The Empire District Electric Company

Requirements For Standby Generators

SERVICES YOU COUNT ON

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The latest revision of this book can be found at www.empiredistrict.com under the “Customer Service” tab.

Effective 05/05/2015

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1.0 INTRODUCTION

The Empire District Electric Company constantly strives to maintain a high standard of service to all Customers. This booklet has been prepared for use by Customers, architects, engineers, electrical contractors and local inspecting authorities so they may receive full benefit from our service. Copies are available at the Empire District Electric Company's Corporate office, service centers, and web site. All holders of "Requirements For Standby Generators and Net Metering" booklets are encouraged to submit comments to aid in future revisions. Please submit comments as follows:

1. Give section, paragraph and page number to which the comment pertains.
2. Submit comments in writing; giving details, sketches, drawings, and all supporting pertinent information.
3. Mail, FAX, or Email to:

   THE EMPIRE DISTRICT ELECTRIC COMPANY

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   Joplin MO 64802

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The impression generally prevails that compliance with the National Electrical Code (NEC), or the various electrical ordinances guarantees to the Customer a wiring installation complete and adequate for the full use of electric service now and in the future. This is not necessarily the case. The NEC and these guidelines are designed to provide the minimum requirements considered necessary for safety. **(The 2008 NEC, Article 90.1 B itself states, "Compliance therewith and proper maintenance will result in an installation essentially free from hazard, but not necessarily efficient, convenient or adequate for good service for future expansion of electrical use.")** Careful design and installation often results in a wiring system that exceeds NEC requirements.

THE EMPIRE DISTRICT ELECTRIC COMPANY, as a utility, must meet the requirements of the National Electrical Safety Code (NESC), which sometimes differ from the National Electrical Code (NEC).

The Company shall have the right to disconnect or refuse service to any installation which violates local, municipal, NEC or NESC regulations. The Company shall also have the right to disconnect or refuse service for installations that are hazardous to the public, or negatively impacts service to other Customers, or Company facilities.

Except for the installation and maintenance of its own property, THE EMPIRE DISTRICT ELECTRIC COMPANY does not install or repair wiring or equipment beyond the point of delivery. Therefore, EDE is not responsible for the voltage levels beyond the point of delivery and does not assume any responsibility for Customer facilities beyond the point of delivery. Your cooperation will be greatly appreciated and will enable you to receive prompt and satisfactory service.

2.0 DEFINITIONS

Backfeed	When electric power flows in the opposite direction from it's usual flow.
Company	THE EMPIRE DISTRICT ELECTRIC COMPANY.
EDE	THE EMPIRE DISTRICT ELECTRIC COMPANY.
Generator	A machine that converts mechanical energy into electrical energy.
Open Transition	A double throw switch provides a break before make when transferring from one source to another. A break before make transfer switch breaks contact with one source of power before it makes contact with another.
Transfer Switch	A disconnecting device that allows safe switching from utility power to emergency generator power while maintaining isolation of each source from the other. Can be manually or automatically done.

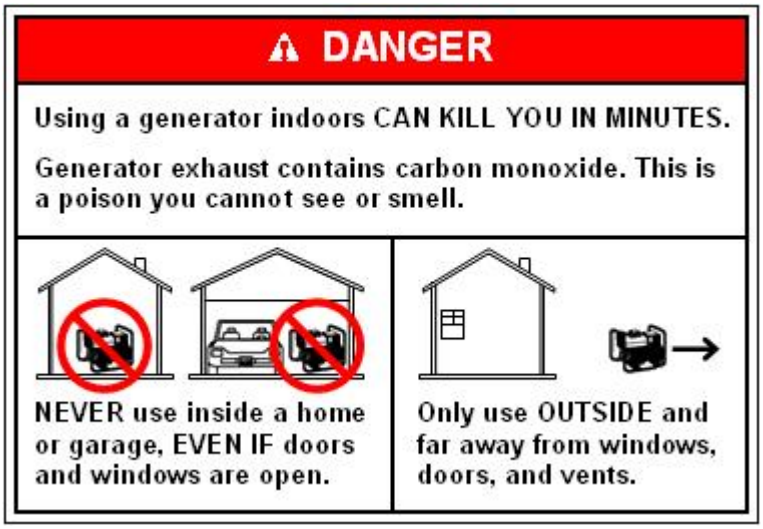
3.0 GENERAL SAFETY

Closed transition upon utility restore switch configurations will not be allowed. This is due to the potential liability that the Company and the Customer may have to other Customers due to damaged equipment caused by improper installation and maintenance that may occur during the life of the device. This is particularly true for installations that do not have a dedicated, licensed electrical maintenance group at the facility.

Portable generators are useful when temporary or remote electric power is needed, but they also can be hazardous. The primary hazards to avoid when using a generator are carbon monoxide (CO) poisoning from the toxic engine exhaust, electric shock or electrocution, fire and burns.
Every year, people die in incidents related to portable generator use. Most of the incidents associated with portable generators reported to Consumer Product Safety Commision (CPSC) involve CO poisoning from generators used indoors or in partially-enclosed spaces.

Carbon Monoxide Hazards

When used in a confined space, generators can produce high levels of CO within minutes. When you use a portable generator, remember that you cannot see or smell CO. Even if you do not smell exhaust fumes, you may still be exposed to CO.



Danger labels are required on all portable generators manufactured or imported on or after May 14, 2007.
If you start to feel sick, dizzy, or weak while using a generator, get to fresh air **RIGHT AWAY. DO NOT DELAY**. The CO from generators can rapidly kill you.

Follow these safety tips to protect against CO poisoning:

- **NEVER** use a generator inside homes, garages, crawlspaces, sheds, or similar areas, even when using fans or opening doors and windows for ventilation. Deadly levels of carbon monoxide can quickly build up in these areas and can linger for hours, even after the generator has shut off.
- Follow the instructions that come with your generator. Locate the unit outdoors and far from doors, windows, and vents that could allow CO to come indoors.
- Install battery-operated CO alarms or plug-in CO alarms with battery back-up in your home, according to the manufacturer's instructions. CO alarms should be certified to the requirements of the latest safety standards (UL 2034, IAS 6-96, or CSA 6.19.01). Test batteries monthly.

To avoid CO poisoning when using generators:

- Never run generators indoors, including garages, basements, crawlspaces and sheds.
- Get to fresh air right away if you start to feel dizzy or weak.

Electrical Hazards:

- Generators pose a risk of shock and electrocution, especially if they are operated in wet conditions. If you must use a generator when it is wet outside, protect the generator from moisture to help avoid the shock/electrocution hazard, but do so without operating the generator indoors or near openings to any building that can be occupied in order to help avoid the CO hazard. Operate the generator under an open, canopy-like structure on a dry surface where water cannot reach it or puddle or drain under it. Dry your hands, if wet, before touching the generator.
- Connect appliances to the generator using heavy-duty extension cords that are specifically designed for outdoor use. Make sure the wattage rating for each cord exceeds the total wattage of all appliances connected to it. Use extension cords that are long enough to allow the generator to be placed outdoors and far away from windows, doors and vents to the home or to other structures that could be occupied. Check that the entire length of each cord is free of cuts or tears and that the plug has all three prongs. Protect the cord from getting pinched or crushed if it passes through a window or doorway.
- **NEVER** try to power the house wiring by plugging the generator into a wall outlet, a practice known as “backfeeding.” This is extremely dangerous and presents an electrocution risk to utility workers and neighbors served by the same utility transformer. It also bypasses some of the built-in household circuit protection devices.

Fire Hazards:

- **Never** store fuel for your generator in the home. Gasoline, propane, kerosene, and other flammable liquids should be stored outside of living areas in properly-labeled, non-glass safety containers. Do not store them near a fuel-burning appliance, such as a natural gas water heater in a garage.
- Before refueling the generator, turn it off and let it cool down. Gasoline spilled on hot engine parts could ignite.

