



**COUNTY OF ERIE  
DIVISION OF PURCHASE  
MEMORANDUM**

**To:** All Using Departments

**From:** Jamie Kucewicz, Buyer

**Date:** 5/17/15

**Subject:** ELECTRICAL PREVENTIVE MAINTENANCE PROGRAM AT  
SOUTHTOWN'S WASTEWATER TREATMENT PLANT

**Bid No.:** 212127-002

**Effective Dates:** May 17, 2015 through May 16, 2018

**Vendor #:** 109958

**Vendor:** FERGUSON ELECTRIC SERVICE CO., INC.  
333 Ellicott Street  
Buffalo, NY 14203

**Telephone:** 716-853-3321

**Contact:** Paul C. Reilly

**Pricing:** per attached documents



COUNTY OF ERIE

MARK C. POLONCARZ  
COUNTY EXECUTIVE

DIVISION OF PURCHASE

VALLIE M. FERRARACCIO  
DIRECTOR

April 15, 2015

Ferguson Electric Service Co., Inc.  
333 Ellicott Street  
Buffalo, NY 14203  
Attn: Dan Bunny

Re: Bid #212127-002 – “Electrical Preventative Maintenance Program at Southtown’s Wastewater Treatment Plant”

Dear Mr. Bunny:

The County of Erie wishes to extend this agreement for an additional three-year period, through May 16, 2018, under the same prices, terms and conditions as the original agreement.

Extension is provided for per paragraph 26, Page 5 of 6 of the Instructions to Bidders (Formal). This offer is for your immediate consideration and acceptance. **Please respond within seven days upon receipt of this request**, indicating whether you agree to extend or do not wish to extend.

If you do wish to extend the contract, please provide a current insurance certificate, with the certificate holder listed as County of Erie, 95 Franklin Street, Buffalo, NY 14202. The County requires General, Auto and Excess Liability coverage and needs to be listed as “Additional Insured” on those policies. A Worker's Compensation & Employer's Liability Certificate must also be provided, and must be on one of the NYS Comp Board forms C105.2, U26.3 or SI-2.

After approval and execution by the County, a fully signed copy will be returned to you for your files.

Yes, I agree to extend  No, I do not wish to extend

Company Name: Ferguson Electric Service Co. Inc.

Representative (Please print): Paul C. Kelly Title: RESIDENT

Signature: [Handwritten Signature] Date: 4/24/15

Sincerely,

[Handwritten Signature]  
James D. Kucewicz  
Buyer

[Handwritten Signature]  
Vallie M. Ferraraccio  
Director of Purchase

5/6/2015  
DATE



# County of Erie

MARK C. POLONCARZ  
COUNTY EXECUTIVE

DIVISION OF PURCHASE



## STANDARD AGREEMENT

This AGREEMENT, made as of the 1st DAY of MAY 2012

by and between: FERGUSON ELECTRIC CONSTRUCTION CO.

of: 333 ELLICOTT STREET, BUFFALO, NY 14203

herein after referred to as the Contractor, and the County of Erie, a municipal corporation of the State of New York, hereinafter referred to as the County:

WHEREAS, in accordance with public open competitive bidding, sealed proposals were received and publicly opened by the County of Erie, Division of Purchase

on APRIL 26, 2012 at 3PM

for: ELECTRICAL PREVENTIVE MAINTENANCE PROGRAM AT SOUTHTOWN'S WASTEWATER TREATMENT PLANT

WHEREAS, the bid of the Contractor submitted in accordance therewith, the sum

of: FIFTY-TWO THOUSAND AND FOUR HUNDRED AND SIXTY-FOUR DOLLARS AND 00/100 (\$52,464.00)

was the lowest responsible bid submitted; and

WHEREAS, a contract is hereby awarded to the Contractor by the County, in accordance with the provisions therein contained; and

WHEREAS, the Notice to Bidders and Specifications make provisions for entering into a proper and suitable contract in connection therewith;

NOW, therefore, the Contractor does hereby for its heirs, executors, administrators and successors agree with the County of Erie that, the Contractor shall for the consideration mentioned, and in the manner set forth in Accepted Invitation to Bid No. 212127-002, Specifications and Provisions of Law annexed hereto and forming a part of this contract, furnish the equipment and materials and perform the work and services described in the Accepted Bid for the above sum.

\_\_\_\_\_ Paid monthly upon presentation of invoices.

\_\_\_\_\_ XXX \_\_\_\_\_ Upon delivery, completion and approval of the work, as per specifications.

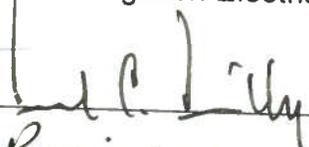
Please refer to the Invitation to Bid (Page 1) and the Instructions to Bidders which are part of this agreement.

IN WITNESS THEREOF, the parties hereto have hereunto set their hands and seals the day and year first above written.

COUNTY OF ERIE

Contractor: Ferguson Electric Construction Co.

by  \_\_\_\_\_  
Director of Purchase

by  \_\_\_\_\_  
Title President

APPROVED AS TO FORM

 \_\_\_\_\_  
Assistant County Attorney  
County of Erie, New York

5/16/12 \_\_\_\_\_ (date)

Document No.: 12-398-Pu



**COUNTY OF ERIE**  
**MARK C. POLONCARZ**  
**COUNTY EXECUTIVE**  
**DIVISION OF PURCHASE**  
**INVITATION TO BID**

RECEIVED  
 MAR 29 2012  
 FERGUSON ELECTRIC  
 CONSTRUCTION CO

Bids, as stated below, will be received and publicly opened by the Division of Purchase in accordance with the attached specifications. FAX bids are unacceptable. Bids must be submitted in a sealed envelope to:

County of Erie  
 Division of Purchase  
 Attention: CHARLES SAXE, BUYER (716) 858-6336  
 95 Franklin Street, Room 1254  
 Buffalo, New York 14202-3967

**NOTE:** Lower left hand corner of envelope **MUST** indicate the following:

BID NUMBER: 212127-002

OPENING DATE: APRIL 26, 2012 TIME: 3PM

FOR: ELECTRICAL PREVENTIVE MAINTENANCE PROGRAM AT SOUTHTOWN'S WASTEWATER TREATMENT PLANT

Ferguson Electric Construction Co.  
 333 Ellicott Street  
 Buffalo, NY 14203

NAME OF BIDDER: \_\_\_\_\_

If you are submitting other Invitations to Bid, each bid must be enclosed in a separate envelope.

Following EXHIBITS are attached to and made a part of the bid specifications, and part of any agreement entered into pursuant to this Invitation to Bid:

- X EXHIBIT "A" - Assignment of Public Contracts
- X EXHIBIT "B" - Purchases by Other Local Governments or Special Districts
- X EXHIBIT "C" - Construction/Reconstruction Contracts
- EXHIBIT "D" - Bid Bond (Formal Bid)
- N/A EXHIBIT "E" - Bid Bond (Informal Bid)
- X EXHIBIT "F" - Standard Agreement
- X EXHIBIT "G" - Non-Collusive Bidding Certification
- X EXHIBIT "H" - MBE/ WBE Commitment
- X EXHIBIT "IC" - Insurance **CLASSIFICATION "A"**
- X EXHIBIT "P" & EXHIBIT "PBI" - Performance Bond 100%
- EXHIBIT "Q" - Confined Space Program Certification

(Rev. 1/00)

**County of Erie**  
**DIVISION OF PURCHASE**  
**NON-COLLUSIVE BIDDING CERTIFICATION**

By submission of this bid, each bidder and each person signing on behalf of any bidder certifies, and in the case of a joint bid each party thereto certifies as to its own organization, under penalty of perjury, that to the best of his knowledge and belief:

- (1) the prices in this bid have been arrived at independently without collusion, consultation, communication, or agreement, for the purpose of restricting competition, as to any matter relating to such prices with any other bidder or any competitor;
- (2) unless otherwise required by law, the prices which have been quoted in this bid have not been knowingly disclosed by the bidder and will not knowingly be disclosed by the bidder prior to opening, directly or indirectly, to any other bidder or to any competitor; and
- (3) no attempt has been made or will be made by the bidder to induce any other person, partnership or corporation to submit or not to submit a bid for the purpose of restricting competition.

