

ROCHESTER GAS & ELECTRIC

HIGH VOLTAGE SERVICE SWITCHGEAR GUIDE FOR 4160, 11500, 12470 AND 34500 VOLTS

GENERAL REQUIREMENTS SPECIFICATION

SPECIFICATION: High Voltage Service Guide

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1 RG&E Process

- 1.1 Customer contacts RG&E Marketing & Sales requesting service. RG&E Marketing qualifies customer for Rate 8 High Voltage.
- 1.2 RG&E Marketing & Sales meets customer, collects electric load profile and transformer KVA. RG&E Marketing issues a notification to RG&E Distribution Engineering with site and utility plans if available.
- 1.3 RG&E Distribution Engineer and Marketing & Sales representative meet with the customer to review options for service. (Refer to Section 2 below: Typical Switchgear Arrangements)
- 1.4 RG&E Distribution Engineering designs switchgear single-line with maximum customer transformer high side fuse rating, assigns the RG&E Station number identification, list of RG&E approved manufacturers, and prepares the RG&E specification form. (Refer to Section 5: Distribution Manual Operated Switchgear Specification Form and Section 6: Auto Throwover – Operated Switchgear Specification Form)
- 1.5 RG&E Distribution Engineering forwards the RG&E Station Single-Line and Specification form to RG&E Marketing & Sales and the customers consulting engineer.
- 1.6 RG&E Marketing & Sales to forward the RG&E Station Operation Diagram Single-Line and switchgear specification form with customer letter to the customer.
- 1.7 Customer submits the RG&E Specification Form and Single-Line (Operating Diagram) to the RG&E approved manufacturers for bid. Customer awards the bid and contacts RG&E Marketing & Sales with the name of the successful bidder.
- 1.8 Manufacturer designs 3 hardcopy (11 x 17) of the switchgear shop drawings with equipment sheets and forwards to RG&E Distribution Engineering for review. This will require at least three (3) weeks by RG&E. One (1) reproducible of each approved diagram shall be furnished by the manufacturer. If any changes to the reproducible, the manufacturer shall furnish corrected prints to RG&E for approval.

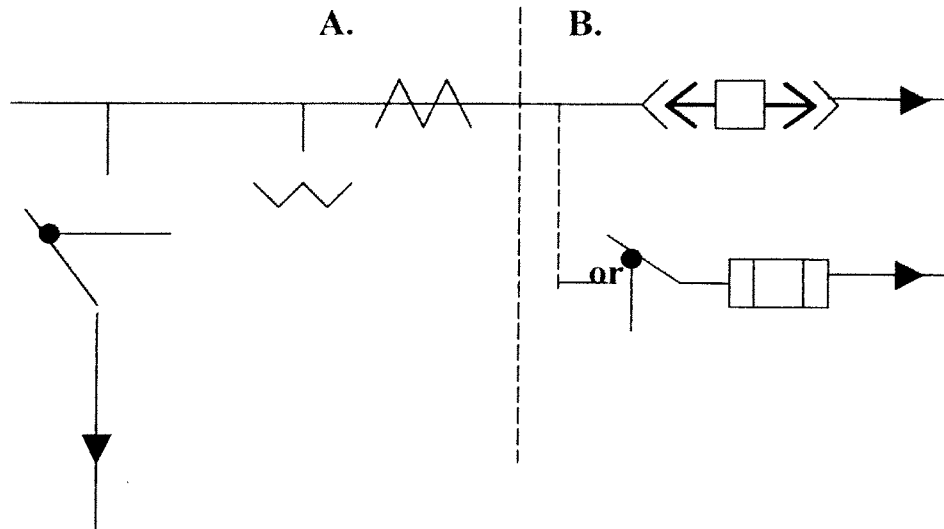
- 1.9 Upon RG&E approval, the customer will order the switchgear from the manufacturer and provide RG&E's Distribution Engineer with the approximate completion date.
- 1.10 RG&E Distribution Engineer will design the service route with specifications, switchgear pad location and drawing. RG&E sketch, specifications, and pad drawings will be forwarded to RG&E Marketing & Sales and the customer's consulting engineer.
- 1.11 The switchgear will be delivered to:
RG&E Operation Center
1300 Scottsville Road
Rochester, New York 14624
for QC, testing and any changes that maybe required by the manufacturer before delivery. RG&E will install the CT's and VT's for metering, and sensing and tag the gear with RG&E identification numbers as shown on the final RG&E Station Operating Diagram. Manufacturer will deliver RG&E specified E fusing with spares.
- 1.12 The switchgear will be delivered by RG&E to the site. RG&E with the customer's assistance will stage the switchgear on the RG&E specified concrete pad.
- 1.13 RG&E will install the high voltage cables on the line side of the switchgear. The customer is responsible for installing the high voltage load side cables, operating the fused load break switches and energizing the new load.