Consumers can obtain this and additional safety information from the Publications section of CPSC's web site or by sending your publication request to info@cpsc.gov or write the U.S. Consumer Product Safety Commission, Office of Information and Public Affairs, 4330 East West Highway, Bethesda, MD 20814.

4.0 GENERATOR SIZING

There are various methods to size a generator to meet the service load. This sizing depends not only on the service load but the starting current required by the various motors served. Another issue in sizing is the requirement of the Authority-Having-Juristiction over the electrical facilities. Their requirements may be quite different than what is put forth in this document or by the NEC. EDE always recommends that the Customer use a qualified licensed electrician to size a generator. The electrician will take all of these factors into consideration in the generator sizing process. However, the worksheet shown below can give some guidance to sizing a Generator.

Please keep these things in mind when using this worksheet:

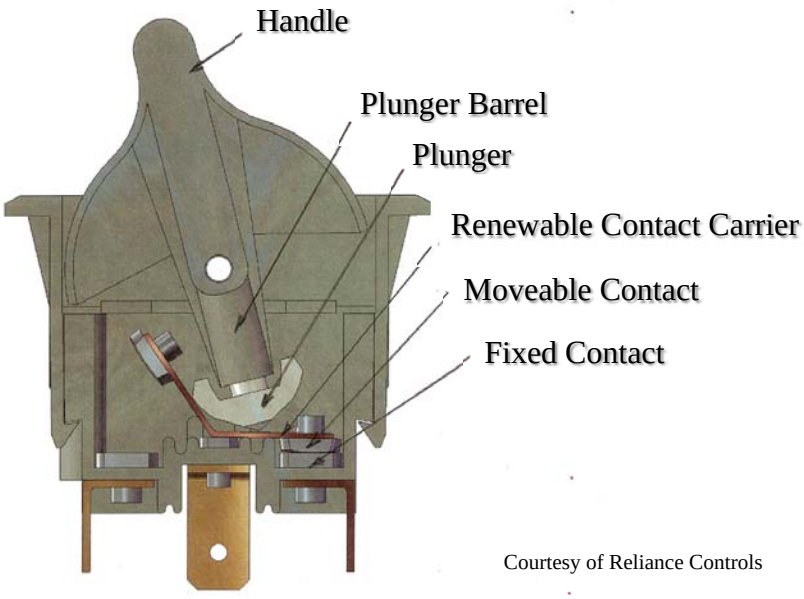
- These are typical load values.
- Actual loads served by the generator may vary from these values.
- For a new installation, the load is determined by NEC Article 220.
- For existing facilities, the NEC Article 220.87 allows the sizing of the service equipment capacity by looking at the maximum demand data for one year or the average power demand of a 15 minute period over a minimum of 30 days. Since the service equipment will be supplied by the Generator, these values can guide you on generator sizing. Unfortunately, in most applications, these values are not available from EDE.
- To guarantee all motor driven equipment will be able to start simultaneously, select from the starting watts column when entering the watts into the "Selected Watts" column. If the loads will be staggered in their starts, the "Running Watts" may be used in the "Selected Watts" column. However it should be noted that under certain conditions motor loads may not start without causing damage to the motor or stalling the generator.
- If a Uninterruptible Power Supply (UPS) system is being used, the watts of the UPS should be multiplied by three in order to account for any harmonic loading produced by the UPS.
- When using an automatic transfer switch, the 2008 NEC Article 702.5(B)(2) requires the generator to have adequate capacity to supply the full load transferred.

APPLIANCE			STARTING WATTS	RUNNING WATTS	SELECTED WATTS
LIGHTING LOAD	Total Square Feet of the House	X		3	
TELEVISION, 27"				500	
REFRIGERATOR/FREEZER			1950	700	
DEEP FREEZER			1200	700	
1/3 HP FURNACE FAN			1600	800	
1/3 HP SUMP PUMP, CODE G			1600	800	
1/2 HP SUMP PUMP, CODE G			3600	1200	
1/4 HP GARAGE DOOR OPERATOR			1200	600	
MICROWAVE OVEN			1500	750	
ELECTRIC WATER HEATER 50 GAL.			5000	5000	
COMPUTER (DESKTOP, MONITOR, LASER PRINTER)			1500	1500	
DISHWASHER (HOT DRY)			1500	1500	
PORTABLE ELECTRIC HEATER			1500	1500	
AIR CONDITIONER 12,000 BTU (1 Ton)			7600	1900	
AIR CONDITIONER 24,000 BTU (2 Ton)			11200	2800	
AIR CONDITIONER 32,000 BTU (3 ton)			14000	3500	
AIR CONDITIONER 48,000 BTU (4 ton)			20000	5000	
1 HP WATER PUMP, CODE G			5760	1920	
2 HP WATER PUMP, CODE G			7500	2500	
1/3 HP WATER PUMP			2000	1000	
3/4 HP WATER PUMP, CODE L			6800	1700	
1-1/2 HP WATER PUMP, CODE L			9600	2400	
1/4 HP ATTIC FAN, CODE G			1200	600	
ELECTRIC CLOTHES DRYER			8000	6000	
GAS CLOTHES DRYER			2100	750	
WASHING MACHINE			1600	800	
ELECTRIC RANGE 6" ELEMENT				1200	
ELECTRIC RANGE 8" ELEMENT				2000	
OTHER					
TOTAL WATTS NEEDED (SUMMATION OF THE RIGHT COLUMN)					

5.0 OPTIONAL STANDBY GENERATORS

5.1 GENERAL

5.1.1 Manual Transfer Switches composed of molded-case breakers or contactors are not acceptable. The switch mechanism shall be designed to provide a positive contact movement and transition. An example of a correctly configured manual switch is shown below



Courtesy of Reliance Controls

5.1.2 The Manual Transfer Switch shall be marked by the manufacturer "suitable for use as service equipment" and have a short circuit fault current rating that matches the maximum fault current available at the metering point. This is shown in Table 1 below.

Transformer Size Serving the House	Maximum Fault Current (A)
10 kVA CSP Transformer	2,719
15 kVA CSP Transformer	4,263
25 kVA CSP Transformer	13,022
50 kVA CSP Transformer	18,065

Table 1 Maximum Fault Current

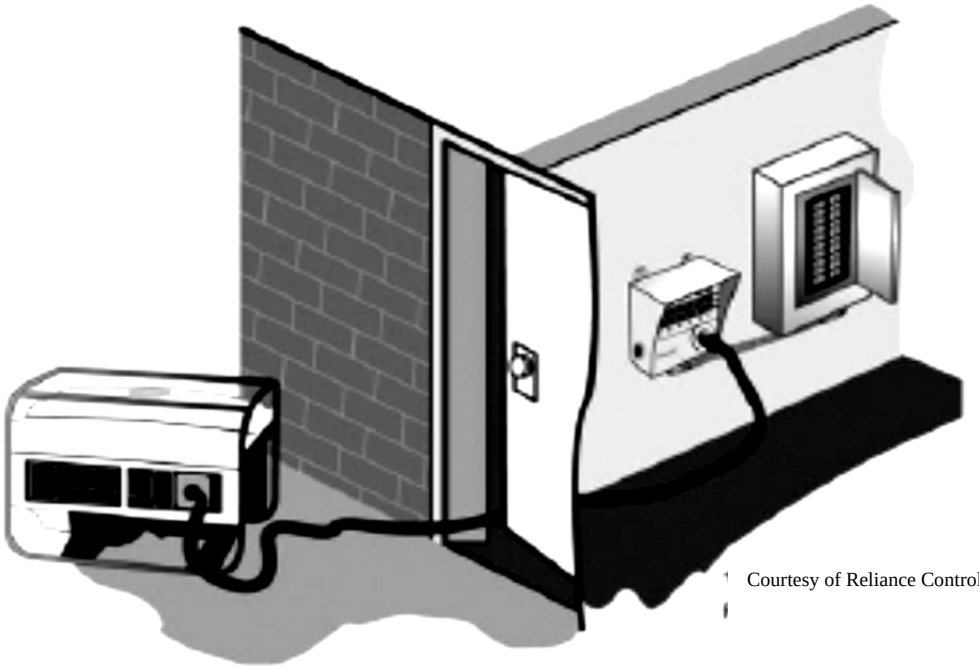
If the manual transfer switch can not meet this value, an external circuit breaker or fused disconnect with fault limiting capabilities will be installed between the Company supply and the transfer switch.

