshal's Office, R.D. 2, Box 166A, Dover, DE 19901	(302) 739-4394
Wilmington	NBC amend	NEC	NFPA 101amend	Dept Licenses & Inspection, 800 French St, 5th Floor, Wilmington DE 19801	(302) 571-4423
Dist. of Columbia	NBC amend	NEC amend	None	Adm, Bldg & Land Use Regulation Adm, 614 H St NW, Room 312, Washington, DC 20001	(202) 727-7340
Florida	SBC&SFBC	NEC	NFPA 101amend	Program Mgr, Dept of Community Affairs, The Rhyne Bldg., Tallahassee, FL 32399	(904) 487-1824
Jacksonville	SBC	NEC amend	NFPA 101	Sup Elect Section, Room 100 City Hall, 220 E Bay St, Jacksonville, FL 32202	(904) 630-1100
Miami	SFBC Dade	NEC w/excl	NFPA 101	Building Code Compliance Office, 140 W Flagler St, Suite 1603 Miami, FL 33130	(305) 375-2901
Orlando	SBC amend	NEC amend	NFPA 101	Bldg Official, Bur of Code Enforcement., 400 S Orange Av, Orlando, FL 32801	(407) 246-2271
Georgia	SBC	NEC	NFPA 101amend	Commis'nr, Dept Comm Affrs, 1200 Equitable Bldg, 100 Peachtree St, Atlanta, GA 30303	(404) 656-5526
Atlanta	SBC	NEC amned	NFPA 101amend	RL Dover, Electrical Division, 55 Trinity Av, PO Box 4005 (Zip 30305) Atlanta, GA 30335	(404) 330-6180
Hawaii	None	None	None	Local	
Honolulu	UBC amend	NEC amend	NFPA 101 ltd.	Takeo Kawabata, Elect Engr , City/County Bldg Dept, 650 S King St, Honolulu, HI 96813	(808) 527-6011
Idaho	UBC	NEC w/supl	NFPA 101	Elect Div Admr, Dept of Labor and Industrial Services, 277 N 6th, Boise, ID 83720	(208) 334-2183
Illinois	None	NEC Local	NFPA 101	State Fire Marshal, 1035 Stevenson Dr, Springfield, IL 62703	(217) 785-4712
Chicago	CBC	CEC	None	Chief Electrical Inspector, Dept of Buildings, 121 N LaSalle St, Chicago, IL 60602	(312) 744-3457
Indiana	UBC amend	NEC amend	None	St Fire Marshall, Dept of Bldg Services, 402 W Washington St, Indianapolis, IN 46204	(317) 232-2226

CBC = Chicago Bldg Code; NBC = Nat Bldg Code; SBC = Southern Bldg Code; SFBC = S. Florida Bldg Code; UBC = Uniform Bldg Code; NEC = Nat Electric Code