Note: Switchgear purchased by the customer is owned and maintained by the customer, and operated by RG&E.

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2 Typical Switchgear Arrangements

2.1 Single Circuit Feed – Manual



A. RG&E operating side: Incoming load break switch, billing metering.

B. Customer operating side: Main breaker or main load break switch with fuse.

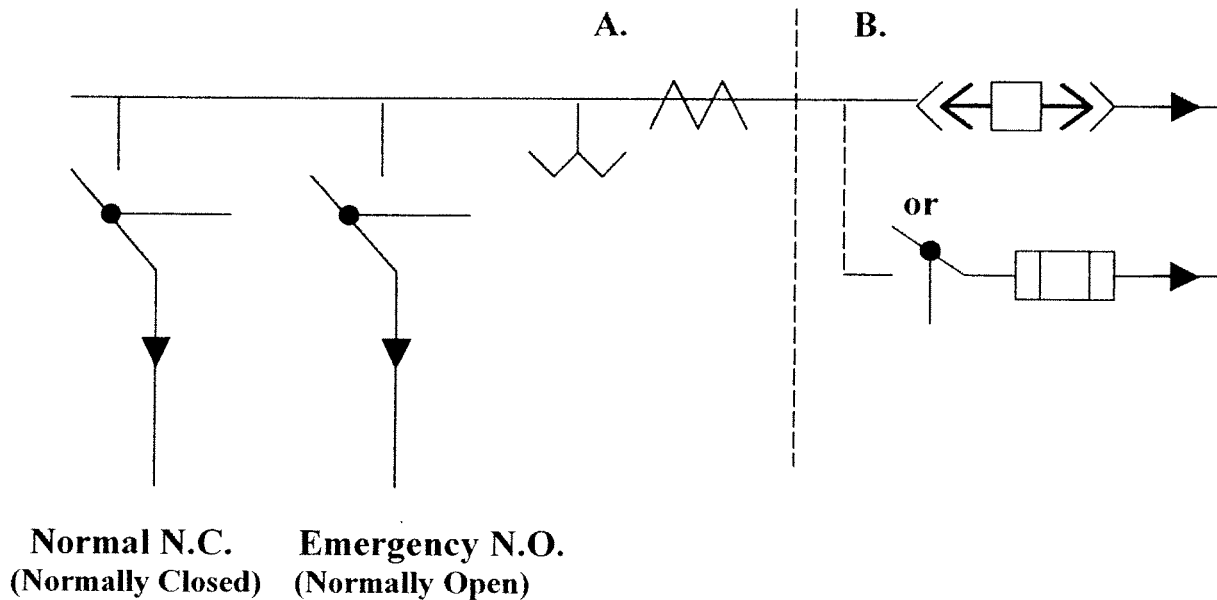
Advantages:

1. Low cost.
2. Minimum space required.
3. Connected load capacity

Disadvantages:

1. Customer outage (up to 16 hours) when single source is faulted.
2. Customer outage is required for maintenance of RG&E source.
3. Customer outage is required for maintenance of customer main switch.
4. Customer outage is required for maintenance or faulted customer owned transformer. Outage dependant on availability of replacement

2.2 Two Circuit Feed – Manual



- A. RG&E operating side: Two incoming load break switches, billing metering.
B. Customer operating side: Main breaker or main load break switch with fuse.