5.1.3 The neutral and grounding conductor must be carried through to the generator. The neutral and ground will be separated at the generator.

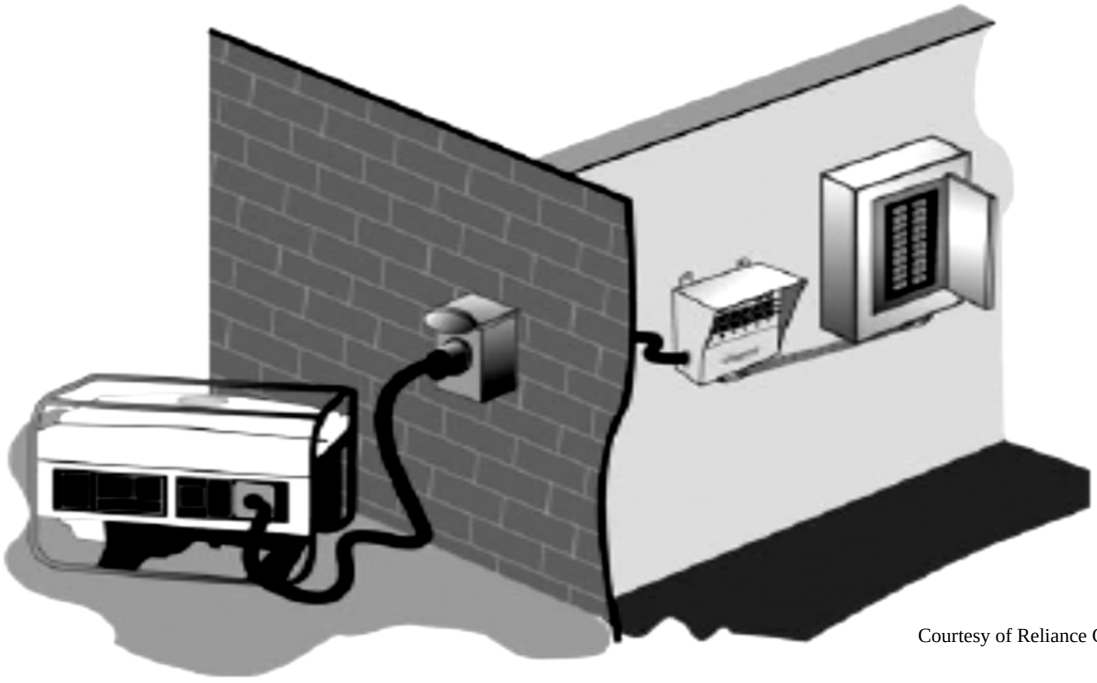
5.2 PORTABLE GENERATOR

5.2.1 PARTIAL LOAD TRANSFER

Below are illustrated examples of solutions to serving a part of Customer's Service panel.



Courtesy of Reliance Controls



Courtesy of Reliance Controls

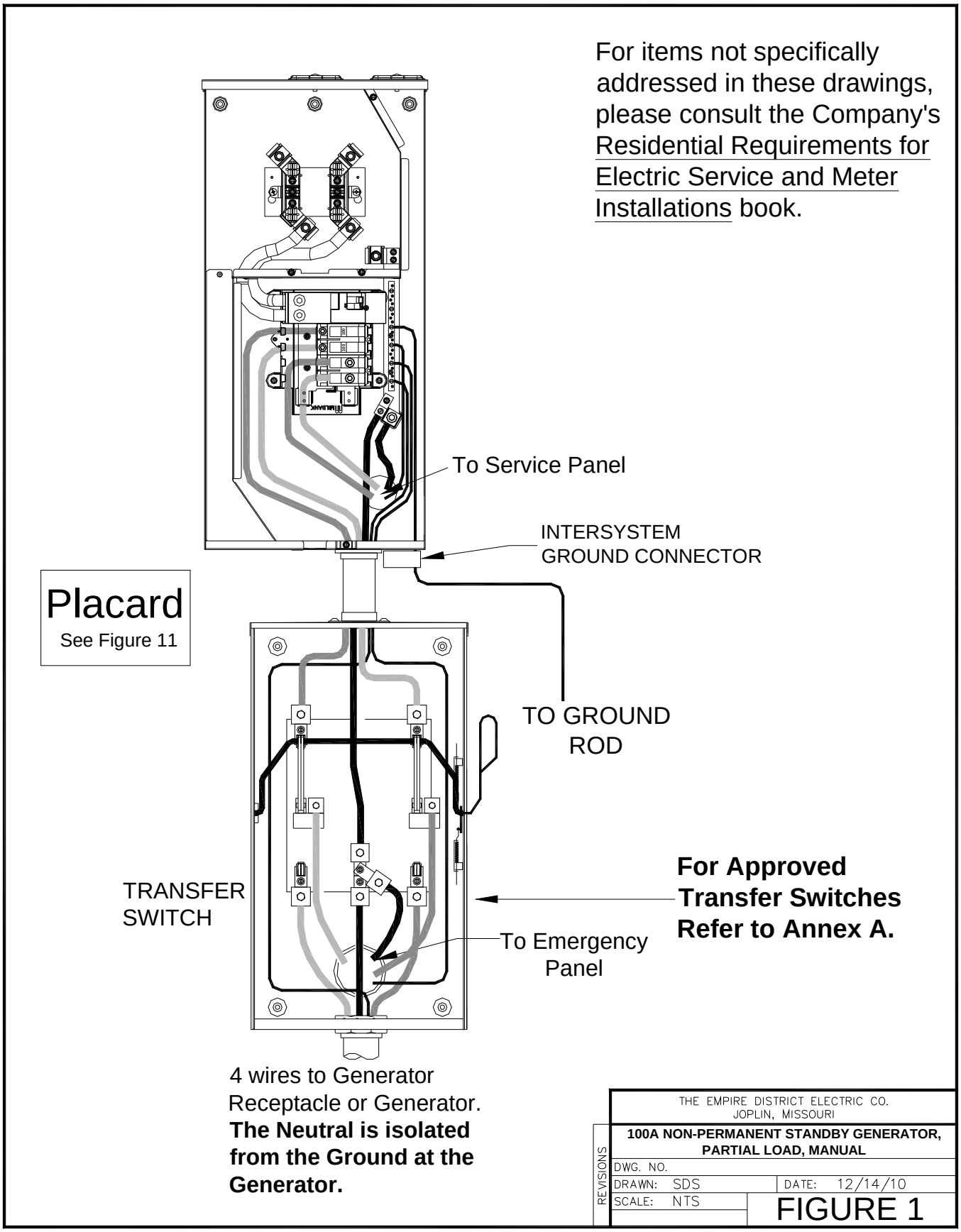
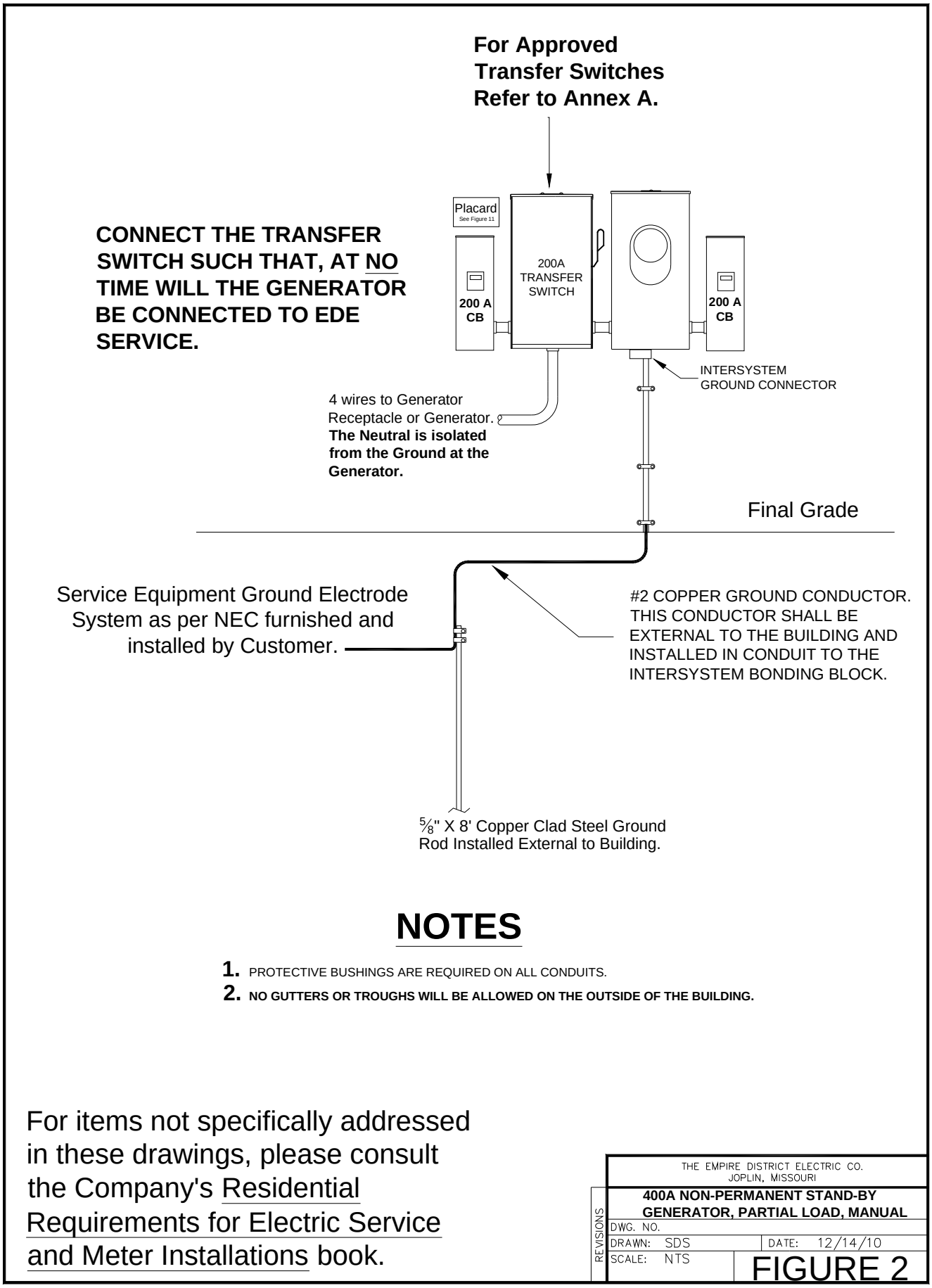