Indianapolis	UBC amend	NEC amend	None	Deputy Adm., Inspect Services, 2001 City/County Bldg, Indianapolis, IN 46204	(317) 327-5550
Iowa	UBC amend	NEC amend	Iowa Fire M Rules	State Building Code Bureau, Wallace State office Building, Des Moines, IA 50319	(515) 281-5821
Des Moines	UBC amend	NEC amend	None	Larry Hagen, Senior Elect Inspector, Building Dept, 602 E 1st St, Des Moines, IA 50309	(515) 283-4925
Kansas	UBC	NEC	NFPA 101 amend	Ed Redmon, KS Fire Marshall., 700 SW Jackson St, Ste 600, Topeka, KS 66603-3714	(913) 296-3401
Wichita	UBC amend	NEC amend	NFPA 101	Supt Central Inspection, 455 N Main St, Wichita, KS 67202	(316) 268-4460
Kentucky	NBC, (KYBC)	NEC amend	NFPA 101 (KYBC)	State Fire Marshal, The 127 Building, 1047 US 127 S, Frankfort, KY 40601	(502) 564-3626
Louisiana	SBC	NEC	NFPA 101	Chief Architect, State Fire Marshal's Office, 5150 Florida Blvd, Baton Rouge, LA 70806	(504) 925-4920
New Orleans	SBC amend	NEC amend	NFPA 101	Dir, Dept of Saf and Permits, Rm 7E05 City Hall, 1300 Perdido St, New Orleans, LA 70112	(504) 565-6111
Maine	None	NEC	NFPA 101	Admr Electrician Exam Bd Licenc & Enforce, State House Station # 35, Augusta ME 04333	(207) 582-8723
Maryland	NBC	NEC	NFPA 101 amend	Ch Fire Prot Eng, Off St Fire Marshall, 101 Old Court Rd, Ste 300, Pikesville, MD 21032	(410) 514-7220
Baltimore	NBC amend	NEC amend	NFPA 101	Dennis Chojnowski, Permit Enforc, 417 E Fayette St, Rm 100, Baltimore, MD 21202	(410) 396-3462
Massachusetts	NBC amend	NEC Amend	NFPA 101 lmted	Bd of Bldg Regulations, One Ashburton Place, Rm 1301, Boston, MA 02108	(617) 727-3200
Boston	NBC amend	NEC amend	NFPA 101 lmted	Coms'ner Buildings and Inspectional Serv, 1010 Massachusetts Av, Boston, MA 02118	(617) 635-5300
Michigan	NBC amend	NEC amend	None	Ch Elec Div, Bur of Construction Codes, 7150 Harris Dr, PO Box 30254, Lansing MI 48909	(517) 322-1739
Detroit	NBC amend	NEC amend	Ref NFPA 101	Head Engr, Mech. Elect. Div, 434 City/County Bldg, 2 Woodward Av, Detroit, MI 49226	(313) 224-3181
Minnesota	UBC amend	NEC amend	None	St Bd of Electricity, Griggs Midway Bldg #S-173, 1821 University Av, St Paul, MN 55104	(612) 642-0800
Minneapolis	UBC amend	NEC amend	None	Supvr, Inspections Div, 300 Public Health Center, 250 S 4th St, Minneapolis, MN 55415	(612) 673-5845
Mississippi	SBC	NEC	NFPA 101 lmted	St Bldgs only- Dir Office of Bldgs & Grnds, 1501 Walter Sillers Bldg, Jackson, MS 39201	(601) 359-3621
