Best Practices for Specifying Emergency Power Systems

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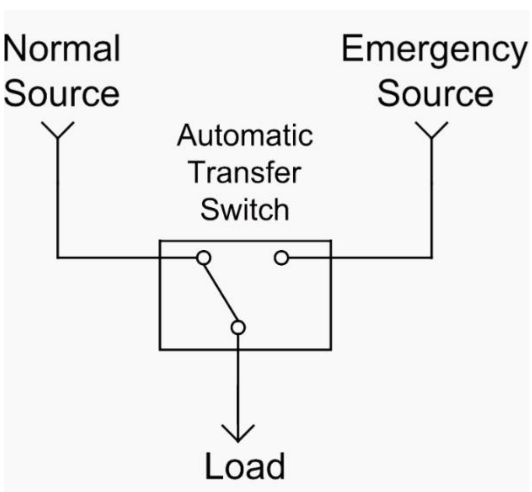
Yancey Power Systems



Agenda:

1. The Importance of Specific Emergency Power Specifications
2. Best Practices for being Specific in Emergency Power Specifications
3. Upcoming Trends in Emergency Power Specifications

Sizing

Codes (ISO, NEC, UL, NFPA, IBC, ASCE, OSHA, IEEE, etc.)

Application & Installation

Paralleling Solutions

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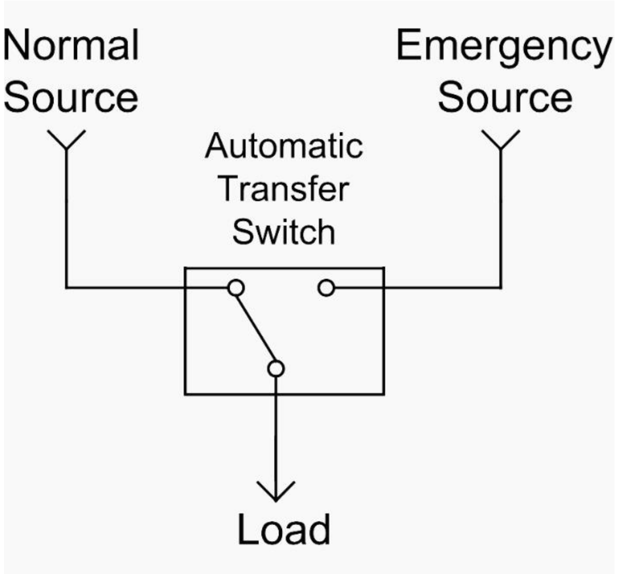
The Importance of Specific Emergency Power Specifications



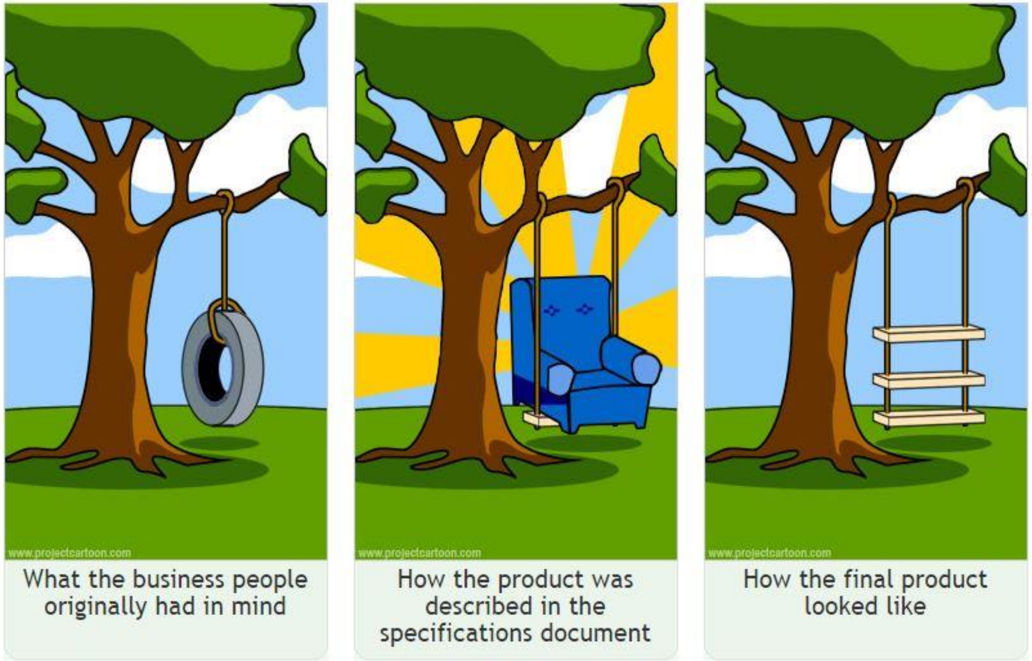
The Importance of Specific Emergency Power Specifications