Figure 1: 100A Non-Permanent Standby Generator, Partial Load, Manual



NOTES

1. PROTECTIVE BUSHINGS ARE REQUIRED ON ALL CONDUITS.
2. **NO GUTTERS OR TROUGHS WILL BE ALLOWED ON THE OUTSIDE OF THE BUILDING.**

For items not specifically addressed in these drawings, please consult the Company's Residential Requirements for Electric Service and Meter Installations book.

	THE EMPIRE DISTRICT ELECTRIC CO. JOPLIN, MISSOURI
REVISIONS	**400A NON-PERMANENT STAND-BY GENERATOR, PARTIAL LOAD, MANUAL**
	DWG. NO.
	DRAWN: SDS — DATE: 12/14/10
	SCALE: NTS — FIGURE 2

Figure 2: 400A Non-Permanent Standby Generator, Partial Load, Manual

5.2.2 WHOLE LOAD TRANSFER

Following are specific drawings addressing the proper configurations for this application.

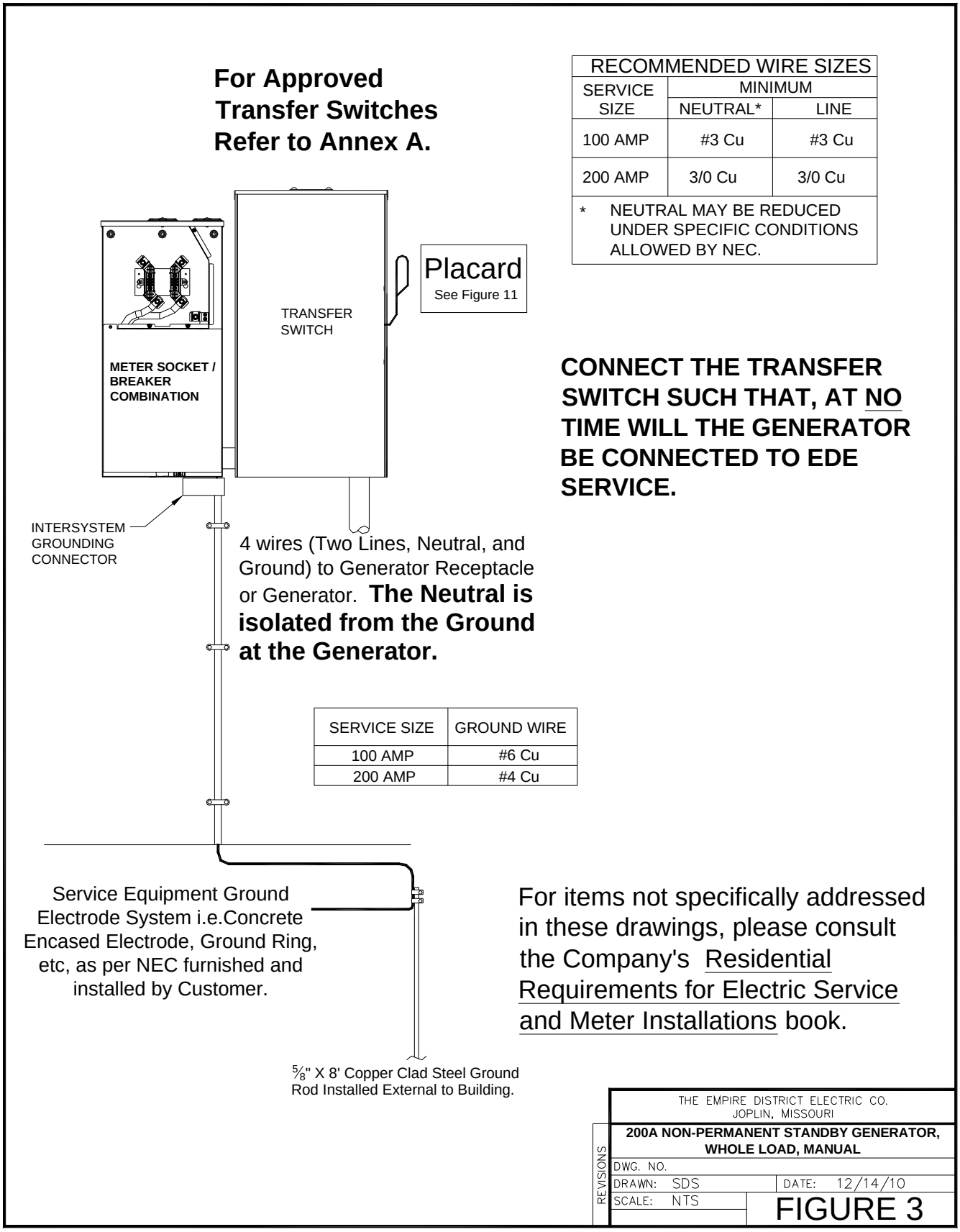


Figure 3: 200A Non-Permanent Standby Generator, Whole Load, Manual

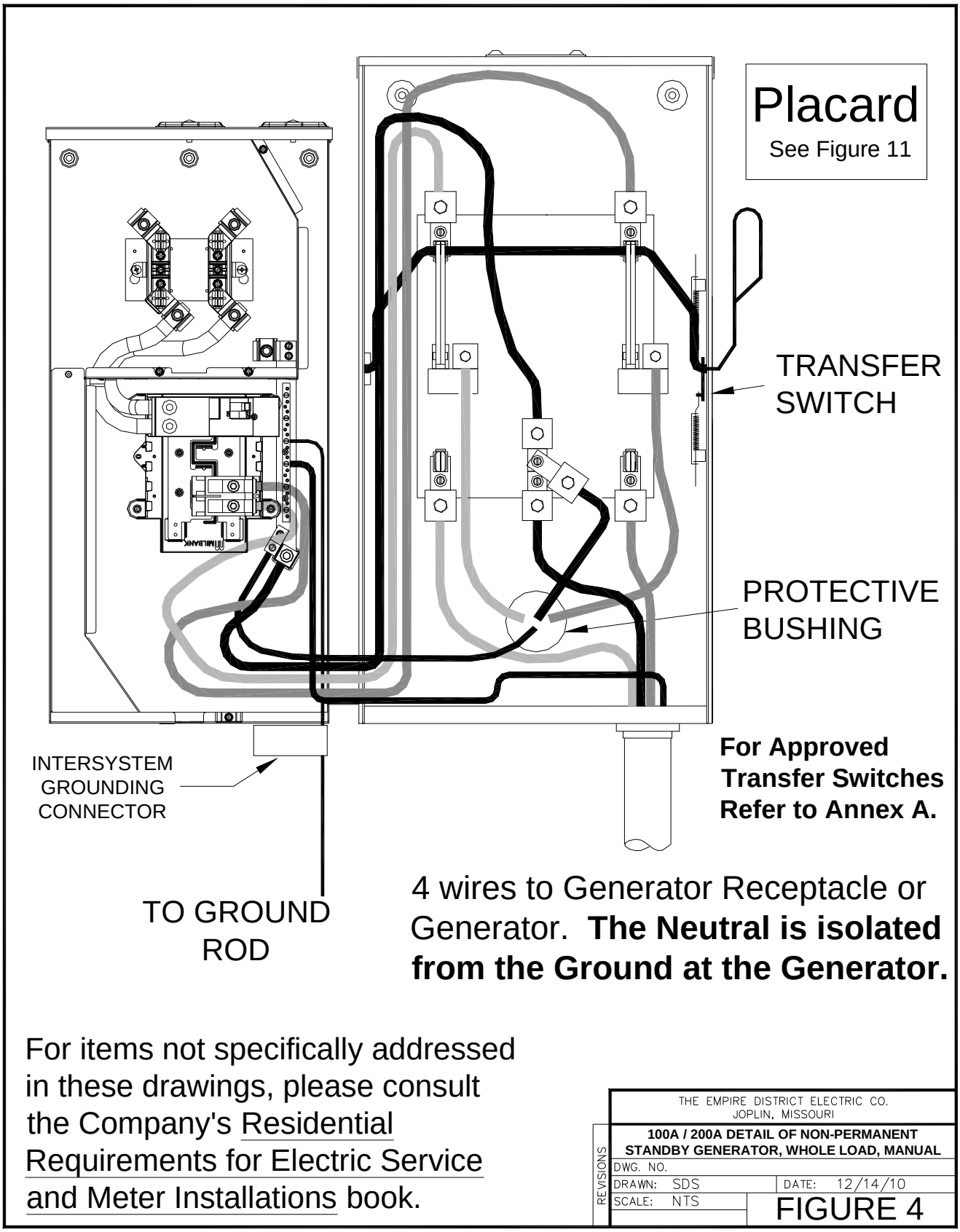
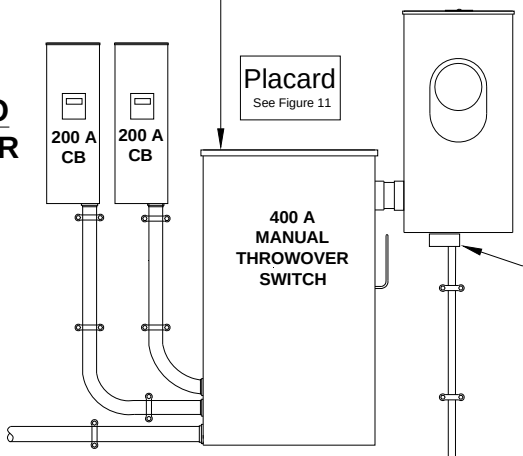


Figure 4: 100A / 200A Detail of Non-Permanent Standby Generator, Whole Load, Manual

For Approved Transfer Switches Refer to Annex A.

CONNECT THE TRANSFER SWITCH SUCH THAT, AT NO TIME WILL THE GENERATOR BE CONNECTED TO EDE SERVICE.



NOTES

1. PROTECTIVE BUSHINGS ARE REQUIRED ON ALL CONDUITS.
2. **NO WIRING GUTTERS OR TROUGHS WILL BE ALLOWED ON THE OUTSIDE OF THE BUILDING.**

For items not specifically addressed in these drawings, please consult the Company's Residential Requirements for Electric Service and Meter Installations book.

THE EMPIRE DISTRICT ELECTRIC CO. JOPLIN, MISSOURI	
400A Non-Permanent Standby Generator, Whole Load, Manual	
REVISIONS	DWG. NO.
DRAWN: SDS	DATE: 12/14/10
SCALE: NTS	FIGURE 5