Jackson	SBC	NEC	None	Charles Dezrow, Building Official, Bldg Permit Div, PO Box 17, Jackson, MS 39205	(601) 960-1159
Missouri	NBC St Fac	NEC St Fac	NFPA 101 St Fac	Office of Adm, Dept of Design & Construcion, PO Box 809, Jefferson City, MO 65102	(314) 751-4191
Kansas City	UBC amend	NEC amend	None	Director Codes Administration, 18th Floor City Hall, 414 E 12th St, Kansas City, MO 64106	(816) 274-1464
St. Louis	NBC amend	NEC	None	Supt. Electrical Section, Building Dept, Rm 425, 1200 Market St, St. Louis, MO 63103	(314) 622-3326
Montana	UBC amend	NEC amend	None	Bureau Chief Bldg Codes Bureau, Dept of Commerce, PO Box 200517 Helena, MT 59620	(406) 444-3933
Nebraska	UBC amend	NEC	NFPA 101 Amend	Terry Carlson, Exec Dir, State Electrical Bd, 800 S 13th St., RM 109, Omaha, NB 68102	(402) 471-3550
Omaha	UBC amend	NEC	NFPA 101 Amend	John Jesse, Superintendent, Permits and Inspection, 1819 Farnam St, Omaha, NB 68183	(402) 444-5380
Nevada	UBC amend	NEC	NFPA 101 refr	Bruce Nipp, St Public Works Bd, Capitol Complex 505 E King St, Carson City, NV 89710	(702) 687-3981
Las Vegas	UBC amend	NEC amend	NFPA 101	John Tucker, Director Building and Safety, 400 E Stewart Av, Las Vegas, NV 89101	(702) 229-6251
New Hampshire	NBC	NEC	NFPA 101 amend	State Fire Marshal, Dept of Safety, 10 Hazen Dr, Concord, NH 03305	(603) 271-3294
New Jersey	NBC	NEC	None	Dept Comm Affrs, Div of Housing and Devel, 101 S Broad St, CN 802, Trenton, NJ 08625	(609) 292-7899
New Mexico	UBC amend	NEC amend	none	R. Pacheco, act. Bureau Chief, Electrical Bureau, 725 St. Michael's Dr, Santa Fe, NM 87504	(505) 827-7036
Albuquerque	UBC amend	NEC amend	None	D Steele, Ch Bldg Official, Codes Administration, 600 2nd St NW, Albuquerque, NM 87102	(505) 764-1626
New York	U Fire & Bldg	U Fire & Bldg	U Fire & Bldg	Carl Sager, Director, Codes Division, Dept of State, 162 Washington AV, Albany, NY 12231	(518) 474-4073
Buffalo	NY Fire & Bldg	NEC	NY Fire & Bldg	David Pierowicz, Ch Elect Inspector, City Hall, Rm 601, 65 Niagara Sq, Buffalo, NY 14202	(716) 851-5902
New York City	NY City Bldg	NY City Elect	None	M Kahme, PE, Dir, Bur of Elec Contr, Rm 2337 Mun Bldg, 1 Center St, New York, NY 10007	(212) 669-8338
North Carolina	SBC amend	NEC amend	None	Alan Barringer, Ch Elect Engr, Dept of Insurance, 410 N Boylan Av, Raliegh, NC 27611	(919) 733-3901
North Dakota	UBC	NEC suppl	NFPA 101	Richard Haman, Exec Dir Electrical Board, 721 Memorial Highway, Bismark, ND 58504	(701) 224-2822