"WHATEVER THE HECK IT IS,
IT WAS BUILT EXACTLY TO SPECIFICATIONS."

The Importance of Specific Emergency Power Specifications

"Specification" Definition:

1. An act of describing or identifying something precisely or of stating a precise requirement
2. A detailed description of the design and materials used to make something.
3. A standard of workmanship, materials, etc., required to be met in a piece of work.



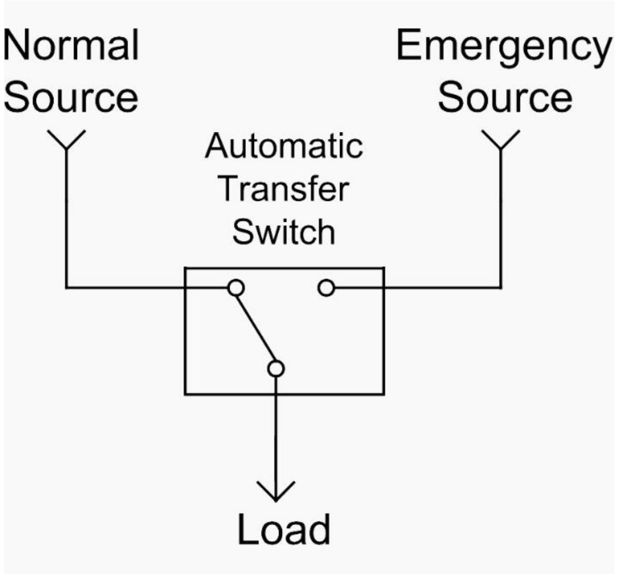
The Importance of Specific Emergency Power Specifications

Some of the Issues Caused by Non-Specific Specifications:

1. Specifications have a significant impact on the Project Budget, Timeline, and overall Performance
2. Specifications have impact on the specific Equipment quoted on the Project and which Vendor may be ultimately Chosen
3. Specifications can make Positively & Negatively affect the timeliness of the Submittal Process.

The More Specific the Specification, the Less Specification Interpretation …. The More the Engineer & Owner get what they Designed

Best Practices for being Specific in Emergency Power Specifications



Best Practices for being Specific in Emergency Power Specifications

Where do most Specifications Come From:

1. Engineering Firm Developed - Typically the Most Specific
2. MasterSpec - Typically the Most General, Over Specified, and/or Unedited
3. Equipment Supplier/Manufacturer - Typically the Most Proprietary :)

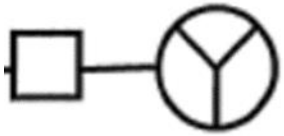
Generator Cooling System Specification – Best Practice:

2.05 COOLING SYSTEM

A. A radiator with blower type fan shall be provided to maintain safe operation at 110 degrees F. ambient temperature. Air flow restriction from the radiator shall not exceed 0.5" H20. Provide ductwork with flexible connecting section between radiator and discharge louver frame. Provide an engine coolant heater with thermostat to maintain coolant temperature at not lower than 60 degrees F. Heater shall operate on 120 VAC. Heater shall have an oil pressure disconnect to turn heater off when engine is operating.

C. The engine shall be liquid-cooled by Unit Mounted Radiator 122°F/50°C.

C. The enclosures shall allow the generator set to operate at full load in an ambient of 40°C - 45°C with no additional derating of the electrical output.