**NOTICE**

(Penal Law, Section 210.45)

IT IS A CRIME, PUNISHABLE AS A CLASS A MISDEMEANOR UNDER THE LAWS OF THE STATE OF NEW YORK, FOR A PERSON, IN AND BY A WRITTEN INSTRUMENT, TO KNOWINGLY MAKE A FALSE STATEMENT, OR TO MAKE A FALSE STATEMENT, OR TO MAKE A STATEMENT WHICH SUCH PERSON DOES NOT BELIEVE TO BE TRUE.

**BID NOT ACCEPTABLE WITHOUT FOLLOWING CERTIFICATION:**

Affirmed under penalty of perjury this 26th day of April, 20 12

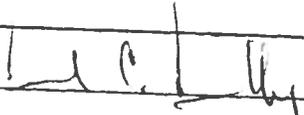
TERMS Net 10 DELIVERY DATE AT DESTINATION \_\_\_\_\_

FIRM NAME Ferguson Electric Service Co., Inc.

ADDRESS 321 Ellicott Street

Buffalo, New York

ZIP 14203

AUTHORIZED SIGNATURE 

TYPED NAME OF AUTHORIZED SIGNATURE Paul C. Reilly

TITLE President TELEPHONE NO. 716-853-3321

**FOR BID #212127-002**

**ATTENTION VENDORS**

There will be a **MANDATORY** pre-bid Conference/Inspection of this project for **ALL** prospective vendors. Erie County personnel will be on hand to conduct an on-site walk through of this facility and to answer any questions pertaining to this project.

**ATTENDANCE IS MANDATORY.** No bids will be accepted from vendors not in attendance.

Vendors are to meet at Erie County Southtown's Wastewater Treatment Plant, General Office, 3690 Lakeshore Road, Buffalo, NY 14219 **on Friday, April 13 @ 9AM.**

Vendors may contact the Treatment Plant at (716) 823-8188 for directions.

**County of Erie**  
**DIVISION OF PURCHASE**  
**BID SPECIFICATIONS**

BID NO 212127-002

Address: E.C. Wastewater Treatment Plant  
 3690 Lakeshore Road  
 Buffalo, NY 14219

Ship Via: N/A  
 Date Required at Destination: AS REQUESTED

ITEM NO.	QUAN-TITY	UM	CATALOG NO./DESCRIPTION	UNIT PRICE	TOTAL PRICE
			To cover the complete cost of a three (3) year Electrical		
			Distribution System Preventive Maintenance Program at:		
			Erie County Sewer District #3, Southtown's Wastewater		
			Treatment Plant, 3690 Lakeshore Road, Buffalo, NY 14219.		
			NYS Prevailing wage applies. Reference PRC #2012002758.		
			Contract period is May 17, 2012 thru May 16, 2015. Vendors		
			are required to provide a price for each year. The contract will		
			be awarded to the vendor with the lowest total price for all		
			three (3) years combined. USE PRICE SHEET ON PAGE 2A.		
			<b>NOTE:</b> All interested vendors must attend a mandatory pre-bid		
			meeting to be held on Friday, April 13, 2012 @ 9AM at the Erie		
			County Southtown's Wastewater Treatment Plant, General Office,		
			3690 Lakeshore Road, Buffalo, NY 14219.		

**NOTE:** Bid results cannot be given over the phone. All requests for bid results should be submitted in writing or faxed to:

**ERIE COUNTY DIVISION OF PURCHASE**  
 Freedom of Information Officer  
 95 Franklin Street, Rm. 1254  
 Buffalo, NY 14202  
 FAX #: 716/858-6465

**TOTAL NET BID DELIVERED INSIDE** \$52,464.00

**NAME OF BIDDER** Ferguson Electric Service Co., Inc.

(Rev. 9/95)

ERIE COUNTY OFFICE BUILDING, 95 FRANKLIN STREET, BUFFALO, NEW YORK 14202 (716) 858-6336

COUNTY OF ERIE, NEW YORK  
DIVISION OF PURCHASING  
BID NUMBER: 212127-002

PAGE 2A OF 6 PAGES  
95 FRANKLIN STREET – ROOM 1254  
BUFFALO, NY 14202

**BID #212127-002 – VENDOR PRICE SHEET  
(MUST SUBMIT YOUR BID USING THIS SHEET)**

**This contract will be in effect from May 17, 2012 thru May 16, 2015.**

**Please provide a price for each year of the contract:**

**May 2012 – May 2013** \$ 22,516.00

**May 2013 – May 2014** \$ 14,553.00

**May 2014 – May 2015** \$ 15,395.00

**TOTAL** \$ 52,464.00

**NAME OF BIDDER** Ferguson Electric Service Co., Inc.

Note:

Attachment #1

Names of Testing Organization Personnel as requested by the Bid Specification.

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## Standard Specification Form

### Electrical Maintenance Tests

#### 1. GENERAL SCOPE

1. The owner shall engage the services of a recognized independent testing firm for the purpose of performing inspections, tests and test data evaluation as herein specified.
2. The testing firm shall provide all material, equipment, labor and technical supervision to perform such tests and inspections.
3. It is the purpose of these specifications to assure that all tested electrical equipment and systems are operational and within industry and manufacturer's tolerances. All lists of equipment to be maintained has been attached and should be included as part of this specification.
4. Communication between the owner and service provider is of utmost importance. Plant uptime is required 24/7. Any power outage must be planned and approved by the owner. Where power down conditions cannot be avoided and required for the maintenance specified, specific time intervals and durations of work will be required to complete the task..

#### (3) YEAR ELECTRICAL PREVENTIVE MAINTENANCE SCOPE

##### Year #1

- Infrared Thermographic Inspection of the Southtowns Wastewater Treatment Plant Electrical Distribution System (2 days plus report generation). Southtowns Waste Water Treatment Plant will provide qualified electricians to remove and replace equipment covers as required.
- Visual Inspection of Southtowns Waste Water Treatment Plant Electrical Distribution System.
- Two (2) transformer oil sample and analysis. Analysis will include
  - Gas in Oil Analysis
  - Water Content
  - Acid Content
  - Interfacial Tension
  - Color Analysis
  - Dielectric Strength
  - Specific Gravity
  - PCB Content
- Inspection, testing of the batteries and charger located in the main outdoor switchgear, and generator switchgear.

- De-energized preventive maintenance of the main 15kV outdoor switchgear including:
  - All switchgear sections
  - All 15kV circuit breakers
  - All current and potential devices
  - All auxiliary devices
- De-energized preventive maintenance of the (2) main 15/2.4kV transformers.
- De-energized preventive maintenance of the 2.4kV outdoor switchgear including:
  - All switchgear sections
  - (2) Main 2.4kV circuit breakers
  - (1) Tie 2.4kV circuit breaker
  - (2) Feeder 2.4kV circuit breakers (1) spare, (1) Gen
- De-energized preventive maintenance of the 2.4kV switchgear including:
  - All switchgear sections
  - (4) 2.4kV circuit breakers
  - (2) 2.4kV Generator Switchgear
  - Capacitor Bank
  - All current and potential devices

## Year #2

- Infrared Thermographic Inspection of the Southtowns Wastewater Treatment Plant Electrical Distribution System (2 days plus report generation). South Towns Waste Water Treatment Plant will provide qualified electricians to remove and replace equipment covers as required.
- Visual Inspection of your facilities Electrical Distribution System.
- Two (2) transformer oil sample and analysis. Analysis will include
  - Gas in Oil Analysis
  - Water Content
  - Acid Content
  - Interfacial Tension
  - Color Analysis
  - Dielectric Strength
  - Specific Gravity
  - PCB Content
- Inspection, testing of the batteries and charger located in the main outdoor switchgear, and generator switchgear.
- Inspection, testing and calibration of all of the protective relays in the main 15kV switchgear, 2.4kV outdoor switchgear, 2.4kV generator switchgear and 2400 volt Motor Control Centers.
- De-energized preventive maintenance of the 2400 volt motor control centers including:
  - (2) Main disconnect switches
  - (9) 2400 volt starters and accessories
  - All current and potential devices
- De-energized preventive maintenance of the (2) 2.4kV circuit breakers in the 2.4kV switchgear that feed the Motor Control Centers.