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Ohio	NBC amend	NEC amend	None	Elmer Waltz, Div of Factory Bldg Insp, 2323 W 5th Av, PO Box 825, Columbus, OH 43216	(614) 644-2622
Cincinnati	NBC amend	NEC suppl	NFPA 101	Bob Lack, Ch Elec Insp, Dept Bldg & Insp, City Hall, Rm 316, Cincinnati, OH 45202	(513) 381-6080
Cleveland	NBC amend	NEC suppl	None	Marion Long, Ch Insp, Div of Bldg and Housing, 601 Lakeside Av, Cleveland, OH 44144	(216) 664-2285
Columbus	NBC amend	NEC amend	NFPA 101 amend	Dan Benninger, Ch Elec Insp, Regulation Div, 1250 Fairwood Av, Columbus, OH 43206	(614) 645-6076
Oklahoma	NBC	NEC	NFPA 101 amend	Office State Fire Marshal, 4545 N Lincoln Blvd, Suite 280, Oklahoma City, OK 73105	(405) 524-9610
Oklahoma City	NBC amend	NEC amend	NFPA 101	RL Hood, Supt Insp Serv, Public Works Dept 200 N Walker Av, Oklahoma City, OK 73109	(405) 297-2948
Oregon	UBC amend	NEC amend	None	Junior Owings, Ch Elect Insp, Bldg Codes Div, 1535 Edgewater St NW, Salem, OR 97310	(503) 373-7509
Pennsylvania	None	None	State	Director, Bur Occup. & Industrial Safety, Rm 1529 7th & Forester St, Harrisburg, PA 17120	(717) 787-3323
Philadelphia	NBC amend	NEC amend	None	Sup Elect Unit, Dept of Lic & Inspec, 1600 Arch St, Room 549, Philadelphia, PA 19103	(215) 686-2513
Pittsburgh	NBC amend	NEC	None	Chief Bur Bldg Inspection, Dept of Public Safety, 200 Ross St, Pittsburgh, PA 15220	(412) 255-2176
Rhode Island	NBC amend	NEC amend	None	J Cirillo, Commissioner, State Bldg Comm, 1 Capitol Hill, 2nd Floor, Providence, RI 02908	(401) 277-3529
South Carolina	SBC	NEC	None	Director, Building Code Council, 1201 Main St, Suite 820, Columbia, SC 29201	(803) 737-0568
Charleston	SBC	NEC	None	Building & Fire Official, 701 E Bay St, Drawer 1412, Charleston, SC 29403	(803) 724-7431
South Dakota	UBC amend	NEC amend	NFPA 101	Exec Dir, State Electrical Commission, 302 S Paunee Ave, Pierre, SD 57501	(605) 773-6213
Tennessee	SBC	NEC suppl	NFPA 101	Elect Sec, Dept of Comm & Ins, Vol Pl, 3rd Fl, 500 J Robertson Pky, Nashville, TN 37243	(615) 741-7170
Memphis	SBC amend	NEC amend	None	Bldg Off, Memphis/Shelby Cnty Code Enfor, 160 N Main St, Rm 750, Memphis, TN 38103	(901) 576-5341
Nashville	SBC amend	NEC amend	NFPA 101 amend	Dir, Dept of Codes Adm, Metro Howard Bldg, 700 2nd Av S, Nashville, TN 37201	(615) 862-6600
Texas	None	None	NFPA 101 lmtd	Dept of Lic & Reg, Policy & Stds Div Box 12157, Capitol St, Austin, TX 78711	(512) 463-7356
Dallas	UBC amend	NEC amend	None	Economic Dev Dept, Bldg Inspection Div, 320 E Jefferson Blvd, Room 105, Dallas, TX 75203	(214) 948-4480
El Paso	SBC amend	NEC amend	NFPA 101	Ch Electrical Inspector, Public Inspection Dept, 2 Civic Center Plaza, El Paso, TX 79901	(915) 541-4900
Ft. Worth	UBC amend	NEC amend	None	Asst Dir/Bldg Official, City Dept of Devel, 1000 Throckmorton St, Ft. Worth, TX 76102	(817) 871-7821
Houston	UBC amend	NEC suppl	None	Dept Public Works, Codes & Standards Group, PO Box 1562, Houston, TX 77251	(713) 754-0004
San Antonio	UBC amend	NEC amend	NFPA 101	Dir, Bldg Insp Dept, 506 Delorosa St, (Zip 78294) PO Box 83996, San Antonio, TX 78283	(210) 299-8232
Utah	UBC amend	NEC	NFPA 101 Ltd	Dept of Commerce, Div of Occup & Prof License, PO Box 45802, Salt Lake City, UT 84145	(801) 530-6731
Salt Lake City	UBC amend	NEC	None	Sr Elect Inspector, Building & Housing Services, 451 S State St, Salt Lake City, UT 84111	(801) 535-7752
Vermont	NBC amend	NEC state	NFPA 101 amend	Ch Electl Insp, Dept of Labor and Industry, National Life Bldg, Dwr 20 Montpelier, VT 05620	(802) 828-2106
Virginia	NBC amend	NEC amend	None	Assoc Dir, Code Enforc Office, Div of Bldg Regulation, 501 N 2nd St, Richmond, VA 23219	(804) 371-7160
Washington	UBC amend	NEC+State	None	Ch Elect Inspector, Div of Bldg & Constr Safety Services, PO Box 44460, Olympia, WA 98504	(206) 586-0486
Seattle	UBC amend	NEC amend	None	Prin Engr, Dept of Construction & Land Use, 710 2nd Av, Suite 700, Seattle, WA 98104	(206) 233-3892
West Virginia	NBC amend	NEC amend	NFPA 101 amend	Deputy State Fire Marshal, State Capitol, 2100 Washington St, Charleston, WV 25305	(304) 558-2191
Wisconsin	State BC	NEC amend	None	Div of Safety & Bldgs, PO Box 7969, 201 E Washington Av, Madison, WI 53707	(608) 266-3080
Milwaukee	Milwaukee BC	NEC suppl	None	Commissioner, Dept of Bldg Insp, 841 N Broadway Av, MB 1001, Milwaukee, WI 53202	(414) 278-2542
Wyoming	UBC	NEC	None	Dept Fire Prevention & Electrical Safety, 1 W 25th St, Cheyenne, WY 82002	(307) 777-7119