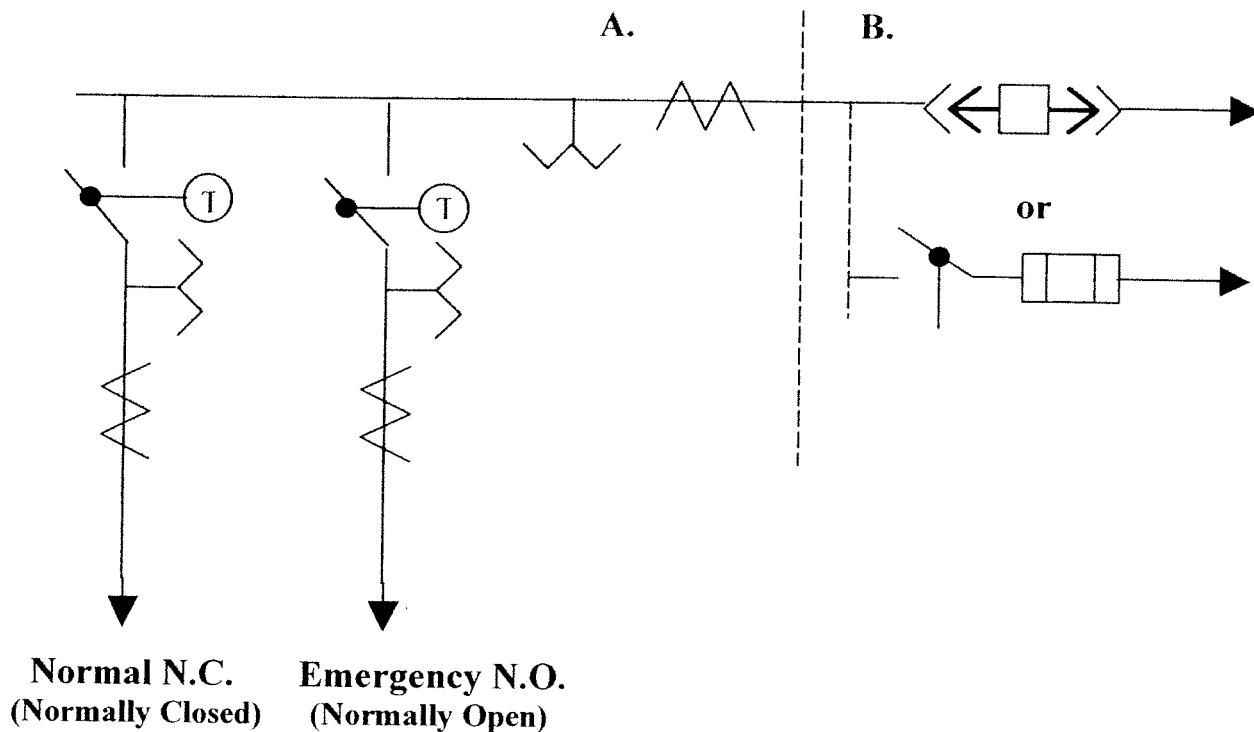
Advantages:

1. Customer outage is minimal (1-2 hours) when normal source is faulted.
2. Customer outage is zero for maintenance of RG&E sources.
3. Connected Load Capacity

Disadvantages:

1. Higher cost than single circuit.
2. More space required than single circuit manual.
3. Customer outage is required for maintenance of customer main switch.
4. Customer outage is required for maintenance or faulted customer owned transformer. Outage dependant on availability of replacement.

2.3 Two Circuit Feed – Auto Throwover, RG&E Side



- A. RG&E operating side: Two incoming load break switches with motor operators, automatic control, billing metering.
- B. Customer operating side: Main breaker or main load break switch with fuse.