Year #3

- Infrared Thermographic Inspection of the Southtowns Wastewater Treatment Plant Electrical Distribution System (2 days plus report generation). South Towns Waste Water Treatment Plant will provide qualified electricians to remove and replace equipment covers as required.
- Visual Inspection of your facilities Electrical Distribution System.
- Two (2) transformer oil sample and analysis. Analysis will include
  - Gas in Oil Analysis
  - Water Content
  - Acid Content
  - Interfacial Tension
  - Color Analysis
  - Dielectric Strength
  - Specific Gravity
  - PCB Content
- Inspection, testing of the batteries and charger located in the main outdoor switchgear, and generator switchgear.
- De-energized preventive maintenance of the 2.4kV/480 volt substations including:
  - (2) Fused load interrupter switches
  - (2) Dry type 1500kVa transformers
  - Lot 480 volt switchgear
  - (17) Draw-out circuit breakers.
  - All current and potential devices

Notes:

1. The coordination for the required utility line outages is the responsibility of the testing firm.
2. Power outages to accommodate maintenance must be done to accommodate the schedule and requirements of Southtowns Waste Water Treatment Plant. Power outages may be limited in duration.
3. All equipment switching for preventive maintenance will be the responsibility of the testing firm.

## 2. APPLICABLE REFERENCES

### 2.1 Codes, Standards, and Specifications (cont).

All inspections and field tests shall be in accordance with the latest edition of the following codes, standards, and specifications except as provided otherwise herein.

1. American National Standards Institute – ANSI
2. American Society for Testing and Materials - ASTM
  - ASTM D 92 *Test Method for Flash and Fire Points by Cleveland Open Cup*
  - ASTM D 445 *Test Method for Kinematic Viscosity of Transparent and Opaque Liquids*
  - ASTM D 664 *Test Method for Acid Number of Petroleum Products by Potentiometric Titration*
  - ASTM D 877 *Test Method for Dielectric Breakdown Voltage of Insulating Liquids using Disk Electrodes*
  - ASTM D 923 *Test Method for Sampling Electrical Insulating Liquids*
  - ASTM D 924 *Test Method for A-C Loss Characteristics and Relative Permittivity (Dielectric Constant) of Electrical Insulating Liquids*
  - ASTM D 971 *Test Method for Interfacial Tension of Oil against Water by the Ring Method*
  - ASTM D 974 *Test Method for Acid and Base Number by Color-Indicator Titration*
  - ASTM D 1298 *Test Method for Density, Relative Density (Specific Gravity), or API Gravity of Crude Petroleum and Liquid Petroleum Products by Hydrometer Method*
  - ASTM D 1500 *Test Method for ASTM Color of Petroleum Products (ASTM Color Scale)*
  - ASTM D 1524 *Test Method for Visual Examination of Used Electrical Insulating Oils of Petroleum Origin in the Field*
  - ASTM D 1533 *Test Methods for Water in Insulating Liquids (Karl Fischer Reaction Method)*
  - ASTM D 1816 *Test Method for Dielectric Breakdown Voltage of Insulating Oils of Petroleum Origin Using VDE Electrodes*
  - ASTM D 2029 *Test Methods for Water Vapor Content of Electrical Insulating cases by Measurement of Dew Point*
  - ASTM D 2129 *Test Method for Color of Chlorinated Aromatic Hydrocarbons (Askarels)*
  - ASTM D 2284 *Test Method of Acidity of Sulfur Hexafluorid*

## 2. APPLICABLE REFERENCES

### 2.1 Codes, Standards, and Specifications (cont).

- ASTM D 2285 *Test Method for Interfacial Tension of Electrical Insulating Oils of Petroleum Origin against Water by the Drop-Weight Method*
- ASTM D 2477 *Test Method for Dielectric Breakdown Voltage and Dielectric Strength of Insulating Gases at Commercial Power Frequencies*
- ASTM D 2685 *Test Method for Air and Carbon Tetrafluoride in Sulfur Hexafluoride by Gas Chromatography*
- ASTM D 2759 *Method for Sampling Gas from a Transformer under Positive Pressure*
- ASTM D 3284 *Test Method for combustible Gases in Electrical Apparatus in the Field*
- ASTM D 3612 *Test Method of Analysis of Gases Dissolved in Electrical Insulating Oil by Gas Chromatography*
- ASTM D 3613 *Methods of Sampling Electrical Insulating Oils for Gas Analysis and Determination of Water Content*
3. Association of Edison Illuminating Companies - AEIC
4. Canadian Standards Association - CSA
5. Electrical Apparatus Service Association - EASA
- ANSI/EASA AR 100 *Recommended Practice for the Repair of Rotating Electrical Apparatus*
6. Institute of Electrical and Electronic Engineers - IEEE
- ANSI/IEEE C2 *National Electrical Safety Code*
- ANSI/IEEE C37 *Guides and Standards for Circuit Breakers, Switchgear, Relays, Substations, and Fuses*
- ANSI/IEEE C57 *Distribution, Power, and Regulating Transformers*
- ANSI/IEEE C62 *Surge Protection*
- ANSI/IEEE Std. 43 *IEEE Recommended Practice for Testing Insulation Resistance of Rotating Machinery*
- ANSI/IEEE Std. 48 *Standard Test Procedures and Requirements for Alternating-Current Cable Terminations 2.5 kV through 765 kV*

## 2. APPLICABLE REFERENCES

### 2.1 Codes, Standards, and Specifications (cont).

IEEE Std. 81 *IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System (Part I)*

ANSI/IEEE Std. 81.2 *IEEE Guide for Measurement of Impedance and Safety Characteristics of Large, Extended or Interconnected Grounding Systems (Part 2)*

ANSI/IEEE Std. 95 *IEEE Recommended Practice for Insulation Testing of Large AC Rotating Machinery with High Direct Voltage*

IEEE Std. 100 *The IEEE Standard Dictionary of Electrical and Electronics Terms*

IEEE Std. 141 *IEEE Recommended Practice for Electrical Power Distribution for Industrial Plants (IEEE Red Book)*

ANSI/IEEE Std. 142 *IEEE Recommended Practice for Grounding of Industrial and Commercial Power Systems (IEEE Green Book)*

ANSI/IEEE Std. 241 *IEEE Recommended Practice for Electric Power Systems in Commercial Buildings (Gray Book)*

ANSI/IEEE Std. 242 *IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems (Buff Book)*

IEEE 386 *IEEE Standard for Separable Insulated Connectors System for Power Distribution Systems above 600 V*

ANSI/IEEE Std. 399 *IEEE Recommended Practice for Industrial and Commercial Power Systems Analysis (Brown Book)*

ANSI/IEEE Std. 400 *IEEE Guide for Making High-Direct-Voltage Tests on Power Cable Systems in the Field*

ANSI/IEEE Std. 421B *IEEE Standard for High-Potential-Test Requirements for Excitation Systems for Synchronous Machines*

ANSI/IEEE Std. 446 *IEEE Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications (Orange Book)*

ANSI/IEEE Std. 450 *IEEE Recommended Practice for Maintenance, Testing, and Replacement of Vented Lead-Acid Batteries for Stationary Applications*

ANSI/IEEE Std. 493 *IEEE Recommended Practice for the Design of Reliable Industrial and Commercial Power Systems (Gold Book)*

## 2. APPLICABLE REFERENCES

### 2.1 Codes, Standards, and Specifications (cont).

ANSI/IEEE Std 519 IEEE *Recommended Practices and Requirements for Harmonic Control in Electrical Power Systems*

ANSI/IEEE Std. 602 IEEE *Recommended Practice for Electric Systems in Health Care Facilities (White Book)*

ANSI/IEEE Std. 637 IEEE *Guide for the Reclamation of Insulating Oil and Criteria for Its Use*

ANSI/IEEE Std. 739 IEEE *Recommended Practice for Energy Management in Commercial and Industrial Facilities (Bronze Book)*

ANSI/IEEE Std. 902 IEEE *Guide for Maintenance, Operation, and Safety of Industrial and Commercial Power Systems (Yellow Book)*

IEEE Std. 1015 IEEE *Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems (Blue Book)*

IEEE Std. 1100 IEEE *Recommended Practice for Powering and Grounding Sensitive Electronic Equipment (Emerald Book)*

ANSI/IEEE Std. 1106 IEEE *Recommended Practice for Maintenance, Testing, and Replacement of Nickel-Cadmium Storage Batteries for Generating Stations and Substations*

ANSI/IEEE Std. 1159 *Recommended Practice for Monitoring Electric Power Quality*

ANSI/IEEE Std. 1188 *Recommended Practice for Maintenance, Testing, and Replacement of Valve-Regulated Lead-Acid (VRLA) Batteries for Stationary Applications*