Figure 5: 400A Detail of Non-Permanent Standby Generator, Whole Load, Manual

5.3 PERMANENTLY INSTALLED GENERATOR

5.3.1 PARTIAL LOAD TRANSFER

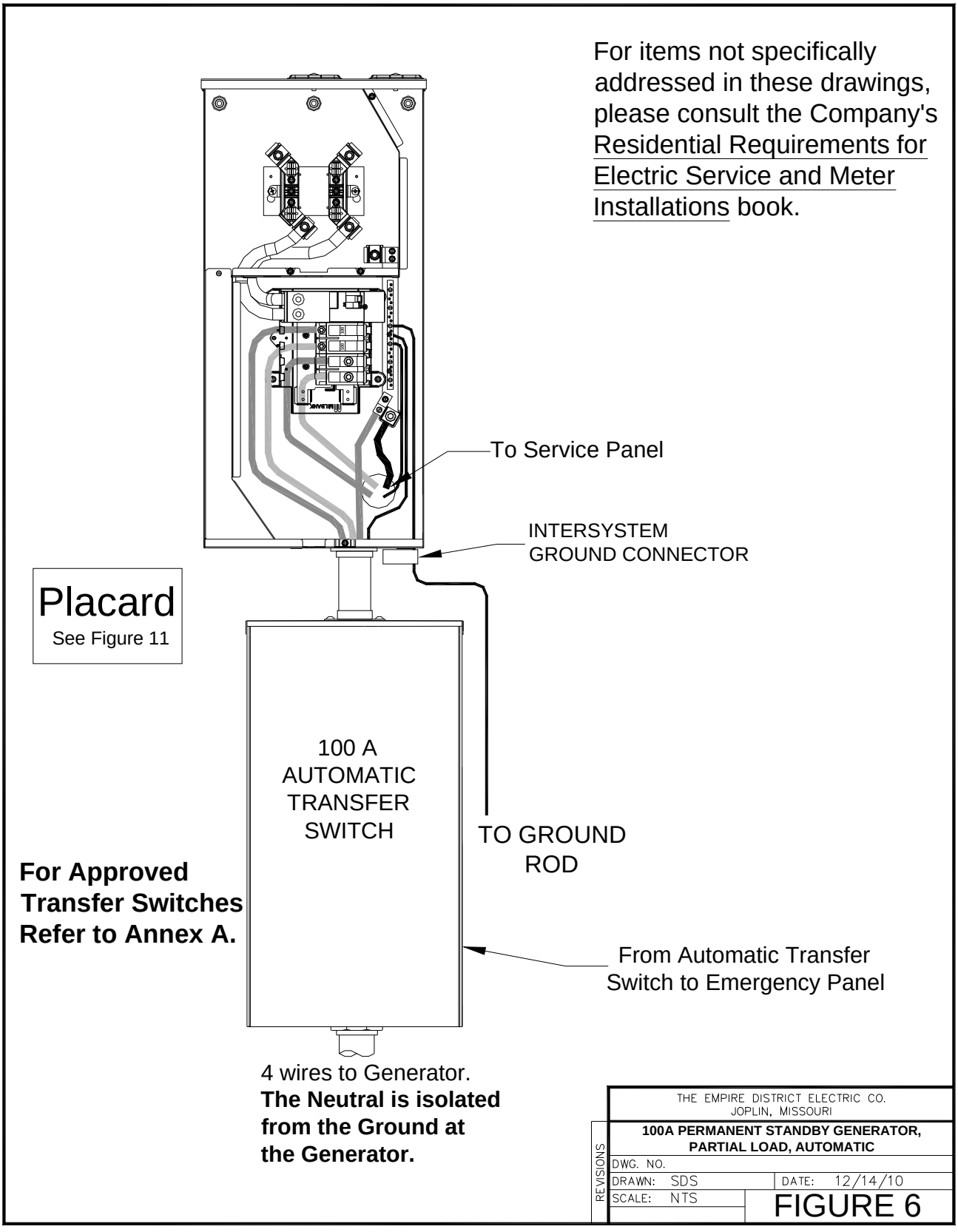


Figure 6: 100A Permanent Standby Generator, Partial Load, Automatic

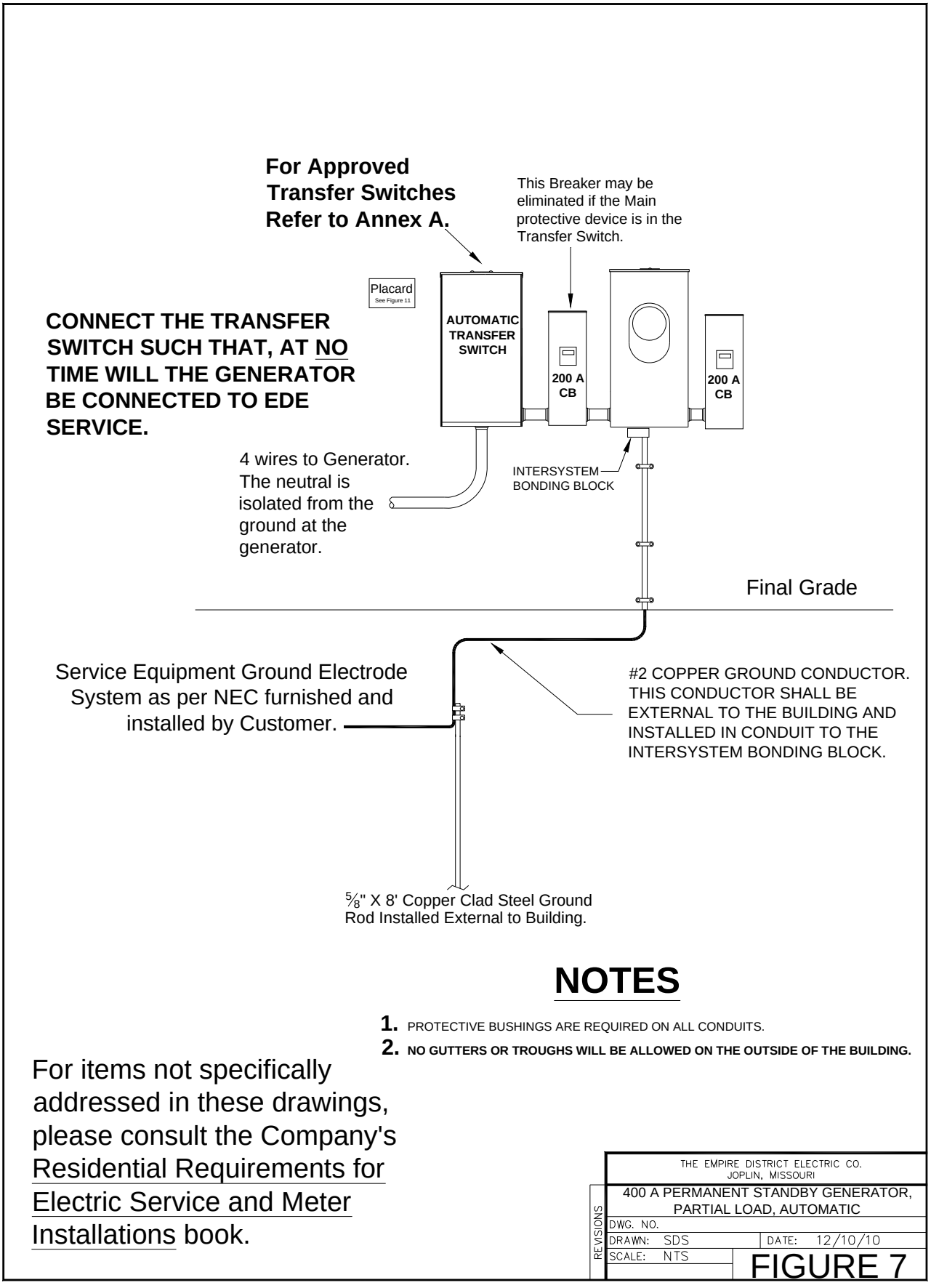