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Appendix

National Electrical Code (NEC)

Many NEC requirements, important to on-site power, lie buried in articles not obvious by their titles to have relationship to generators. The code does not have an article on portable power sources, yet requirements exist in Articles 210-Branch Circuits, 230-Services, 240-Overcurrent Protection, 250-Grounding and 305-Temporary Wiring. Section 551-7 contains requirements for recreational vehicle mounted power. Article 517 has important requirements for emergency systems in health care facilities.

Since on-site power must be compatible with utility furnished power, many of the requirements of other articles also apply to on-site power. For example Article 250-5 tells what systems must be grounded. These requirements apply, with certain listed exceptions whether the power is on-site or furnished by a utility.

Let us first talk about the four 700 to 705 articles. The on-site power industry has an interest in these articles in their entirety. These articles cover pages 723-737 in the code. No person serious about on-site power should have any difficulty becoming very familiar with these fifteen pages. Certainly no person specifying on-site power can afford not to be familiar with these articles.

Article 700, Emergency Systems

Article 700 has five parts. Most important to the emergency power source are Parts A, General, and C, Sources of Power. The important Part A requirements are:

700-1. Scope. Emergency systems are those needed where a life threatening situation may exist. It may surprise the reader to learn that the NEC does not require

emergency systems. The statement is, "Emergency systems are those systems legally required and classed as emergency by municipal, state, federal or other codes..."

That is not a very strong statement. Emergency systems, per NEC Article 700, are only required if some other code says so. That is why the other columns are in our table 1. The other code will frequently be NFPA 101, The Life Safety Code, which does require emergency lighting for many occupancy types. Where NFPA 101 is not specified, the model building code probably contains a requirement for emergency lighting.

700-4. Tests and Maintenance. (a) Requires witnessed tests upon installation and periodically afterward. (b) Requires periodic testing on a schedule acceptable to the authority having jurisdiction. No recommended period given. (e) Requires testing under maximum anticipated load. That may require auxiliary load banks, if insufficient load exists at the site at the time of the test.

700-5. Capacity and Rating. Allows the alternate power source (usually a generator) to supply other loads, including peak shaving. Requires load shedding or other means to assure adequate power to the emergency loads when needed.

700-6. Transfer Equipment. Requires automatic transfer equipment.

700-7. Signals. Requires audible and visible signals to show (a) derangement of the emergency source, (b) the battery is carrying the load, (c) that the battery charger is not functioning, (d) a ground fault on the system.

Part C. Sources of Power.

700-12. Requires assumption of load within 10 seconds. Permits six choices for

sources of power, only one of which is a generator set. The six sources are:

- (a) Storage battery.
- (b) Generator set.
- (c) Uninterruptible Power Supply.
- (d) Separate Service.
- (e) Connection Ahead of Service Disconnecting Means.
- (f) Unit Equipment.

The requirements for (b) generator set are automatic start, two hour on-site fuel supply (with an exception), automatic battery charger (independent of the engine generator charger) for the cranking battery and 15 minute time delay on shut down.

An important requirement, in light of some recent disasters, is that the equipment shall be designed and located to minimize the hazards that might cause complete failure due to flooding, fires, icing and vandalism. Numerous failures of the emergency system occurred due to these conditions during the great Chicago Flood, the World Trade Center bombing, the fire at One Meridian Plaza in Philadelphia and many others.

Article 701. Legally Required Standby Systems.

Article 701 is similar to article 700 but makes requirements for applications less critical to life. Again the NEC itself does not require standby systems. It only outlines the requirements if some other authority specifies a standby system. This may include illumination or power. The article does not give any hint of typical applications. The requirements are somewhat less stringent than those for Article 700. Article 701-8, Signals, does not require indication of ground faults. 701-11 allows 60 seconds to start in place of the 10 seconds start required by 700-12.

A major difference between Article 700 and 701 is that 701 does not require standby circuits to be in separate raceways.

Article 702. Optional Standby Systems.