7. Insulated Cable Engineers Association - ICEA

8. InterNational Electrical Testing Association - NETA

ANSI/NETA ETT *Standard for Certification of Electrical Testing Technicians*

NETA ATS *Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems*

9. National Electrical Manufacturer's Association - NEMA

NEMA AB4 *Guidelines for Inspection and Preventive Maintenance of Molded-Case Circuit Breakers Used in Commercial and Industrial Applications*

ANSI/NEMA 84.1 *Electrical Power Systems and Equipment Voltage Ratings (60 Hz)*

NEMA MG1 *Motors and Generators*

2. **APPLICABLE REFERENCES**

2.1 **Codes, Standards, and Specifications (cont).**

10. National Fire Protection Association - NFPA
  - ANSI/NFPA 70 National Electrical Code*
  - ANSI/NFPA 70B Recommended Practice for Electric Equipment Maintenance*
  - ANSI/NFPA 70E Electrical Safety Requirements for Employee Workplaces*
  - ANSI/NFPA 99 Standard for Healthcare Facilities*
  - ANSI/NFPA 101 Life Safety Code*
  - ANSI/NFPA 110 Emergency and Standby Power Systems*
  - ANSI/NFPA 780 Installation of Lightning Protection Systems*
11. Occupational Safety and Health Administration - OSHA
12. Scaffold Industry Association - SIA
  - ANSI/SIA A92.2 Vehicle Mounted Elevating and Rotating Aerial Devices*
13. State and local codes and ordinances
14. Underwriters Laboratories, Inc. - UL

### 3. QUALIFICATIONS OF TESTING ORGANIZATION AND PERSONNEL

#### 3.1 Testing Organization

- 3.1. The testing firm shall be an independent testing organization.
- 3.2. The testing firm shall be regularly engaged in the testing of electrical equipment devices, installations, and systems.
- 3.3. The testing firm must have a full-time Field Safety Inspector that is an employee of the company. The Field Safety Inspector is to perform safety inspections while the Electrical Preventive Maintenance is taking place. A signed copy of every field safety inspection must be made part of the final report each year.
- 3.4. The testing firm must have a full-time Electrical Professional Engineer that is an employee of the company. The Professional Engineer will be required to review, approve and stamp the final test data and recommendations that will be provided each year.
- 3.5. The testing firm shall utilize technicians who are regular full-time employees employed by the firm for testing services. Hiring 3<sup>rd</sup> party test firms that are not regular employees of your company is not acceptable.
- 3.6. The testing firm shall submit proof of the above qualifications with bid documents. The Lead Service Technician, Field Safety Inspector and Professional Engineer must be listed by name in the proposal. Failure to submit proof of the qualifications called for here in will result in disqualification of the bid.
- 3.7. Final payment will be held on this project until all of the above criteria are met including copies of safety inspections and P.E. stamps on the reports.

#### 4. DIVISION OF RESPONSIBILITY

- 4.1. The owner shall supply a suitable and stable source of electrical power to each test site. The testing firm shall specify the specific power requirements.
- 4.2. The owner shall notify the testing firm when equipment becomes available for maintenance tests. Work shall be coordinated to expedite project scheduling.
- 4.3. The testing firm shall notify the owner prior to commencement of any testing.
- 4.4. Any system, material, or workmanship which is found defective on the basis of maintenance tests shall be reported including recommended corrective actions.
- 4.5. The testing firm shall maintain a written record of all tests and shall assemble and certify a final test report. The certification must be done by an Electrical P.E. (See Section 3.4 of this specification).

## 5. GENERAL

All parties involved must be cognizant of industry-standard safety procedures. This document does not include any procedures, including specific safety procedures. It is recognized that an overwhelming majority of the tests and inspections recommended in this standard are potentially hazardous. Individuals performing these tests shall be capable of conducting the tests in a safe manner and with complete knowledge of the hazards involved.

### 5.1 Safety and Precautions

1. Safety practices shall include, but are not limited to, the following requirements:
  1. All applicable provisions of the Occupational Safety and Health Act, particularly OSHA 29CFR 1910.
  2. Accident Prevention Manual for Industrial Operations, National Safety Council.
  3. Applicable state and local safety operating procedures.
  4. Owner's safety practices.
  5. ANSI/NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces.
2. A safety lead person shall be identified prior to commencement of work.
3. A safety briefing shall be conducted prior to the commencement of work.
4. All tests shall be performed with the apparatus de-energized and grounded except where otherwise specifically required to be ungrounded or energized for certain tests.
5. The testing organization shall have a designated safety representative on the project to supervise operations with respect to safety. This individual may be the same person described in 5.1.2. Documentation testifying to the qualifications must be submitted with the bid documents.

### 5.2 Suitability of Test Equipment

1. All test equipment shall be in good mechanical and electrical condition.
2. Split-core current transformers and clamp-on or tong-type ammeters require careful consideration of the following in regard to accuracy:
  1. Position of the conductor within the core
  2. Clean, tight fit of the core pole faces
  3. Presence of external fields
  4. Accuracy of the current transformer ratio in addition to the accuracy of the secondary meter.

## 5. GENERAL

3. Selection of metering equipment should be based on a knowledge of the waveform of the variable being measured. Digital multimeters may be average or rms sensing and may include or exclude the dc component. When the variable contains harmonics or dc offset and, in general, any deviation from a pure sine wave, average sensing, rms scaled meters may be misleading.
4. Field test metering used to check power system meter calibration must have an accuracy higher than that of the instrument being checked.
5. Accuracy of metering in test equipment shall be appropriate for the test being performed but not in excess of two percent of the scale used.
6. Waveshape and frequency of test equipment output waveforms shall be appropriate for the test and the tested equipment.

### 5.3 Test Instrument Calibration

1. The testing firm shall have a calibration program which assures that all applicable test instruments are maintained within rated accuracy.
2. The accuracy shall be directly traceable to the National Institute of Standards and Technology (NIST).
3. Instruments shall be calibrated in accordance with the following frequency schedule:
  1. Field instruments: Analog, 6 months maximum. Digital, 12 months maximum.
  2. Laboratory instruments: 12 months
4. Dated calibration labels shall be visible on all test equipment
5. Records, which show date and results of instruments calibrated or tested, must be kept up-to-date and must be part of the yearly field service report.
6. Up-to-date instrument calibration instructions and procedures shall be maintained for each test instrument.
7. Calibrating standard shall be of higher accuracy than that of the instrument tested.

## 5. GENERAL

### 5.4 Test Report

- i. The test report shall include the following:
  1. Summary of project.
  2. Description of equipment tested.
  3. Description of tests.
  4. Test data.
  5. Analysis and recommendations.
- ii. Test data records shall include the following minimum requirements:
  1. Identification of the testing organization.
  2. Equipment identification.
  3. Humidity, temperature, and other conditions that may affect the results of the tests/calibrations.
  4. Date of inspections, tests, maintenance, and/or calibrations.
  5. Identification of the testing technician.
  6. Indication of inspections, tests, maintenance, and/or calibrations to be performed and recorded.
  7. Indication of expected results when calibrations are to be performed.
  8. Indication of "as-found" and "as-left" results, as applicable.
  9. Sufficient spaces to allow all results and comments to be indicated.
- iii. The testing organization shall furnish a copy or copies of the complete report to the owner as specified in the maintenance testing contract.

## 7. INSPECTION AND TEST PROCEDURES

### 7.1 Switchgear and Switchboard Assemblies

#### 1. Visual and Mechanical Inspection

1. Inspect physical, electrical, and mechanical condition including evidence of moisture or corona.
2. Inspect anchorage, alignment, grounding, and required area clearances.
3. Prior to cleaning the unit, perform as-found tests, if required.
4. Clean the unit.
5. Verify that fuse and/or circuit breaker sizes and types correspond to drawings and coordination study as well as to the circuit breaker's address for microprocessor-communication packages.
6. Verify that current and voltage transformer ratios correspond to drawings.
7. Inspect bolted electrical connections for high resistance using one of the following methods:
  1. Use of low-resistance ohmmeter in accordance with Section 7.1.2.3.
  2. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or Table 10.12.
  3. Perform thermographic survey in accordance with Section 9.
8. Confirm correct operation and sequencing of electrical and mechanical interlock systems.
  1. Attempt closure on locked-open devices. Attempt to open locked-closed devices.
  2. Make key exchange with devices operated in off-normal positions.
9. Lubrication requirements
  1. Use appropriate lubrication on moving current-carrying parts.
  2. Use appropriate lubrication on moving and sliding surfaces.
10. Perform as-left tests.
11. Inspect insulators for evidence of physical damage or contaminated surfaces.
12. Verify correct barrier and shutter installation and operation.
13. Exercise all active components.
14. Inspect mechanical indicating devices for correct operation.