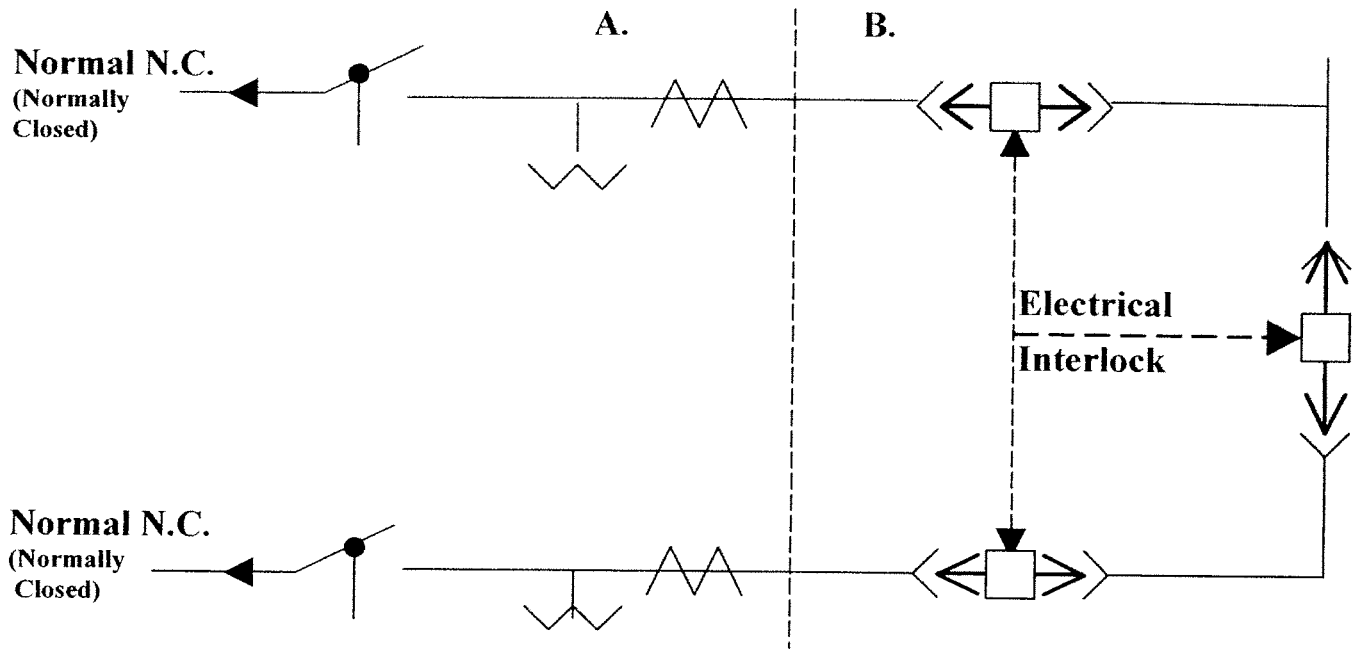
Advantages:

1. Customer outage is momentary when normal source is faulted.
2. Customer outage is zero for maintenance of RG&E sources.
3. Connected Load Capacity

Disadvantages:

1. Higher cost than two circuits manual.
2. More space required than two circuits manual.
3. Customer outage is required for maintenance of customer main switch.
4. Customer outage is required for maintenance or faulted customer owned transformer. Outage dependant on availability of replacement.

2.4 Two Circuit Feed – Auto Throwover, Customer Side



A. RG&E operating side: Two incoming load break switches, billing metering on each source.

B. Customer operating side: Three breaker scheme with automatic control.

Advantages:

1. Customer outage is momentary for only one bus section when a source is faulted.
2. Customer outage is zero for maintenance of RG&E sources.
3. Customer outage is zero for maintenance of customer main switches.
4. Connected Load Capacity

Disadvantages:

1. Highest cost.
2. Greatest space requirements.
3. Customer outage is required for maintenance or faulted customer owned transformer. Outage dependant on availability of replacement.