Article 702 covers only one page. It states that it covers standby systems intended to protect private property where life safety does not depend upon the performance of the system. A fine print note lists typical installations as industrial and commercial buildings, farms and residences. The note specifically mentions heating and refrigeration, data processing and communication systems, and industrial processes. The article thus has a very wide area of use.

The requirements are minimal. The equipment shall simply have capacity to supply the loads intended to be operated at one time. It does require a transfer switch. The article does require signals, where practicable, for showing derangement of the source and that the optional source is carrying the load.

Article 702 does not require any testing or keeping of records at installation or periodically afterward. Only permanently installed equipment applies. As we said earlier, it does not apply to portable generator sets. Trailer mounted sets, brought to the site when needed, do not fit the categories of Articles 700, 701 or 702.

Article 705. Interconnected Electric Power Production Sources.

Article 705 was new in the 1987 NEC. The increasing use of cogeneration plants paralleled with a utility source made it mandatory to include safety requirements in the code. The article was very controversial when first written but NFPA received no significant proposals for changes for the 1990 code or the 1993 code.

Interconnecting power systems presents some difficult problems. Where in a building is it safe to interconnect the sources? How do you separate the sources when the major one fails? How do you provide for safety to linemen against unexpectedly energized lines? What are necessary requirements for compatibility? From the standpoint of a safety code, how do you provide reasonable requirements for systems as diverse as a small wind generator and a large industrial steam system?

The requirements of Article 705 are minimal. The article does not answer all of the above questions nor is it its purpose to do so. However, it does outline minimal system safety parameters:

705-12. Point of Connection. Requires interconnection at the service disconnecting means. Two exceptions apply. One, if the system qualifies as an integrated electric system and complies with all provisions of Article 685. Two, if the system non-utility sources total more than 100kW or more than 1000 volts. The second exception also requires assured maintenance and supervision and protective safeguards.

705-22. Disconnect Device. Requires an accessible disconnecting means for each power source. (Utilities may require that this device be accessible to linemen and may require that the on-off position of the device be visibly verifiable.)

705-40. Loss of Primary Source. Requires that upon loss of the primary power source the on-site source automatically disconnect from the primary source. It shall also not reconnect until the primary source returns. (Note, where the load remaining on the on-site source is larger than the source, this is simple. Where the load remains within the capability of the on-site source, the loss of the primary source

can be difficult to detect. Nevertheless the requirement is vitally necessary.)

Article 445. Generators.

Article 445 has few if any requirements that most generator manufacturers do not meet with a standard product. It has the usual requirements for enclosure, protection of live parts and nameplate markings. It does require overcurrent protection but allows a wide choice of methods including inherent protection. The only requirement that we have heard widely debated is 445-5, Ampacity of Conductors. That section permits unprotected generator lead conductors to the first overcurrent device, providing the leads are sized for 115% of generator rating. Many inspectors feel that this is too lenient. However, the panel responsible has consistently refused to make a change.

Other Articles

A few other questions constantly arise concerning on-site power applications. The answers frequently lie buried in other articles, many times in an exception.

250-6. Portable and Vehicle Mounted Generators. It is frequently not practical to ground portable generators to earth. This section permits the generator frame or the vehicle frame to serve as ground. As with any other system the generator or vehicle system must have an equipment ground system connected to the frame. The code limits such use to receptacles mounted on the generator or equipment or receptacles mounted on the vehicle. If a portable generator serves as the electrical supply to a building, the system must have an earth ground.

305-6(a) Ground Fault Circuit-Interruption (GFCI). Temporary wiring requires GFCI for receptacles. The

exception however exempts portable or vehicle mounted generators not more than 5kW, provided both lines are insulated from the frame and all grounded surfaces. As before the system must have an equipment ground. Some authorities including some generator set manufacturers question the safety of an ungrounded system, however this section permits it. Some time ago we had occasion to investigate this system for a client and concluded that it was safe. Before a shock can occur three failures have to occur:

One-The equipment ground system must fail.

Two-An insulation failure to ground must occur.