## 7. INSPECTION AND TEST PROCEDURES

### 7.1 Switchgear and Switchboard Assemblies (cont.)

15. Verify that filters are in place and/or vents are clear.
16. Perform visual and mechanical inspection of instrument transformers in accordance with Section 7.10.
17. Inspect control power transformers.
  1. Inspect for physical damage, cracked insulation, broken leads, tightness of connections, defective wiring, and overall general condition.
  2. Verify that primary and secondary fuse ratings or circuit breakers match drawings.
  3. Verify correct functioning of drawout disconnecting and grounding contacts and interlocks.

### 2. Electrical Tests

1. Perform electrical tests on instrument transformers in accordance with Section 7.10.
2. Perform ground-resistance tests in accordance with Section 7.13.
3. Perform resistance measurements through bolted electrical connections with a low-resistance ohmmeter, if applicable, in accordance with Section 7.1.1.
4. Perform insulation-resistance tests on each bus section, phase-to-phase and phase-to-ground, for one minute in accordance with Table 10.1.
5. Perform system function tests in accordance with Section 8.
6. Control Power Transformers
  1. Perform insulation-resistance tests. Perform measurements from winding-to-winding and each winding-to-ground. Test voltages shall be in accordance with Table 10.1 unless otherwise specified by manufacturer.
  2. Verify correct function of control transfer relays located in switchgear with multiple power sources.
7. Voltage Transformers
  1. Perform insulation-resistance tests. Perform measurements from winding-to-winding and each winding-to-ground. Test voltages shall be in accordance with Table 10.1 unless otherwise specified by manufacturer.
  2. Verify secondary voltages.
8. Verify operation of switchgear/switchboard heaters.

### 3. Test Values

1. Compare bus connection resistances to values of similar connections.

## 7. INSPECTION AND TEST PROCEDURES

### 7.1 Switchgear and Switchboard Assemblies (cont.)

2. Bolt-torque levels should be in accordance with Table 10.12 unless otherwise specified by manufacturer.
3. Microhm or millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. If manufacturer's data is not available, investigate any values which deviate from similar bus by more than 50 percent of the lowest value.
4. Insulation-resistance values for bus and control power transformers shall be in accordance with manufacturer's published data. In the absence of manufacturer's published data, use Table 10.1. Values of insulation resistance less than this table or manufacturer's minimum should be investigated. Overpotential tests should not proceed until insulation-resistance levels are raised above minimum values.
5. Bus insulation shall withstand the overpotential test voltage applied.
6. Control wiring minimum insulation-resistance values should be comparable to previously obtained results but not less than two megohms.

## 7. INSPECTION AND TEST PROCEDURES

### 7.2.1.2 Transformers, Dry Type, Air-Cooled, Large (cont.)

NOTE: This category consists of power transformers with windings rated higher than 600 volts and low-voltage transformers larger than 167 kVA single-phase or 500 kVA three-phase.

#### 1. Visual and Mechanical Inspection

1. Inspect physical and mechanical condition including evidence of moisture and corona.
2. Inspect anchorage, alignment, and grounding.
3. Prior to cleaning the unit, perform as-found tests, if required.
4. Clean the unit.
5. Verify that control and alarm settings on temperature indicators are as specified.
6. Verify that cooling fans operate.
7. Inspect bolted electrical connections for high resistance using one of the following methods:
  1. Use of low-resistance ohmmeter in accordance with Section 7.2.1.2.2.
  2. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or Table 10.12.
  3. Perform thermographic survey in accordance with Section 9.
8. Perform specific inspections and mechanical tests as recommended by manufacturer.
9. Perform as-left tests.
10. Verify that as-left tap connections are as specified.
11. Verify the presence of surge arresters.

#### 2. Electrical Tests

1. Perform resistance measurements through bolted connections with a low-resistance ohmmeter, if applicable, in accordance with Section 7.2.1.2.1.
2. Perform insulation-resistance tests winding-to-winding and each winding-to-ground with test voltage in accordance with Table 10.5. Calculate polarization index.
3. Perform turns-ratio tests at the designated tap position.
4. Perform an excitation-current test on each phase.
5. Measure the resistance of each winding at the designated position.
6. Measure core insulation-resistance at 500 volts dc if core is insulated and if the core ground strap is removable.

## 7. INSPECTION AND TEST PROCEDURES

### 7.2.1.2 Transformers, Dry Type, Air-Cooled, Large (cont.)

7. Perform an overpotential test on all high- and low-voltage windings-to-ground. See ANSI/IEEE C57.12.91, Sections 10.2 and 10.9.
8. Verify correct secondary voltage phase-to-phase and phase-to-neutral after energization and prior to loading.
9. Test surge arresters in accordance with Section 7.19.

### 3. Test Values

1. Compare bolted connection resistances to values of similar connections.
2. Bolt-torque levels should be in accordance with Table 10.12 unless otherwise specified by manufacturer.
3. Microhm or millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. If manufacturer's data is not available, investigate any values which deviate from similar connections by more than 50 percent of the lowest value.
4. Insulation-resistance test values at one minute should be in accordance with Table 10.5.
5. The polarization index shall be compared to previously obtained results and should not be less than 1.0.
6. Turns-ratio test results should not deviate more than one-half percent from either the adjacent coils or the calculated ratio.
7. Temperature corrected winding-resistance test results should compare within one percent of previously obtained results.
8. Core insulation-resistance values should be comparable to previously obtained results but not less than one megohm at 500 volts dc.

AC overpotential test shall not exceed 65 percent of factory test voltage for one minute duration.

DC overpotential test shall not exceed 100 percent of the ac rms test voltage specified in ANSI C57.12.91, Section 10.2 for one minute duration. The insulation should withstand the overpotential test voltage applied.

## 7. INSPECTION AND TEST PROCEDURES

### 7.2.2 Transformers, Liquid-Filled (cont.)

#### 1. Visual and Mechanical Inspection

1. Inspect physical and mechanical condition.
2. Inspect anchorage, alignment, and grounding.
3. Verify the presence of PCB labeling.
4. Perform as-found tests, if required.
5. Clean bushings and control cabinets.
6. Verify that alarm, control, and trip settings on temperature indicators are as specified.
7. Verify that cooling fans and/or pumps operate correctly.
8. Verify operation of alarm, control, and trip circuits from temperature and level indicators, pressure relief device, and fault pressure relay, if applicable.
9. Inspect bolted electrical connections for high resistance using one of the following methods:
  1. Use of low-resistance ohmmeter in accordance with Section 7.2.2.2.
  2. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or Table 10.12.
  3. Perform thermographic survey in accordance with Section 9.
10. Verify correct liquid level in tanks and bushings.
11. Verify that positive pressure is maintained on gas-blanketed transformers.
12. Perform inspections and mechanical tests as recommended by the manufacturer.
13. Test load tap-changer in accordance with Section 7.12, if applicable.
14. Verify the presence of transformer surge arresters.
15. Perform as-left tests.

## 7. INSPECTION AND TEST PROCEDURES

### 7.2.2 Transformers, Liquid-Filled (cont.)

#### 2. Electrical Tests

1. Perform resistance measurements through bolted connections with a low-resistance ohmmeter, if applicable, in accordance with Section 7.2.2.1.
2. Perform insulation-resistance tests, winding-to-winding and each winding-to-ground, with test voltage in accordance with Table 10.5. Calculate polarization index.
3. Perform turns-ratio tests at the designated tap position.
4. Perform insulation power-factor or dissipation-factor tests on all windings in accordance with test equipment manufacturer's published data.
5. Perform power-factor or dissipation-factor tests or hot collar watts-loss tests on bushings in accordance with test equipment manufacturer's published data.
6. Perform excitation-current tests in accordance with test equipment manufacturer's published data.
7. Measure the resistance of each winding at the designated tap position.
8. If core ground strap is accessible, remove and measure core insulation resistance at 500 volts dc.
9. Measure the percentage of oxygen in the gas blanket, if applicable.
10. Remove a sample of insulating liquid in accordance with ASTM D 923. Sample shall be tested for the following.
  1. Dielectric breakdown voltage: ASTM D 877 and/or ASTM D 1816
  2. Acid neutralization number: ANSI/ASTM D 974
  3. Specific gravity: ANSI/ASTM D 1298
  4. Interfacial tension: ANSI/ASTM D 971 or ANSI/ASTM D 2285
  5. Color: ANSI/ASTM D 1500
  6. Visual Condition: ASTM D 1524
  7. Water in insulating liquids: ASTM D 1533. (Required on 25 kV or higher voltages and on all silicone-filled units.)
  8. Measure power-factor or dissipation-factor in accordance with ASTM D 924.
11. Remove a sample of insulating liquid in accordance with ASTM D 3613 and perform dissolved-gas analysis (DGA) in accordance with ANSI/IEEE C57.104 or ASTM D3612.
12. Test instrument transformers in accordance with Section 7.10.
13. Test surge arresters in accordance with Section 7.19.
14. Test transformer neutral grounding impedance devices, if applicable.