3 Customer Requirements for 15kV Rated (4160, 11500, 12470 volt) and 35kV Rated (34500 volt) Switchgear Service Installation

- 3.1 High Voltage service available:
 - 3.1.a 3-phase – 4-wire wye 4160V 15kv rated
 - 3.1.b 3-phase – 4-wire wye 12470V 15kv rated
 - 3.1.c 3-phase – 3-wire delta 11500V 15kv rated
 - 3.1.d 3-phase – 3-wire delta 34500V 35kv rated
- 3.2 The interrupting capacity (fault current availability) of the 4160, 11500, 12470 & 34500 volt services will be obtained upon written request to the RG&E Marketing & Sales representative and forwarded to RG&E Distribution Engineering.
- 3.3 RG&E will furnish and install metering current and potential transformers. RG&E System Protection & Control (SP&C) will specify largest fuse size that customer may install on the high side of the customer transformer(s).
- 3.4 If the customer provides a breaker for use as a main disconnect on each of two continuously energized primary service feeds and has need for an automatic throwover, they may provide it within their own system. (Refer to Section 4: Electric Substation Standards DO52.20.1, 52.20.2, & 52.20.3)
- 3.5 The customer's secondary systems, as well as his primary systems, shall not be connected so as to parallel the RG&E primary circuits. Any exceptions must be approved by the RG&E Electric System Protection and Control (SP&C) group and the Energy Control Center. If approved, RG&E approved by-pass system (See Section 4: Electric Substation Standards DO52.20.1, 52.20.2, & 52.20.3) will allow RG&E to parallel circuits under correct conditions to perform routine maintenance work or a system tie. An operational check by the RG&E will be performed before service is energized.
- 3.6 RG&E engineering must approve the protection scheme for the customer's system before the customer purchases it to be sure it coordinates with RG&E plans for system protection. A meeting between the RG&E Distribution Engineer, SP&C Engineer, Marketing & Sales rep and the customer should be held to work out final coordination of all relay settings and fuses.

- 3.7 Switchgear- RG&E Distribution engineering will design the concrete pad, grounding grid, conduit routing for the high voltage line side switchgear, 600V service, and billing communication. Switchgear concrete pad design drawing will not be developed until RG&E Distribution Engineering receives final approved shop drawings.
- 3.8 Location:
- 3.8.a If the switchgear is to be placed outside, the customer is to excavate and install concrete pad for the switchgear as per RG&E design. If the switchgear is exposed to vehicular traffic, a vehicle barrier must be provided by the customer as per RG&E Standards. If switchgear is installed indoors, it must be at ground level or one level below grade. The installation is to be level with adjacent floor, not recessed.
 - 3.8.b Building shall be accessible for installation and possible replacement of switchgear if installed indoors or outside. Maintain 96" clearance in front of the switchgear doors as per RG&E Standards and the NEC Article 110 clearance for maintenance. The enclosure shall not be enclosed with a roof. The customer transformers shall maintain proper clearance for oil filled transformers from building structures based on fire ratings & codes. The switchgear is to have four feet clearance on all sides (except in front) not adjacent to customer's gear. In addition, 18" minimum clearance is required above the switchgear.
 - 3.8.c Pipe, or duct systems, unassociated with the electrical installation (e.g. water pipes, gas lines, building fire system and surface drains) shall not enter or pass through the switchgear location. Maintain 8' of clearance.
 - 3.8.d Indoor switchgear room, or area, to have two exits at opposite ends of room where possible.
 - 3.8.e The switchgear area is to have lights, receptacles and drain per National Electric Code.
 - 3.8.f All switchgear equipment (outdoor or indoor) on the high voltage RG&E system operated line side must be assessable 24 hours per day.
 - 3.8.g Contact RG&E Inspection area 72 hours in advance of excavation and installation of the pad and high voltage conduit system.
- 3.9 Switchgear shall have 2 pole fuse block maximum rating 60 amp, 120/240 volt AC feed for heaters and lights. Circuits fused based on connected load. For auto throwover switchgear the sensing potential transformers will NOT be utilized for this purpose. For manual operated equipment an adjacent

secondary distribution circuit shall be utilized. Whenever switchgear is remotely located, the customer should furnish the AC feed. The heaters control condensation in the switchgear and will keep switches operating freely, the lights assist in determining the switch position. The metering will be installed on the outside wall of switchgear.

- 3.10 **High voltage to secondary voltage transformers shall be purchased, owned and maintained by the customer.** Replacement for capacity or failure is the responsibility of the customer. If customer requests RG&E to supply replacement, and it was available, charges must be paid upfront for current cost plus stocking charges before RG&E delivery.