Three-The person must somewhere touch a live conductor on the other side of the line. That gives a very high level of safety.

250-5(d). Separately Derived System. This section requires grounding a separately derived system meeting the requirements of 250-5(b). A generator may or may not be a separately derived system. A fine print note explains that an on-site generator is not separately derived if the neutral is solidly interconnected to a service-system supplied neutral. Such generators should not be separately grounded. Other generators are separately derived and must be grounded if they can be grounded at 150 volts or less to ground or supply 480/277 volts.

517-65(b). Requires the alternate source of power to be a generator set located on the premises. In this case the NEC does not depend on any other code to require an emergency system and a generator set. Similar requirements are in other sections of Article 517 for other health care facilities.

Strictly speaking, Articles 480-Storage Batteries and 690-Solar Photovoltaic Systems also concern on-site power sources.

We will not try to cover those articles. Those systems are outside the scope of this publication.

NFPA 101, The Life Safety Code

The Life Safety Code, NFPA 101 is a large code of approximately 300 pages and 32 chapters. The first seven chapters contain general requirements. The chapter of greatest interest to the on-site power industry is Chapter 5, Means of Egress. Section 5-9 outlines the general requirements for emergency lighting. 5-9.2.1 requires emergency illumination for a period of 1 1/2 hours. Illumination must be an average of 1 footcandle and a minimum of .1 footcandle. Illumination may decline to .6 and .06 at the end of the 1 1/2 hours. The section refers to NFPA 110 for installation, testing and maintenance of the generator set.

The standard mentions only emergency lighting and exit signs. (It refers to other standards for fire detection equipment, fire alarms, elevators and escalators. Those standards will frequently call for fire detection, alarms and one elevator to be on the system.)

Chapters 8-30 in their sections ()-2.9 tell whether emergency lighting is required for each specific occupancy. For example in Chapter 10, New Educational Occupancies, Section 10-2.9 requires emergency lighting in all interior stairs, corridors and normally occupied spaces.

In general schools, most health care facilities, places of assembly, correctional institutions, hotels, dormitories, apartment buildings and certain mercantile buildings require emergency lighting of means of egress.

NFPA 110, Emergency and Standby Power Systems

NFPA 110 is the only code specifically written for on-site power systems alone. It gives details that the committee considers necessary for a minimum level of reliability for life safety applications. NFPA developed the standard primarily for the use of specifiers who needed a guide that went beyond the sketchy and scattered requirements in other codes. It includes only the generator set and transfer switch. This standard was in the writing stage for almost ten years. Much controversy accompanied the writing but no important changes have been proposed since the first edition. Users of the standard appear to be satisfied with it.

The emphasis of NFPA 110 is on reliability, performance, thorough testing and maintenance. The NFPA Standards Council has ruled that NFPA 110 is primary to the NEC and NFPA 99 in matters of performance, testing and maintenance. NFPA 110 is much more specific with regard to generator set installations than other codes. It is also much easier to follow than other codes, once you understand the classifications in section 2-3.

Section 2-3. Classifications of Emergency Power Supply Systems (EPSS).

You will find the acronym EPSS (Emergency Power Supply System) used throughout the standard. The standard classifies EPSS's as Types, Classes, Categories and Levels.

Type indicates the maximum time in seconds allowed before the EPSS assumes the load. Thus, for a Type 10, the system must be fully operational within 10 seconds.

Class indicates the minimum time in hours that the EPSS will operate without refueling. Class 2 represents a system designed to operate for 2 hours.

Level defines the importance of the installation to life safety. Level 1 defines requirements for applications where failure could result in serious injury or loss of human life. Level 2 defines applications that are less critical to life. Level 3 refers to all others. No requirements for Level 3 are in the standard. Levels 1, 2, and 3 are roughly equivalent to Emergency, Legally Required Standby, and Optional Standby in the NEC.

Unique to NFPA 110 is the requirement for prototype testing of the level 1 generator set, see paragraph 3-2.1. The supplier must show proof of performance under normal and adverse conditions before installation. Such certification avoids a host of problems often not discovered until the installation start-up or even much later.