## 7. INSPECTION AND TEST PROCEDURES

### 7.2.2 Transformers, Liquid-Filled (cont.)

#### 3. Test Values

1. Compare bolted connection resistances to values of similar connections.
2. Bolt-torque levels should be in accordance with Table 10.12 unless otherwise specified by the manufacturer.
3. Microhm or millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. If manufacturer's data is not available, investigate any values which deviate from similar connections by more than 50 percent of the lowest value.
4. Insulation-resistance test values at one minute should be in accordance with Table 10.5.
5. The polarization index should be compared to previously obtained results and not be less than 1.0.
6. Turns-ratio test results shall not deviate by more than one-half percent from either the adjacent coils or the calculated ratio.
7. Maximum power factor of liquid-filled transformers corrected to 20°C shall be in accordance with transformer manufacturer's published data. Representative values are indicated in Table 10.3.
8. Investigate bushing power factors and capacitances that vary from nameplate values by more than ten percent. Investigate any bushing hot collar watts-loss results that exceed the test equipment manufacturer's published data.
9. Typical excitation-current test data pattern for a three-legged core transformer is two similar current readings and one lower current reading.
10. Temperature corrected winding-resistance measurements should compare within one percent of previously obtained results.
11. Core insulation values should be comparable to previously obtained results but not less than one megohm at 500 volts dc.
12. Investigate presence of oxygen in the nitrogen gas blanket.
13. Insulating liquid test results shall be in accordance with Table 10.4.
14. Evaluate results of dissolved-gas analysis in accordance with ANSI/IEEE Standard C57.104.
15. Compare grounding impedance device results to previously obtained results. In the absence of previously obtained results, compare to manufacturer's published data.

## 7. INSPECTION AND TEST PROCEDURES

### 7.5.1.2 Switches, Air, Medium-Voltage, Metal-Enclosed

#### 1. Visual and Mechanical Inspection

1. Inspect physical and mechanical condition.
2. Inspect anchorage, alignment, grounding, and required area clearances.
3. Prior to cleaning the unit, perform as-found tests, if required.
4. Clean the unit.
5. Verify correct blade alignment, blade penetration, travel stops, and mechanical operation.
6. Verify that fuse sizes and types are in accordance with drawings, short-circuit studies, and coordination study.
7. Verify that expulsion-limiting devices are in place on all holders having expulsion-type elements.
8. Verify that each fuseholder has adequate mechanical support and contact integrity.
9. Inspect bolted electrical connections for high resistance using one of the following methods:
  1. Use of low-resistance ohmmeter in accordance with Section 7.5.1.2.2.
  2. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or Table 10.12.
  3. Perform thermographic survey in accordance with Section 9.
10. Test all interlocking systems for correct operation and sequencing.
11. Compare switchblade clearances with industry standards.
12. Verify all indicating and control devices for correct operation.
13. Lubrication requirements
  1. Use appropriate lubrication on moving current-carrying parts.
  2. Use appropriate lubrication on moving and sliding surfaces.
14. Perform as-left tests.

## 7. INSPECTION AND TEST PROCEDURES

### 7.5.1.2 Switches, Air, Medium-Voltage, Metal-Enclosed (cont.)

#### 2. Electrical Tests

1. Perform resistance measurements through bolted connections with a low-resistance ohmmeter, if applicable; in accordance with Section 7.5.1.2.1.
2. Perform insulation-resistance tests on each pole, phase-to-phase and phase-to-ground with switch closed and across each open pole for one minute. Test voltage shall be in accordance with manufacturer's published data or Table 10.1.
3. Perform an overpotential test on each pole with switch closed. Test each pole-to-ground with all other poles grounded. Test voltage shall be in accordance with manufacturer's published data or Table 10.2.
4. Measure contact resistance across each switchblade and fuseholder.
5. Measure fuse resistance.
6. Verify operation of cubicle heaters.

#### 3. Test Values

1. Compare bolted connection resistances to values of similar connections.
2. Bolt-torque levels should be in accordance with Table 10.12 unless otherwise specified by manufacturer.
3. Microhm or millivolt drop values should not exceed the high levels of the normal range as indicated in the manufacturer's published data. If manufacturer's data is not available, investigate any values which deviate from adjacent poles or similar switches by more than 50 percent of the lowest value.
4. Insulation resistance values should be in accordance with manufacturer's published data or Table 10.1.
5. The insulation shall withstand the overpotential test voltage applied.
6. Investigate fuse resistance values that deviate from each other by more than 15 percent.

## 7. INSPECTION AND TEST PROCEDURES

### 7.6.1.2 Circuit Breakers, Air, Low-Voltage Power

#### 1. Visual and Mechanical Inspection

1. Inspect physical and mechanical condition.
2. Inspect anchorage, alignment, and grounding.
3. Verify that all maintenance devices are available for servicing and operating the breaker.
4. Prior to cleaning the unit, perform as-found tests, if required.
5. Clean the unit.
6. Inspect arc chutes.
7. Inspect moving and stationary contacts for condition, wear, and alignment.
8. Verify that primary and secondary contact wipe and other dimensions vital to satisfactory operation of the breaker are correct.
9. Perform all mechanical operator and contact alignment tests on both the breaker and its operating mechanism in accordance with manufacturer's published data.
10. Inspect bolted electrical connections for high resistance using one of the following methods:
  1. Use of low-resistance ohmmeter in accordance with Section 7.6.1.2.2.
  2. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or Table 10.12.
  3. Perform thermographic survey in accordance with Section 9.
11. Verify cell fit and element alignment.
12. Verify racking mechanism operation.
13. Lubrication requirements
  1. Use appropriate lubrication on moving current-carrying parts.
  2. Use appropriate lubrication on moving and sliding surfaces.
14. Perform as-left tests.
15. Record as-found and as-left operation counter readings, if applicable.

## 7. INSPECTION AND TEST PROCEDURES

### 7.6.1.2 Circuit Breakers, Air, Low-Voltage Power (cont.)

#### 2. Electrical Tests

1. Perform resistance measurements through bolted connections with a low-resistance ohmmeter, if applicable, in accordance with Section 7.6.1.2.1.
2. Perform insulation-resistance tests on each pole, phase-to-phase and phase-to-ground with the circuit breaker closed and across each open pole for one minute. Test voltage shall be in accordance with manufacturer's published data or Table 10.1.
3. Perform a contact/pole-resistance test.
4. Perform insulation-resistance tests on all control wiring with respect to ground. Applied potential shall be 500 volts dc for 300 volt rated cable and 1000 volts dc for 600 volt rated cable. Test duration shall be one minute. For units with solid-state components, follow manufacturer's recommendation.
5. Make adjustments to the trip settings in accordance with the coordination study.
6. Determine minimum pickup current by primary current injection.
7. Determine long-time delay by primary current injection.
8. Determine short-time pickup and delay by primary current injection.
9. Determine ground-fault pickup and delay by primary current injection.
10. Determine instantaneous pickup value by primary current injection.
11. Test functions of the trip unit by means of secondary injection.
12. Activate auxiliary protective devices, such as ground-fault or undervoltage trip devices, to insure operation of shunt trip devices. Check the operation of electrically-operated breakers in their cubicles.
13. Perform minimum pickup voltage test on shunt trip and close coils in accordance with Table 10.20.
14. Verify correct operation of any auxiliary features such as trip and pickup indicators, zone interlocking, electrical close and trip operation, trip-free, antipump function, trip unit battery condition, and reset all trip logs and indicators.
15. Verify operation of charging mechanism.