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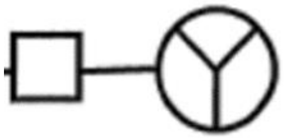
Generator Cooling System Specification – Best Practice:

Specification Concerns:
Multiple Ambients and no Altitude Specified

A Recommended Cooling Specification needs to Include:

1. Specific System Ambient and Altitude: The cooling system shall be sized to cool the engine continuously while operating at full rated load and at site conditions based on a site air flow restriction of 0.5”, a minimum ambient temperature of 104 degrees F & 1000 ft. altitude. Any required de-rations of the radiator resulting from placing the genset inside the specified enclosure or inside a building, shall be taken into consideration by the system supplier



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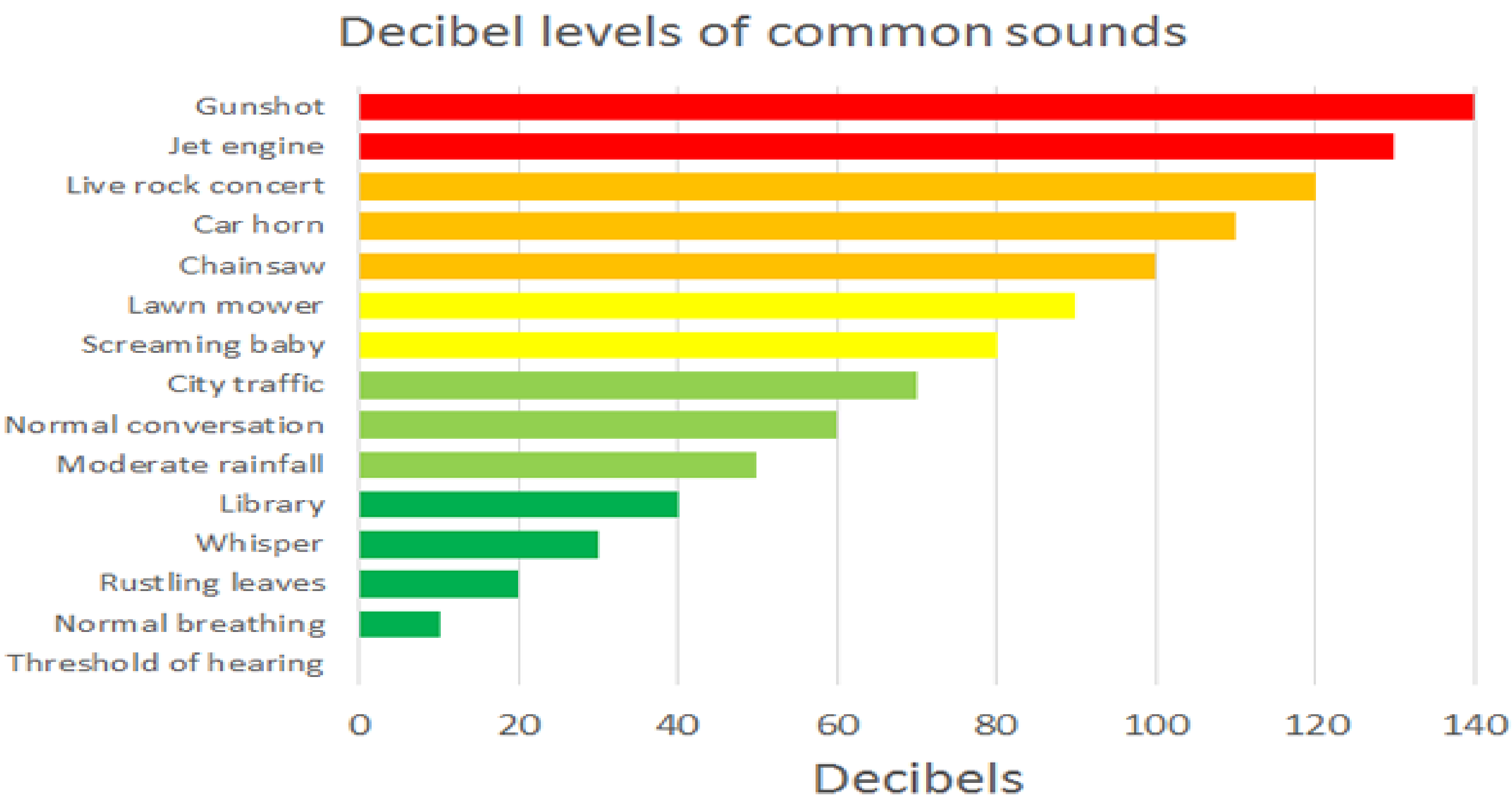
Generator Sound Specification – Best Practice:



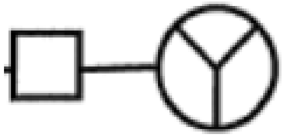
Generator Sound Specification – Best Practice:

2.07 SOUND-ATTENTUATED ENCLOSURE **(CHOOSE OPTION)**

A. All enclosures are to be constructed from high strength, low alloy steel, aluminum or galvanized steel.

B. The enclosure shall be finish coated with powder baked paint for superior finish, durability and appearance. Enclosures will be finished in the manufacturer's standard color.

10. Noise Level Tests: Measure A-weighted level of noise emanating from generator-set installation, including engine exhaust and cooling-air intake and discharge, at [**four**] <**Insert number**> locations [**on the property line**] <**Insert location for measurement**>, and compare measured levels with required values.



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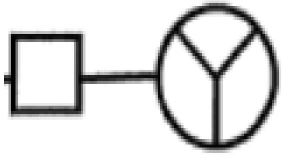
Generator Sound Specification – Best Practice:

Specification Concerns:
No dBA Level, Distance, or Load Specified

There are no Sound Level Standards for Emergency Generators

A Recommended Sound Specification needs to Include:

1. Specific Sound Level & Generator Load: Ex. 75 dBA @ 23’ in a Free Field Environment at 100% Generator Rated Load
2. Most Generator installations are not in a free field environment. Do not recommend site sound testing.



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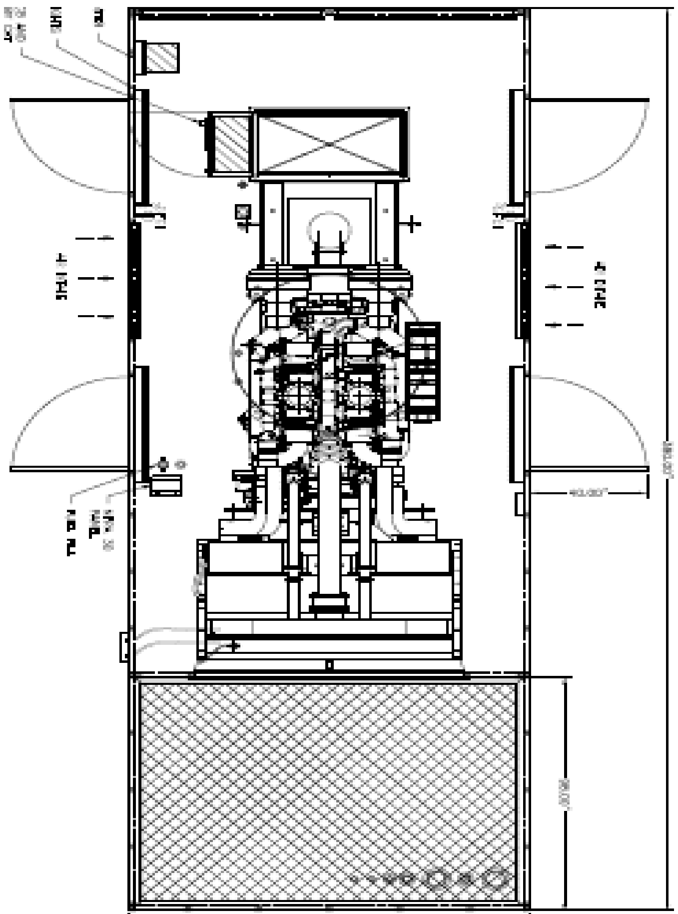
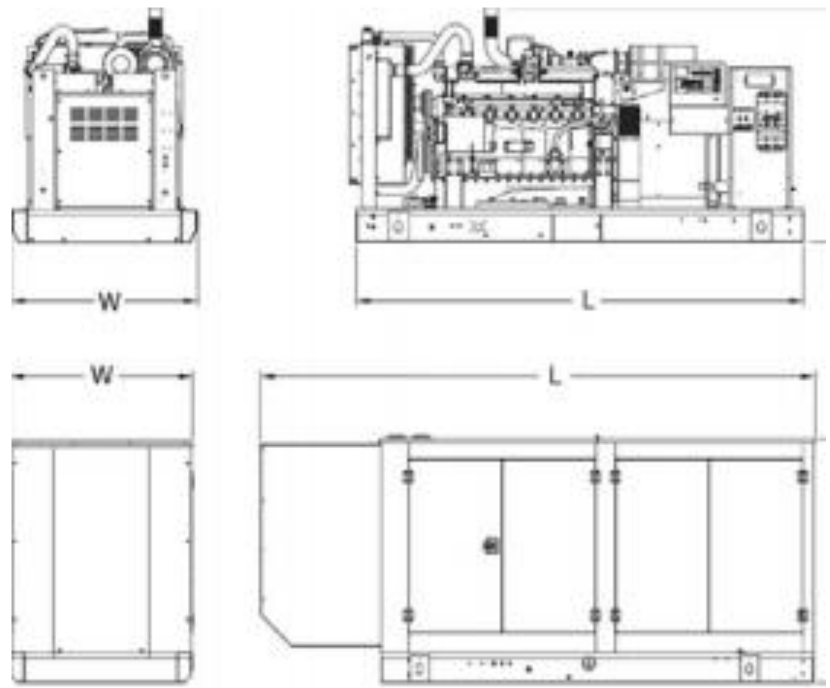
Generator Enclosure System Specification – Best Practice:

L. Walk in enclosures shall be provided with lighting and convenience outlets connected to a load center mounted within the enclosure. All miscellaneous generator equipment requiring electrical circuits shall be connected to this panel. Receptacle outlets shall be weatherproof–while–in–use and GFI protected. The light switch for the lighting fixtures shall be mounted on the interior strike side of the entry door and shall be weatherproof.

Generator Enclosure System Specification – Best Practice:



Walk In Style



Reach In or Skin Tight Style

Generator Enclosure System Specification – Best Practice:

Specification Concerns:
No specifics on definition of Walk In

There are no Enclosure Style Standards for Emergency Generators

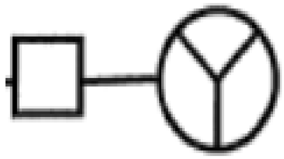
A Recommended Enclosure Specification needs to Include:

1. Provide “Reach In” or “Skin Tight” Style enclosure that allows the maintenance of components while standing outside the enclosure.
2. Provide a “Walk In” Style enclosure that allows maintenance of components while standing inside the enclosure. Clearance between Generator & interior Enclosure wall shall be a min. of 12 - 36”.

Generator Circuit Breaker Specification – Best Practice:

2.12 MAIN LINE CIRCUIT BREAKERS

A. Provide main-line, molded case circuit breakers sized as shown and mounted upon the generator. The outputs of the generator shall be protected by load circuit interrupting and protection devices. They shall operate both manually for normal switching functions and automatically during overload and short-circuit conditions.



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Generator Circuit Breaker Specification – Best Practice:

Specification Concerns:
No Trip Type, 80 or 100% Rating, GFI, or KAIC Specified

A Recommended Circuit Breaker Specification needs to Include:

1. Provide Generator Mounted "UL Listed Molded Case, Electronic Trip Type, 100% rated, complying with UL 489 per Amp Rating Shown on Drawings
2. If Ground Fault Indication or Trip is required, this should be specified
3. If a specific breaker KAIC rating is required, this should be specified

Generator Diesel Fuel System Specification – Best Practice:

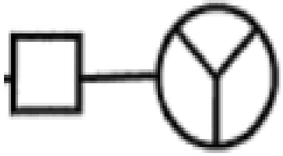
B. Sub-base Diesel Fuel Storage Tank: The storage tank shall be an integral part of the sub-base with enough capacity to operate the generator for at least 24 hours. The tank shall be full capacity double containment within the housing made of heavy gage stainless steel. The tank shall not be galvanized. There shall be a float type fuel level gauge, tank, breather filter unit, and a filler neck with locking cap.

