

**1.0 Introduction:**

Large to small construction projects require on-site electrical power for electrically powered pieces of equipment. In some cases electrical power is already available on-site from the utility, but in many cases utility power is not connected until the later stages of a project and on-site power is delivered by mobile generator systems.

*This Information Sheet discusses the type of generator systems used on construction sites, the various specifications, ratings, and codes applying to generators used in construction.*

### Construction Application Specifications

|               |   |
|---------------|---|
| Ratings       | Prime power ratings to manage continuous loads                  |
| Fuel          | Primarily diesel above 20kW with some LPG/CNG                   |
| Generator End | PMG to manage high motor load starting requirements             |
| Enclosure     | Weather and sound attenuated enclosures for outside use         |
| Alternators   | In many cases sized to specific high starting kVA requirements  |
| Air Cleaners  | Heavy duty for operating in a dust laden environment            |
| Controls      | Auto start capability. Sometimes for paralleling 2 or more sets |



### Codes & Standards Specific to Healthcare Generator Applications (see details over)

|                                       |   |   |
|---------------------------------------|---|---|
| EPA                                   | Tier 4 for mobile diesel generator sets   |   |
| NEMA                                  | This standard covers switchgear boxes and electrical connections                            |   |
| Local Codes                           | Local codes will cover generator use, sound regulations, and construction site requirements |   |
| UL Codes<br>Underwriters Laboratories | 2200  | This covers entire generator set as a manufacturing standard                      |
|                                       | 142   | Applicable to above ground storage tanks to specify leak containment and spillage |
|                                       | 891   | Safety criteria applicable to electrical switchgear up to 600 volt systems        |
|                                       | 1008  | The standard transfer switches are tested and manufactured to (when ATS fitted)   |
|                                       | 1558  | For low voltage power circuit breakers  |

To fulfill our commitment to be the leading supplier and preferred service provider in the Power Generation Industry, the Nixon Power Services team maintains up-to-date technology and information standards on Power Industry changes, regulations and trends. As a service, our Information Sheets are circulated on a regular basis, to existing and potential Power Customers to maintain awareness of changes and developments in engineering standards, electrical codes, and technology impacting the Power Generation Industry.

The installation information provided in this information sheet is informational in nature only, and should not be considered the advice of a properly licensed and qualified electrician or used in place of a detailed review of the applicable National Electric Codes and local codes. Specific questions about how this information may affect any particular situation should be addressed to a licensed and qualified electrician.

## 2.0 Construction Site Generator Specification Requirements:

If there is no utility power available, any generator used on a construction project will be on a temporary basis until the project is completed and/or utility power is connected.

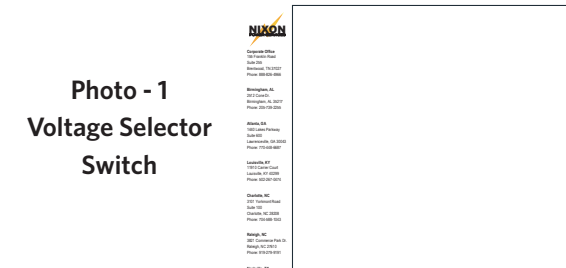
Temporary generator power used on a construction site will have to take account of the following:

- 2.1 Positioning/location** – Temporary generators are brought to site either mounted on a trailer, or a heavy duty base frame suitable for positioning on any level firm service.
- 2.2 Enclosure** – If the generator cannot be positioned under a weather protective canopy, then it is most likely the generator will be mounted in its own weather protective enclosure. If the project is in a noise sensitive area the enclosure will also be sound attenuated. Local ordinances will normally specify the degree of attenuation.
- 2.3 Fuel** – The size of the generator tends to dictate the type of fuel. Many construction projects utilize small portable 3,600 rpm gasoline powered generators up to 20kW. However, units larger than 20kW are mainly diesel powered running at 1,800 rpm. However, LPG and CNG generators are also being offered on mobile generators up to 500kW, but the majority of construction generators above 20kW are diesel fueled.
- 2.4 Fuel Storage** – Most mobile generators are supplied with fuel tanks, and/or gas cylinders already mounted in the generator assembly. Small gasoline generators will have a built in fuel tank. Fuel storage is regulated, particularly with diesel. Generator systems with mounted tanks will have full spill containment double walled fuel tanks built to the applicable codes. Gas storage will also be applicable to local codes for storing compressed gas.  
Most diesel generators are equipped with tanks having the capacity for at least 8-hours operation on average loads. Refueling of generators on large projects is undertaken by the contractor, or the rental company if a rental generator is being used.
- 2.5 Alternator** – In addition to resistive loads such as lights, many construction sites use pieces of equipment with reactive loads such as electric motors. Motor loads need a lot higher amperage to start than run, therefore the alternator on a generator has to be able to absorb high motor starting loads. The generator specification usually includes:
  - PMG (Permanent Magnet Generator) voltage excitation to better voltage regulation with motor loads
  - Brushless 12-wire reconnectable to enable multiple voltage connections for single and three phase

- 2.6 Voltage Selector Switch** – Most rental sets used on a construction site are fitted with a voltage selector switch to provide the user with various the three phase and single phase voltage outputs required by different pieces of electrically power equipment. The lockable switch will be located on the generator complete with outlets for both three and single phase. Voltage selector switches are usually supplied as follows: *(see photo-1 below)*
  - Up to 150kW 3-position selection for 3-phase parallel are series star, and single phase center tapped
  - Above 150kW the 2-position with only the 3-phase voltages to select
- 2.7 Power Distribution** – In many cases the rental company will supply electrical distribution panels with the generator supplying the various site loads through the panel. The distribution panel will have the required single or three phase outlets.
- 2.8 Power Rating** – A prime rating is assigned to an application where the generator set is the primary continuous power source. Generators used on construction sites are usually the only source of power, and as such are rated for prime power. A prime power rating means the generator has been rated to run continuously on full load with 10% overload permitted for 1-hour in any 12-hour period of consecutive hours of operation.
- 2.9 Power Connection** – On a construction site the equipment is connected to the load panel via temporary cables suitable for use in a construction environment. Unlike a fixed installation, the cables have to be easily connected and disconnected. A common method is to use “Cam Lock” connectors. *(see photo-2 below)*.
- 2.10 Engine Emissions** – Generators used on a construction site will be subject to the more stringent EPA exhaust emission standards than a fixed stationary standby generator set application that will only run when the utility is off-line or during a test. The latest mobile generator sets, whether on a skid or a trailer, are rated for continuous operation and will have to meet the latest EPA Tier 4 Final emission levels.

## 3.0 Construction Site Codes/Regulations Covering Generator Systems:

There are several codes and regulations covering the use of generator systems on a construction project. Some of these codes are set by national bodies, and others are regional and local to the area. *(See chart page-1 for details)*



**Photo - 1**  
**Voltage Selector**  
**Switch**



**Photo - 2**  
**Distribution Panel and**  
**Cam Lock Connections**

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