## 7. INSPECTION AND TEST PROCEDURES

### 7.6.1.2 Circuit Breakers, Air, Low-Voltage Power (cont.)

#### 3. Test Values

1. Compare bolted connection resistances to values of similar connections.
2. Bolt-torque levels should be in accordance with Table 10.12 unless otherwise specified by the manufacturer.
3. Microhm or millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. If manufacturer's data is not available, investigate any values which deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.
4. Circuit breaker insulation resistance should be in accordance with Table 10.1.
5. Control wiring minimum insulation-resistance values should be comparable to previously obtained results but not less than two megohms.
6. Trip characteristics of breakers should fall within manufacturer's published time-current tolerance bands.
7. Minimum pickup voltage on shunt trip and close coils should be in accordance with manufacturer's published data. In the absence of manufacturer's published data, refer to Table 10.20.

## 7. INSPECTION AND TEST PROCEDURES

### 7.6.1.3 Circuit Breakers, Air, Medium-Voltage

#### 1. Visual and Mechanical Inspection

1. Inspect physical and mechanical condition.
2. Inspect anchorage, alignment, and grounding.
3. Verify that all maintenance devices are available for servicing and operating the breaker.
4. Prior to cleaning the unit, perform as-found tests, if required.
5. Clean the unit.
6. Inspect arc chutes.
7. Inspect moving and stationary contacts for condition, wear, and alignment.
8. If recommended by manufacturer, slow close/open breaker and check for binding, friction, contact alignment, and penetration. Verify that contact sequence is in accordance with manufacturer's published data. In the absence of manufacturer's published data, refer to ANSI C37.04.
9. Perform all mechanical operation tests on the operating mechanism in accordance with manufacturer's published data.
10. Inspect bolted electrical connections for high resistance using one of the following methods:
  1. Use of low-resistance ohmmeter in accordance with Section 7.6.1.3.2.
  2. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or Table 10.12.
  3. Perform thermographic survey in accordance with Section 9.
11. Verify cell fit and element alignment.
12. Verify racking mechanism operation.
13. Inspect puffer operation.
14. Perform time-travel analysis.
15. Lubrication requirements
  1. Use appropriate lubrication on moving current-carrying parts.
  2. Use appropriate lubrication on moving and sliding surfaces.

## 7. INSPECTION AND TEST PROCEDURES

### 7.6.1.3 Circuit Breakers, Air, Medium-Voltage (cont.)

16. Perform as-left tests.
17. Record as-found and as-left operation-counter readings.

#### 2. Electrical Tests

1. Perform resistance measurements through bolted connections with a low-resistance ohmmeter, if applicable. See Section 7.6.1.3.1.
2. Perform insulation-resistance tests on each pole, phase-to-phase and phase-to-ground with circuit breaker closed and across each open pole for one minute. Test voltage shall be in accordance with manufacturer's published data or Table 10.1.
3. Perform a contact/pole-resistance test.
4. Perform insulation-resistance tests on all control wiring with respect to ground. Applied potential shall be 500 volts dc for 300 volt rated cable and 1000 volts dc for 600 volt rated cable. Test duration shall be one minute. For units with solid-state components or control devices that can not tolerate the applied voltage, follow manufacturer's recommendation.
5. With breaker in the test position, make the following tests:
  1. Trip and close breaker with the control switch.
  2. Trip breaker by operating each of its protective relays.
  3. Verify trip-free and antipump functions.
  4. Perform minimum pickup voltage tests on trip and close coils in accordance with Table 10.20.
6. Perform power-factor or dissipation-factor test with breaker in both the open and closed positions.
7. Perform an overpotential test in accordance with manufacturer's published data.
8. Measure blowout coil circuit resistance.
9. Verify operation of heaters.
10. Test instrument transformers in accordance with Section 7.10.

## 7. INSPECTION AND TEST PROCEDURES

### 7.6.1.3 Circuit Breakers, Air, Medium-Voltage (cont.)

#### 3. Test Values

1. Compare bolted connection resistances to values of similar connections.
2. Bolt-torque levels should be in accordance with Table 10.12 unless otherwise specified by the manufacturer.
3. Microhm or millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. If manufacturer's data is not available, investigate any values which deviate from adjacent poles or similar breakers by more than 50 percent of the lowest value.
4. Circuit breaker insulation resistance should be in accordance with Table 10.1.
5. Control wiring minimum insulation-resistance values should be comparable to previously obtained results but not less than two megohms.
6. Power-factor or dissipation-factor test results shall be compared with previous tests of similar breakers or manufacturer's published data.
7. The insulation shall withstand the overpotential test voltage applied.
8. Minimum pickup for trip and close coils should be in accordance with manufacturer's published data. In the absence of manufacturer's data, refer to Table 10.20.
9. Circuit breaker operation times should conform to manufacturer's published data.

## 7. INSPECTION AND TEST PROCEDURES

### 7.9 Protective Relays

#### 1. Visual and Mechanical Inspection

1. Inspect relays and cases for physical damage.
2. Prior to cleaning the unit, perform as-found tests.
3. Clean the unit.
4. Tighten case connections. Inspect cover for correct gasket seal. Clean cover glass. Inspect shorting hardware, connection paddles, and/or knife switches. Remove any foreign material from the case. Verify target reset.
5. Inspect relay for foreign material, particularly in disk slots of the damping and electromagnets. Verify disk clearance. Verify contact clearance and spring bias. Inspect spiral spring convolutions. Inspect disk and contacts for freedom of movement and correct travel. Verify tightness of mounting hardware and connections. Burnish contacts. Inspect bearings and/or pivots.
6. Verify that all settings are in accordance with coordination study or setting sheet supplied by owner.
7. Perform as-left tests.

#### 2. Electrical Tests

1. Perform insulation-resistance test on each circuit-to-frame. Determine from the manufacturer's published data the allowable procedures for this test for solid-state and microprocessor-based relays.
2. Inspect targets and indicators.
  1. Determine pickup and dropout of electromechanical targets.
  2. Verify operation of all light-emitting diode indicators.
  3. Set contrast for liquid-crystal display readouts.

## 7. INSPECTION AND TEST PROCEDURES

### 7.9 Protective Relays (cont.)

#### 3. Functional Operation

1. 2/62 Timing Relay
  1. Determine time delay.
  2. Verify operation of instantaneous contacts.
2. 21 Distance Relay
  1. Determine maximum reach.
  2. Determine maximum torque angle.
  3. Determine offset.
  4. Plot impedance circle.
3. 24' Volts/Hertz Relay
  1. Determine pickup frequency at rated voltage.
  2. Determine pickup frequency at a second voltage level.
  3. Determine time delay.
4. 25 Sync Check Relay
  1. Determine closing zone at rated voltage.
  2. Determine maximum voltage differential that permits closing at zero degrees.
  3. Determine live line, live bus, dead line, and dead bus set points.
  4. Determine time delay.
  5. Verify dead bus/live line, dead line/live bus and dead bus/dead line control functions.
5. 27 Undervoltage Relay
  1. Determine dropout voltage.
  2. Determine time delay.
  3. Determine the time delay at a second point on the timing curve for inverse time relays.
6. 32 Directional Power Relay
  1. Determine minimum pickup at maximum torque angle.
  2. Determine closing zone.

## 7. INSPECTION AND TEST PROCEDURES

### 7.9 Protective Relays (cont.)

3. Determine maximum torque angle.
  4. Determine time delay.
  5. Verify the time delay at a second point on the timing curve for inverse time relays.
  6. Plot the operating characteristic.
7. 40 Loss of Field (Impedance) Relay
1. Determine maximum reach.
  2. Determine maximum torque angle.
  3. Determine offset.
  4. Plot impedance circle.
8. 46 Current Balance Relay
1. Determine pickup of each unit.
  2. Determine percent slope.
  3. Determine time delay.
9. 46N Negative Sequence Current Relay
1. Determine negative sequence alarm level.
  2. Determine negative sequence minimum trip level.
  3. Determine maximum time delay.
  4. Verify two points on the  $(I_2)^2t$  curve.
10. 47 Phase Sequence or Phase Balance Voltage Relay
1. Determine positive sequence voltage to close the normally open contact.
  2. Determine positive sequence voltage to open the normally closed contact (undervoltage trip).
  3. Verify negative sequence trip.
  4. Determine time delay to close the normally open contact with sudden application of 120 percent of pickup.
  5. Determine time delay to close the normally closed contact upon removal of voltage when previously set to rated system voltage.