Figure 7: 400A Permanent Standby Generator, Partial Load, Automatic

5.3.2 WHOLE LOAD TRANSFER

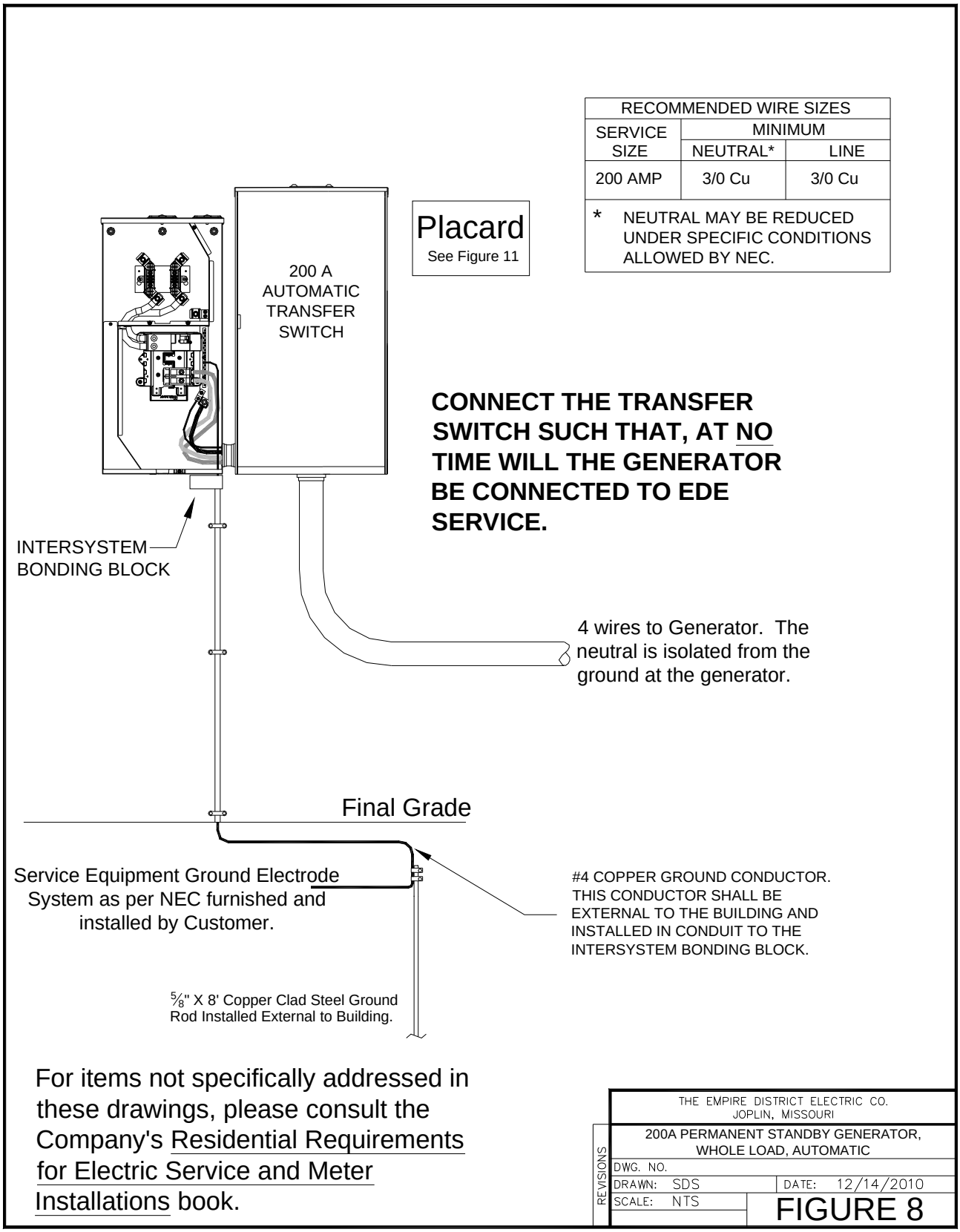


Figure 8: 200A Permanent Standby Generator, Whole Load, Automatic

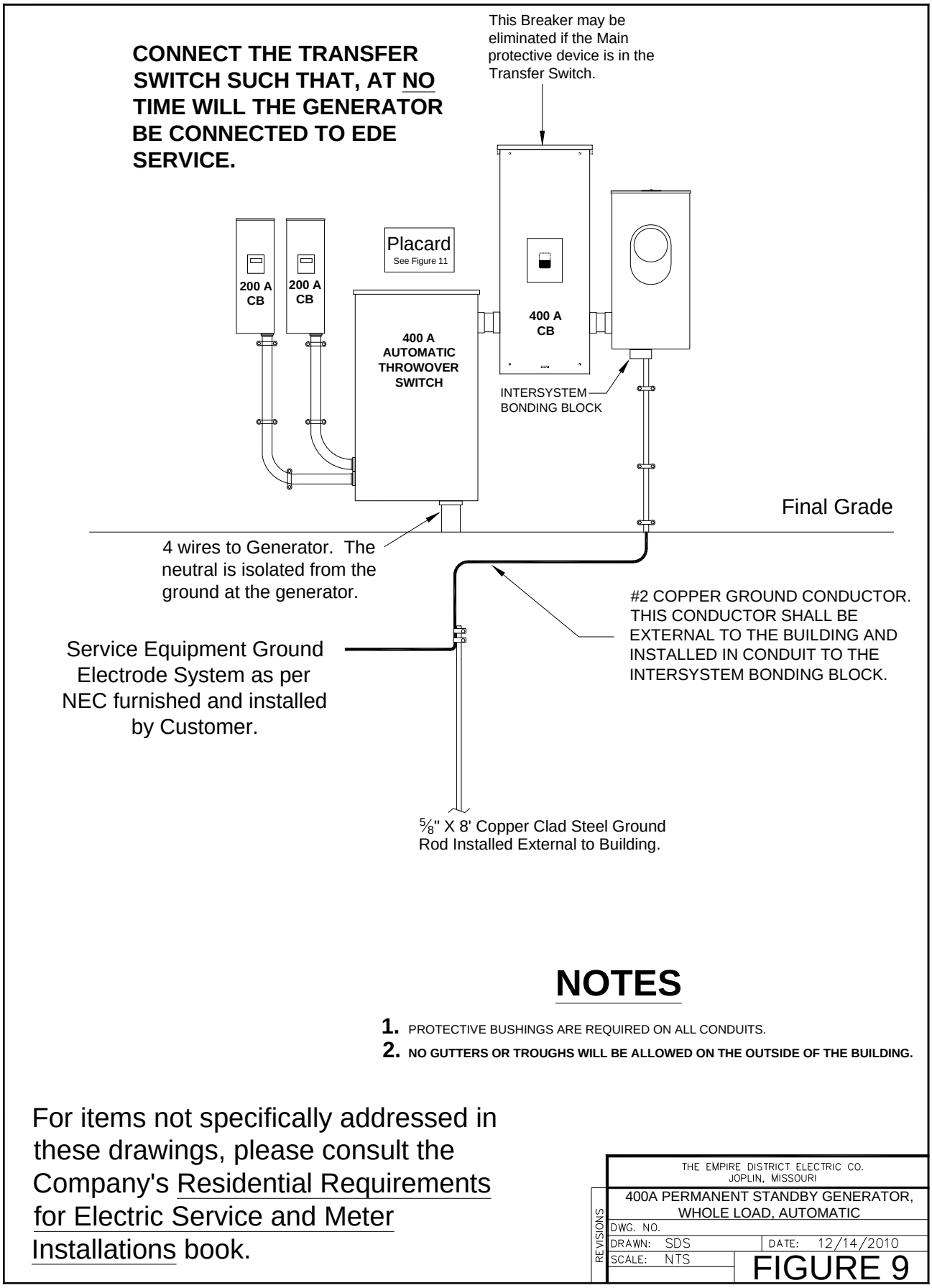
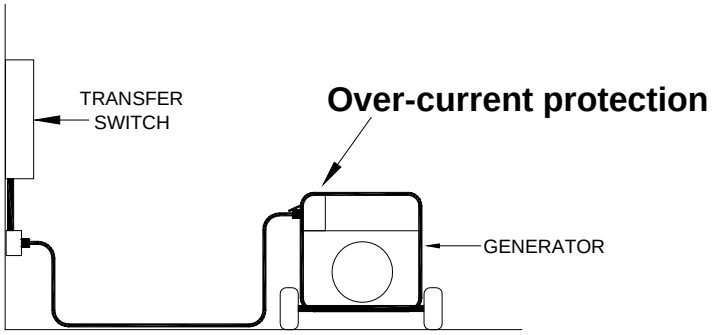
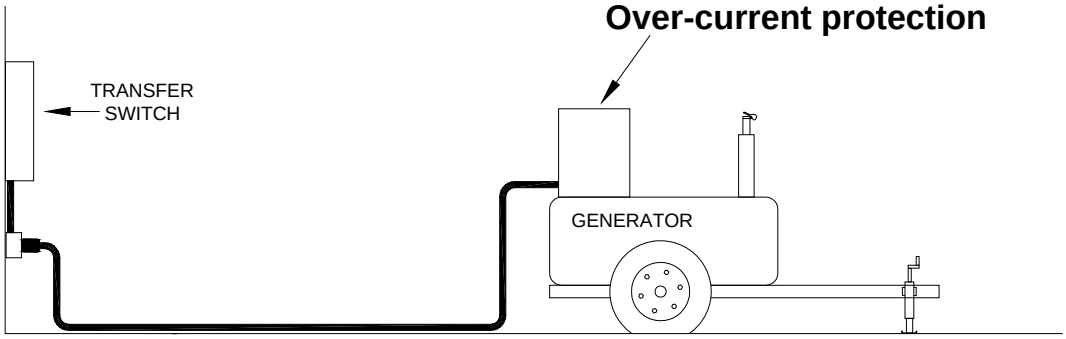
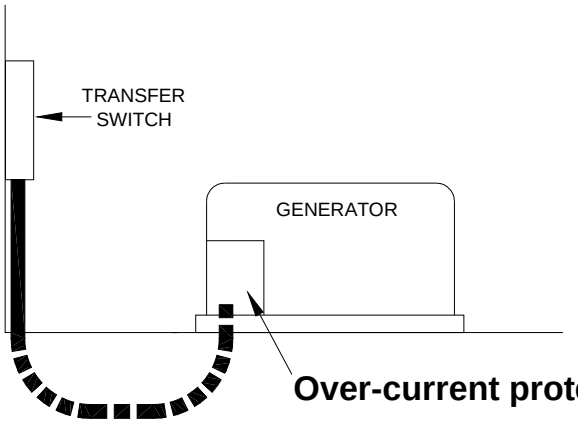


Figure 9: 400A Permanent Standby Generator, Whole Load, Automatic







Over-current protection is required at the generator to not only protect the generator from overload but the service wire as well. This is as per NEC Article 445.12A and Article 230.90A.