Generator Diesel Fuel System Specification – Best Practice:

Specification Concerns:
No Generator Load Specified

A Recommended Enclosure Specification needs to Include:

1. Provide "Base Tank Capacity sized to run Generator for 24 Hours at 100% Generator Rated Load"
2. For Large Capacity Base Tanks, 72 Hours+, may require Specifying Stairs/Platform to meet NEC access requirements



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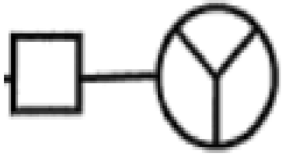
Generator Diesel Fuel System Specification – Best Practice:

Specification Concerns:
Not including or including Fuel Requirements for: NFPA 30 & 37, GEFA, Cobb County, &/or City of Atlanta

A Recommended Enclosure Specification needs to Include:

1. Listing the Fuel Requirements in Specifications that are Required for NFPA 30, 37, GEFA, Cobb County, &/or City of Atlanta



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Generator NFPA 110 Specification – Best Practice:

1.4 SYSTEM DESCRIPTION

A. Engine generator system to provide source of emergency and standby power.

B. System Capacity: As shown on drawings at an elevation of 1,000 feet above sea level, and ambient temperature between -20°F and 122°F; standby rating using engine-mounted radiator.

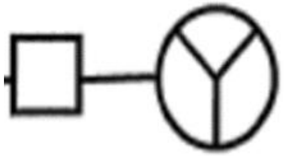
C. Operation: In accordance with NFPA 110.

Generator NFPA 110 Specification – Best Practice:

Specification Concerns:
Missing Level 1 or Level 2 & Type 10 or Type 60

A Recommended Alternator Specification needs to Include:

1. "Generator Set shall be a complete power system (EPSS) that meets NFPA 110, Level 1, Type 10 Requirements.
2. Not an issue for most Diesel Fueled Generators
3. With Growing Natural Gas Generator applications, important to include in all Natural Gas Standby specifications



Generator Alternator Specification – Best Practice:

Load acceptance shall be 100% of nameplate kW rating and meet the requirements of NFPA 110. The engine-generator set shall be so designed that instantaneous voltage dip upon application of nameplate kW/kVA shall not exceed 30% with recovery to stable operation within 10 seconds. Sustained voltage dip data is not acceptable.

Generator Alternator Specification – Best Practice:

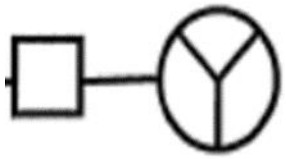
Specification Concerns:
Does not include a specific Load or Design SKVA

A Recommended Alternator Specification needs to Include:

1. "Alternator shall have a SKVA capability of XXX SkVA at a Maximum xx% Voltage Dip at rated Power Factor and Voltage.

Generator Alternator Specification – Best Practice:

C. Insulation shall be Class H, 105 degrees C rise according to NEMA standards. All windings and coils shall have an additional treatment of three (3) coats of varnish to prevent fungus growth.



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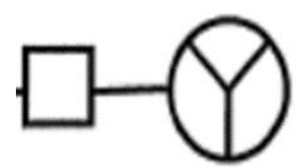
Generator Alternator Specification – Best Practice:

Specification Concerns:
105 C Temp Rise on a Standby Generator

A Recommended Alternator Specification needs to Include:

Table 3 — Maximum Temperature Rise (40 °C ambient)

CONTINUOUS				
	Class A	Class B	Class F	Class H
Temp. °C	60	80	105	125
Temp. °F	108	144	189	225
STANDBY				
	Class A	Class B	Class F	Class H
Temp. °C	85	105	130	150
Temp. °F	153	189	234	270



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Automatic Transfer Switch Specification – Best Practice:

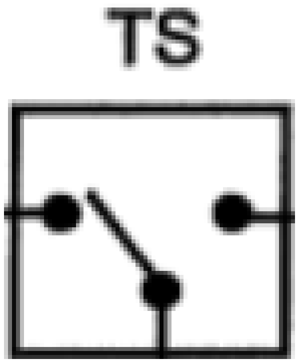
D. Automatic Open-Transition Transfer Switches: I
closed on both sources at the same time.