RG&E High Voltage System configuration for Transformers Specification EM-01250:

4,160 **Grd Wye**/2,400 volts – 15kV Rated
12,470 **Grd Wye**/ 7200 volts – 15kV Rated
11,500 **Delta** – 15kV Rated
34,500 **Delta** – 35kV Rated

Voltage availability to be determined by RG&E Engineering

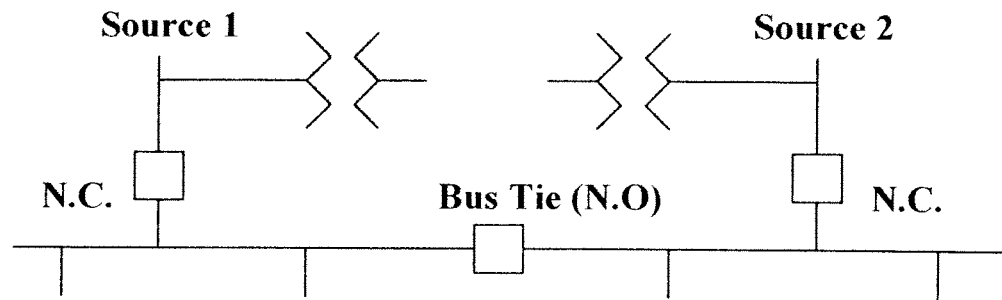
- 3.11 If the customer's transformer is to be installed in same room as the switchgear provision must be made for cooling transformer and for oil containment.
- 3.12 Customer's switchgear is owned by the customer and shall be operated by RG&E. If switchgear is installed indoors, the customer is to provide a door between RG&E room and customer's room. Customer switchgear operated by RG&E will have identification numbers on the switches and breakers. Certified equipment test reports must be made available for any switchgear to be operated by RG&E.
- 3.13 Customer equipment areas containing equipment operated by RG&E to have one of the following:
- 3.13.a Dual padlocks – RG&E and customer's
 - 3.13.b Customer lock only – Spare key to be provided to RG&E
 - 3.13.c Key (under RG&E padlock) at site.
 - 3.13.d Key provided by customer's 24 hours security personnel.
- 3.14 Rooms housing RG&E only equipment that are owned, operated and maintained by RG&E shall have doors equipped with the RG&E core

cylinder, figure 8, 7 pin lock store house lock approved by RG&E. This lock cylinder will be supplied by the RG&E Security at no cost.

- 3.15 If the customer's gear is cable connected to RG&E gear, the customer is to provide and install conduit from his gear to RG&E's. The exact location of conduit will be determined after RG&E selects its switchgear manufacturer and the drawings become available. RG&E will either install the cable from its gear to the customer's gear at cost, or the customer may install the cable from his gear to RG&E gear, per RG&E specifications. Specifications to be supplied by Electric Substation and Distribution Engineering Department. The connection to RG&E gear to be made by RG&E.
- 3.16 If dual metering is to be totalized, or if meters are to be remote from switchgear, then customer is to provide metering conduit and metering wires. Contact Electric Meter Engineer 724-8638 for further details of number of meter wires, size conductors, and size of conduit required.
- 3.17 When switchgear is to be bus connected and the customer's supplier cannot meet RG&E requirements, the customer must supply a transition cell between switchgear cabinets. As a result, this will require additional space. An alternate to this is to use cable connected switchgear. RG&E switchgear is normally entered and exited through the hole in the floor.
- 3.18 Installation of switchgear:
 - 3.18.a Switchgear will be installed by RG&E.
 - 3.18.b Testing and operation of switchgear to be completed by RG&E
 - 3.18.c Verification of operation of switchgear to be made by RG&E.
(functional test or operational check)
- 3.19 Service Charges
 - 3.19.a The customer service charge will be determined according to RG&E's filed Tariff Schedule for Electric Service. The customer, or his agent, should follow the designed requirements.
 - 3.19.b Providing it is available, and the customer desires a second circuit to increase his service reliability, he must pay the entire cost of the second circuit installation including the additional switchgear necessary.