	THE EMPIRE DISTRICT ELECTRIC CO. JOPLIN, MISSOURI
REVISIONS	GENERATOR CONFIGURATION
	DWG. NO.
	DRAWN: SDS — DATE: 12/14/2010
	SCALE: NTS — FIGURE 10

Figure 10: Generator Configuration

5.3.3 AUTOMATIC TRANSFER

5.3.3.1 "Y" Mechanical Switches – Acceptable
"W" Mechanical Switches – Acceptable with delay
Breakers & Contactors – Not Acceptable (See Section 5.3.3.3)

5.3.3.2 Designs utilizing components of molded-case circuit breakers, contactors, or parts thereof which are not intended for continuous duty, repetitive switching or transfer between two active power sources are not acceptable.

5.3.3.3 If the switch is composed of molded case circuit breakers specifically designed as an automatic transfer switch or switching mechanical held contactors, the automatic transfer switch must have circuitry that will verify that all poles are open on the utility switch portion so as to confirm the generator is not supplying voltage back into the EDE's distribution system. If a pole is found to be "stuck" closed, the device will not transfer the feed to the emergency source.

5.3.3.4 Where neutral conductors must be switched as shown on an electrical engineering design, the Automatic Transfer Switch shall be provided with fully-rated overlapping neutral transfer contacts. The neutrals of the normal and emergency power sources shall be connected together only during the transfer and retransfer operation and remain connected together until power source contacts close on the source to which the transfer is being made. The overlapping neutral contacts shall not overlap for a period greater than 100 milliseconds. Neutral switching contacts which are not overlapping are not acceptable.

5.3.3.5 During the open transition back to utility source, there shall be a delay of at least 3 seconds to allow the load's inductive voltages to decay. These requirements shall apply to both actual emergency operation as well as to testing the generator.

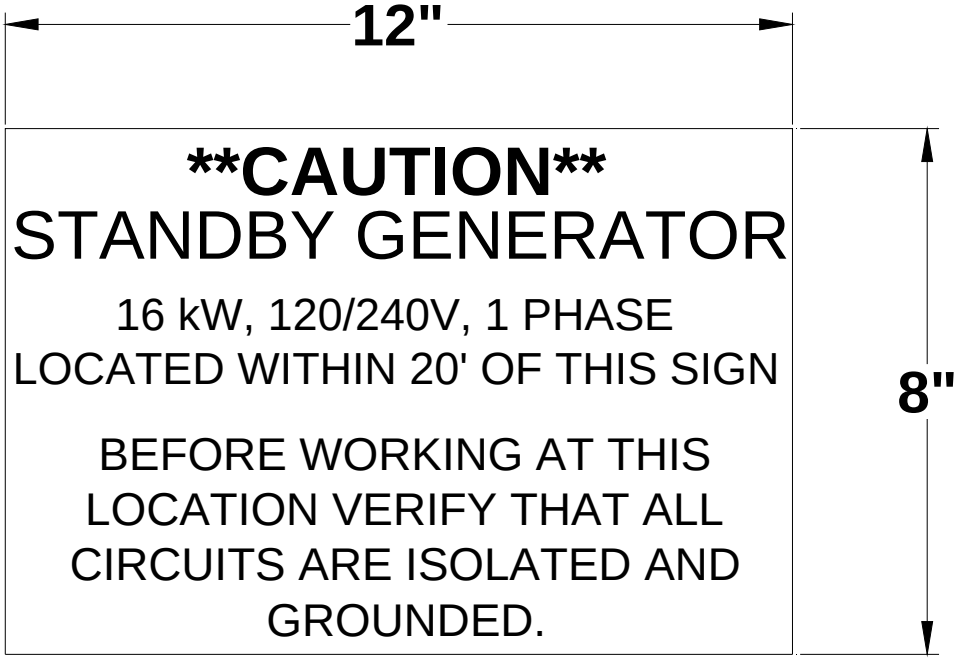
5.3.3.6 This type of installation requires a main disconnecting mechanism between the Automatic Transfer Switch and the Metering Point at a readily accessible location on the external portion of the building or structure. This is required to allow isolation from EDE during severe utility service conditions so that the Generator and Automatic Transfer Switch can be protected from unnecessary transfers.

5.3.3.7 The generator must be capable of providing all loads that are connected to it through the automatic transfer switch as per NEC 702.5 (B) 2.

5.3.3.8 The Customer may supply all or a portion of the electrical load from the standby generator as dictated by the guidelines of this section

5.3.3.9 If the transfer switch is located inside the structure and/or away from the meter socket location, a placard will be installed at the meter socket location as per Figure 11. Please note that the Customer shall change the following to conform to their situation.

Size of the Generator
Generator service voltage
Generator phase, i.e. single phase or three phase
The location of the Generator from the location of the placard



NOTES

1. The sign material shall be an etched laminated plastic. The surface shall be black and the substrate shall be white. This is so specified to have the letters appear as white when they are etched into the plastic.
2. The lettering for the "**CAUTION**" and the "**STANDBY GENERATOR**" shall be ¾" tall.
3. All other lettering shall be ½" tall.
4. These placards shall be screwed or bolted externally to the structure as close as practicable to the meter socket and at the same level as the meter. Gluing is not acceptable.

	THE EMPIRE DISTRICT ELECTRIC CO. JOPLIN, MISSOURI
REVISIONS	STANDBY GENERATOR PLACARD
	DWG. NO.
	DRAWN: SDS — DATE: 12/14/10
	SCALE: NTS — FIGURE 11

Figure 11: Standby Generator Placard

Annex A
EQUIPMENT LIST

Approved Manual Transfer Switches

Description	Durham	Milbank	Ronk	Asco
100A Manual Transfer	SV110DT		7103	D185A210000#*
200A Manual Transfer	SV210DT		7205A	D185A220000#*
400A Manual Transfer	SV410DT		7406	

Description	GE (Midwest			
100A Manual Transfer	GS1101B12UL			
200A Manual Transfer	GS1202B20UL			
400A Manual Transfer	GS1404B01UL			

Approved Automatic Transfer Switches

Description	Generac	Asco	Kohler	Siemens	Cummins Onan
100 Automatic Transfer without Circuit Breaker	RTSN100A3	D185A2100F##* or 3002200F1####*,		SR100R or SL100R	
100 Automatic Transfer with Circuit Breaker	RTSE100A3	1AUSA2100F##* or 3AUS2100F1####*		SR100RD or SL100RD	RSS 100-6868
200 Automatic Transfer without Circuit Breaker	RTSN200A3	D185A2200F##* or 3002200F1####*	RDT-CFNC-0200A	SR200R or SL200R	
200 Automatic Transfer with Circuit Breaker	RTSE200A3	1AUSA2200F##* or 3AUS2200F1####*	RDT-CFNC-200ASE	SR200RD ro SL200RD	RSS 200-6869
400 Automatic Transfer without Circuit Breaker	RTSN400A3	D185A2400F##* or 3002200F1####*		SR400R or SL400R	
400 Automatic Transfer with Circuit Breaker	RTSE400A3	1AUSA2400F##* or 3AUS2400F1####*		SR400RD or SL400RD	
* The # symbols represent engine control and accessory options, and the enclosure configuration of the switch which are at the discretion of the Customer.					

Description	Briggs and Stratton
100 Automatic Transfer Without Circuit Breaker	
100 Automatic Transfer With Circuit Breaker	071045
200 Automatic Transfer without Circuit Breaker	
200 Automatic Transfer with Circuit Breaker	071046
400 Automatic Transfer without Circuit Breaker	
400 Automatic Transfer with Circuit Breaker	