For Level 1 the standard requires about a dozen visual safety and shutdown indications at the generator set, see Table 3-5.5.1(d). It also calls for remote audible alarm for any of the conditions. It calls for prealarms where early attention might avoid a system shutdown.

The witnessed acceptance test is very thorough. The system must perform all functions with results observed and recorded. Paragraph 5-13.2.5 calls for a two hour full nameplate kW load test. The test need not be at rated power factor if the factory test was at rated power factor. Immediately after the load test and a five minute cooldown the system must demonstrate that it can pick up full kW load in one step.

Attention, also, needs to be called to the appendix material. The information on maintenance, operation and testing is particularly helpful.

NFPA 99, Health Care Facilities

A few years ago NFPA combined a number of health care standards into one large code. Few changes in requirements took place but the texts disappeared into chapters of the Health Care Facilities Code. The well known NFPA 76A became essentially Chapter 3, Electrical Systems, of the new code. As the little ^x superscripts in NEC Article 517 show, NFPA 99 is primary to the NEC in relation to performance, maintenance and testing. With regard to the emergency system, however, NFPA 99 is primary only on the load side of the transfer switch. NFPA 110 is primary for the generator set and transfer switch. When you want to know what equipment goes on emergency circuits in various health care facilities, NFPA 99, Chapter 3, is the authority.

NFPA 20, Centrifugal Fire Pumps

NFPA 20 is very different from the usual minimum safety standard issued by NFPA. The fire pump committee prefers not to have any overcurrent protection in the fire pump circuit feeders. An exception does allow short circuit protection but must not open the circuit on locked rotor current. We recommend the inclusion of short circuit protection. Lack of it could cause failure of the entire emergency system. The interest of the on-site power industry lies with the power supply, Chapter 6 and the fire pump controller and transfer switch, Chapter 7. A fire pump must have a dedicated circuit and transfer switch. Until the 1987 revision the standard required the transfer switch to be a part of the fire pump controller. The present standard permits a separate transfer switch. The designer of such systems must give careful attention to meeting service rating and fault current requirements.

NFPA 37, Stationary Combustion Engines and Gas Turbines

NFPA 37 concerns installation of engines. It is important because it is the source for details of stationary engine installations. Other standards frequently reference it. NFPA 99 references NFPA 37 in the text and NFPA 110 references it in the appendix. Textual references make the standard mandatory. Appendix references are for information.

Chapter 2 gives requirements for mounting, locating and housing engines. Persons quoting generator sets requiring conformity with NFPA 37 should be aware of Par. 3-3.1(b) and (f). These often overlooked clauses requires lubricating oil overtemperature shutdown (b) or indication (f) for engines over 100 horsepower.

NFPA 37, Chapter 5, is the reference for liquid fueled engine fuel tank and day tank installations. This chapter gives some details, such as a table for day tank steel thickness, but frequently in turn references NFPA 30, Flammable and Combustible Liquids Code. Chapter 4 does the same thing for gas fueled engine and references NFPA 54, National Fuel Gas Code and NFPA 58, Standard for Storage and Handling of Liquefied Petroleum Gases.

Chapter 6 covers exhaust piping and chimneys. It gives details for safe exhaust piping routing and installation. Examples are material of wrought iron or steel and drains for low points in the line. For chimneys the standard references NFPA 211, Standard for Chimneys, Fireplaces, Vents and Solid Fuel Burning Appliances.

NFPA 37 has only seven pages of text but be especially aware of Chapter 10, Mandatory Referenced Publications. The 13 mandatory referenced standards could keep the designer checking for days.

**NFPA 30, Flammable and Combustible
Liquids Code**

NFPA 54, National Fuel Gas Code

**NFPA 58, Standard for Storage and
Handling of LPG**

These three fuel codes are probably not well known in the on-site power industry. Nevertheless they are extremely important. Of all the safety codes these are some of the most necessary. They rank with the NEC in their importance in saving lives. It is important that installations follow the safe practices that they have developed.