4 Electric Substation Standards DO52.20.1, 52.20.2, & 52.20.3

This standard is to be used as a guide when designing a throw over utilizing two normally closed Source Switches and a normally Open Tie Switch.



1. Operated for loss of any one or all three phases.
2. Check other Source alive before scheme operates (all three phases). Throw over is blocked when both Sources are dead.
3. Time delays of three seconds at zero volts to override voltage dips and instantaneous Source reclosures.
4. Open dead Source Switch and check open before closing Tie Switch. Prevents back feeding faulted Source and losing whole station.
5. Manual-Auto transfer switch must monitor:
 - a. Throwover control circuit.
 - b. Close and trip circuit of both Source and Tie Switches.
6. A "b" auxiliary switch of the Tie switch should monitor the throw over control circuit to check the Tie Switch open and to break up the throw over control circuit when the Tie Switch closes.
7. The Bus Differential Lockout relays, when available, must block the throw over control circuit.
8. In Customer operated Stations:
 - a. A "b" switch electrical interlock must be added to prevent the customer tying the two Sources. The interlock will allow closing any two switches.
 - b. A key operated "By-Pass" switch is added to allow RG&E switchmen to close all three switches and hold one Source without interrupting customer power.
 - c. A manual contact of the "Man-Auto" transfer switch is put in series with the "By-Pass" switch in the Tie Switch close circuit. In case the "By-Pass"

switch in the Tie Switch close circuit. In case the “By-Pass” switch had been left closed, the “b” auxiliary switches interlock would be inoperative and a throw over operation could cause complete shutdown by back feeding the faulted line.

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5 Distribution Manual Operated Switchgear Specification Form

Date	
Specification Number	DMS-5.2
Job Location	
Delivery Point	1300 Scottsville Road Rochester, NY 14623
Shipping Date	
Type of Enclosure?	<input type="checkbox"/> Indoor <input type="checkbox"/> Outdoor
Billing Metering Required?	<input type="checkbox"/> Yes <input type="checkbox"/> No
House Service Transformer Required?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Surge Arresters Required?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Type	
Class	
Rating	
Meter Cabinet Location	<input type="checkbox"/> Side <input type="checkbox"/> Rear
Cable Terminators, Provision for Mounting Only?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Manufacturer	
Catalog Number	
AC Lights/ Heater	Volts
Nominal Voltage	kV
BIL Voltage	kV BIL
Short Circuit Interrupting Rating	kA RMS
Fault Closing/Close & Latch Rating	kA RMS Asymmetrical
Momentary Rating	kA RMS Asymmetrical
Continuous Current Rating	Amps
Load Current Interrupting Rating	Amps
PROJECT ENGINEER	
SUPERVISOR	

General Requirement Specification DMS-5.2 are a part of this Specification.

6 Auto Throwover – Operated Switchgear Specification Form

Date	
Specification Number	DAS-4
Job Location	
Delivery Point	1300 Scottsville Road Rochester, NY 14623
Shipping Date	
Type of Enclosure?	<input type="checkbox"/> Indoor <input type="checkbox"/> Outdoor
Billing Metering Required?	<input type="checkbox"/> Yes <input type="checkbox"/> No
House Service Transformer Required?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Surge Arresters Required?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Type	
Class	
Rating	
Meter Cabinet Location	<input type="checkbox"/> Side <input type="checkbox"/> Rear
Cable Terminators, Provision for Mounting Only?	<input type="checkbox"/> Yes <input type="checkbox"/> No
Manufacturer	
Catalog Number	
AC Lights/ Heater	Volts
Nominal Voltage	kV
BIL Voltage	kV BIL
Short Circuit Interrupting Rating	kA RMS
Fault Closing/Close & Latch Rating	kA RMS Asymmetrical
Momentary Rating	kA RMS Asymmetrical
Continuous Current Rating	Amps
Load Current Interrupting Rating	Amps
PROJECT ENGINEER	
SUPERVISOR	

General Requirement Specification DAS-4 are a part of this Specification.