1. Sources shall be mechanically and electricall
on the load at the same time.

E. Automatic Delayed-Transition Transfer Switches:
momentarily disconnect both sources, with trar
automatic transfer-switch controller. Interlocked tc
sources at the same time.

1. Adjustable Time Delay: For override of nor
and engine start signals for alternative sourc
factory set for one second.
2. Sources shall be mechanically and electricall
on the load at the same time.
3. Fully automatic break-before-make operatior
4. Fully automatic break-before-make operatio
zero phase difference.

F. Automatic Closed-Transition Transfer Switches: (
Transition is controlled by programming in the autc



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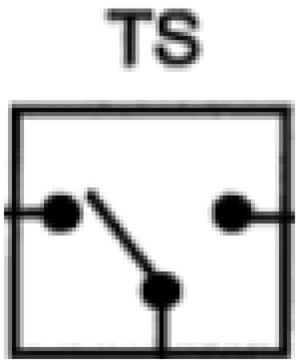
Automatic Transfer Switch Specification – Best Practice:

Recommended Transfer Switch Specification needs to include:

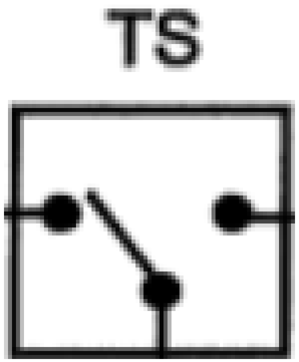
1. Transfer Switch Operation: Manual or Automatic
2. Transfer Switch Style: Standard, Service Entrance Rated, or Bypass Isolation
3. Transfer Switch Transition: Open, Delayed, or Closed
4. Number of Poles: 2, 3, or 4 & should 4^{th} pole be Switched or Overlapping



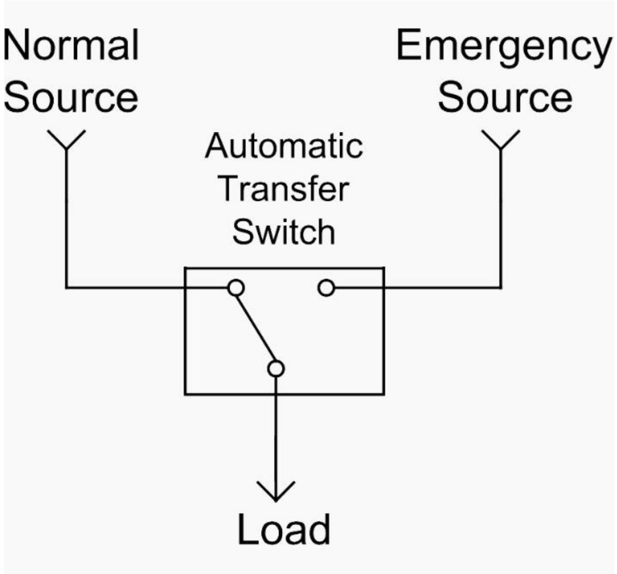
Automatic Transfer Switch Specification – Best Practice:

Recommended Transfer Switch Specification needs to include:

1. NEMA Type: 1, 3R, 12, 4X, etc.
2. KAIC Rating (Specific Breaker or Any Breaker)
3. Utility & Emergency Sensing: 1 or 3 Phase
4. Programmable Engine Exerciser



Upcoming Trends in Emergency Power Specifications



Upcoming Trends in Emergency Power Applications:

1. Communications:
   a. Practical Design is moving into the IOT World

2. Engineering Software Design Tools
   a. Need to be more Intuitive & Easier to Use (Like a Phone App)

3. Fuel Type
   a. Continued Growth of Natural Gas Generator Applications

Upcoming Trends in Emergency Power Applications:

4. Codes, Codes, & More Codes
   a. 700.3(F) is a new provision in NFPA's 2017 NEC for legally required systems. It requires provisions to be able to connect a temporary source of power for emergency systems which rely on a single alternate source of power which will be disabled for maintenance or repairs.

Continued Industry Education is Key to our Future!

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Thank You!

Questions & Answers