## 7. INSPECTION AND TEST PROCEDURES

### 7.9 Protective Relays (cont.)

11. 49R Thermal Replica Relay
  1. Determine time delay at 300 percent of setting.
  2. Determine a second point on the operating curve.
  3. Determine pickup.
12. 49T Temperature (RTD) Relay
  1. Determine trip resistance.
  2. Determine reset resistance.
13. 50 Instantaneous Overcurrent Relay
  1. Determine pickup.
  2. Determine dropout.
  3. Determine time delay.
14. 51 Time Overcurrent
  1. Determine minimum pickup.
  2. Determine time delays at two points on the time current curve.
15. 55 Power Factor Relay
  1. Determine tripping angle.
  2. Determine time delay.
16. 59 Overvoltage Relay
  1. Determine overvoltage pickup.
  2. Determine time delay to close the contact with sudden application of 120 percent of pickup.
17. 60 Voltage Balance Relay
  1. Determine voltage difference to close the contacts with one source at rated voltage.
  2. Plot the operating curve for the relay.
18. 63 Transformer Sudden Pressure Relay
  1. Determine rate-of-rise or the pickup level of suddenly applied pressure in accordance with manufacturer's specifications.

## 7. INSPECTION AND TEST PROCEDURES

### 7.9 Protective Relays (cont.)

2. Verify operation of the 63 FPX seal-in circuit.
3. Verify trip circuit to remote breaker.
19. 64 Ground Detector Relay
  1. Determine maximum impedance to ground causing relay pickup.
20. 67 Directional Overcurrent Relay
  1. Determine directional unit minimum pickup at maximum torque angle.
  2. Determine closing zone.
  3. Determine maximum torque angle.
  4. Plot operating characteristics.
  5. Determine overcurrent unit pickup.
  6. Determine overcurrent unit time delay at two points on the time current curve.
21. 79 Reclosing Relay
  1. Determine time delay for each programmed reclosing interval.
  2. Verify lockout for unsuccessful reclosing.
  3. Determine reset time.
  4. Determine close pulse duration.
  5. Verify instantaneous overcurrent lockout.
22. 81 Frequency Relay
  1. Verify frequency set points.
  2. Determine time delay.
  3. Determine undervoltage cutoff.
23. 85 Pilot Wire Monitor
  1. Determine overcurrent pickup.
  2. Determine undercurrent pickup.
  3. Determine pilot wire ground pickup level.

## 7. INSPECTION AND TEST PROCEDURES

### 7.9 Protective Relays (cont.)

#### 24. 87 Differential

1. Determine operating unit pickup.
2. Determine the operation of each restraint unit.
3. Determine slope.
4. Determine harmonic restraint.
5. Determine instantaneous pickup.
6. Plot operating characteristics for each restraint.

#### 4. Control Verification

1. Verify that each of the relay contacts performs its intended function in the control scheme including breaker trip tests, close inhibit tests, 86 lockout tests, and alarm functions.
2. For microprocessor-based relays, verify all used inputs, outputs, and internal logic.

#### 5. Test Values

1. When not otherwise specified, use manufacturer's recommended tolerances.
2. When critical test points are specified, the relay should be calibrated to those points even though other test points may be out of tolerance.

## 7. INSPECTION AND TEST PROCEDURES

### 7.10 Instrument Transformers

#### 1. Visual and Mechanical Inspection

1. Inspect physical and mechanical condition.
2. Prior to cleaning the unit, perform as-found tests, if required.
3. Clean the unit.
4. Inspect bolted electrical connections for high resistance using one of the following methods:
  1. Use of low-resistance ohmmeter in accordance with Section 7.10.2 and 7.10.3.
  2. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or Table 10.12.
  3. Perform thermographic survey in accordance with Section 9.
5. Verify that all required grounding and shorting connections provide contact.
6. Verify correct operation of transformer withdrawal mechanism and grounding operation.
7. Verify correct primary and secondary fuse sizes for voltage transformers.
8. Lubrication requirements
  1. Use appropriate lubrication on moving current-carrying parts.
  2. Use appropriate lubrication on moving and sliding surfaces.
9. Perform as-left tests.

## 7. INSPECTION AND TEST PROCEDURES

### 7.10 Instrument Transformers (cont.)

#### 2. Electrical Tests - Current Transformers

1. Perform resistance measurements through bolted connections with a low-resistance ohmmeter, if applicable, in accordance with Section 7.10.1.
2. Perform insulation-resistance test of each current transformer and wiring-to-ground at 1000 volts dc. For units with solid-state components, follow manufacturer's recommendations.
3. Perform a polarity test of each current transformer.
4. Perform a ratio-verification test using the voltage or current method in accordance with ANSI/IEEE C57.13.1. 1 (*IEEE Guide for Field Testing of Relaying Current Transformers*).
5. Perform an excitation test on transformers used for relaying applications in accordance with ANSI/IEEE C57.13.1. (*IEEE Guide for Field Testing of Relaying Current Transformers*).
6. Measure current circuit burdens at transformer terminals.
7. When applicable, perform insulation-resistance and dielectric withstand tests on the primary winding with the secondary grounded. Test voltages shall be in accordance with Tables 10.5 and 10.9 respectively.
8. Verify that current circuits are grounded and have only one grounding point in accordance with ANSI/IEEE C57.13.3 (*IEEE Guide for the Grounding of Instrument Transformer Secondary Circuits and Cases*).

#### 3. Electrical Tests - Voltage Transformers

1. Perform resistance measurements through bolted connections with a low-resistance ohmmeter, if applicable, in accordance with Section 7.10.1.
2. Perform insulation-resistance tests winding-to-winding and each winding-to-ground. Test voltages shall be applied for one minute in accordance with Table 10.5. For units with solid-state components, follow manufacturer's recommendations.
3. Perform a polarity test on each transformer to verify the polarity marks or H1-X1 relationship as applicable.
4. Perform a turns ratio test on all tap positions, if applicable.
5. Measure voltage circuit burdens at transformer terminals.
6. Perform a dielectric withstand test on the primary windings with the secondary windings connected to ground. The dielectric voltage shall be in accordance with Table 10.9. The test voltage shall be applied for one minute.

#### 4. Electrical Tests - Coupling Capacitor Voltage Transformers

1. Perform all tests from 7.10.3 Voltage Transformers.

## 7. INSPECTION AND TEST PROCEDURES

### 7.10 Instrument Transformers (cont.)

2. Measure capacitance of capacitor sections.
3. Measure power-factor or dissipation-factor in accordance with test equipment manufacturer's published data.

### 5. Test Values

1. Compare bolted connection resistances to values of similar connections.
2. Bolt-torque levels should be in accordance with Table 10.12 unless otherwise specified by the manufacturer.
3. Microhm or millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. If manufacturer's data is not available, investigate any values which deviate from similar connections by more than 50 percent of the lowest value.
4. Insulation-resistance measurement on any instrument transformer shall be not less than that shown in Table 10.5.
5. Polarity results shall agree with transformer markings.
6. Compare measured burdens to instrument transformer ratings.
7. Ratio accuracies shall be within 0.5 percent of nameplate or manufacturer's published data.
8. The insulation shall withstand the overpotential test voltage applied.
9. Capacitance of capacitor sections of coupling-capacitance voltage transformers shall be in accordance with manufacturer's published data.
10. Power-factor or dissipation-factor shall be in accordance with test equipment manufacturer's published data.

## 7. INSPECTION AND TEST PROCEDURES

### 7.11 Metering Devices

1. **Visual and Mechanical Inspection**
  1. Inspect physical and mechanical condition.
  2. Verify tightness of electrical connections.
  3. Inspect cover gasket, cover glass, condition of spiral spring, disk clearance, contacts, and case-shorting contacts, as applicable.
  4. Prior to cleaning the unit, perform as-found tests, if required.
  5. Clean the unit.
  6. Verify freedom of movement, end play, and alignment of rotating disk(s).
  7. Perform as-left tests.
2. **Electrical Tests**
  1. Verify accuracy of meters at all cardinal points.
  2. Calibrate meters in accordance with manufacturer's published data.
  3. Verify all instrument multipliers.

## 7. INSPECTION AND TEST PROCEDURES

### 7.16.1.2 Motor Control, Motor Starters, Medium-Voltage

#### 1. Visual and Mechanical Inspection

1. Inspect physical and mechanical condition including evidence of moisture and corona.
2. Inspect anchorage, alignment, and grounding.
3. Prior to cleaning the unit, perform as-found tests, if required.
4. Clean the unit.
5. Inspect bolted electrical connections for high resistance using one of the following methods:
  1. Use of low-resistance ohmmeter in accordance with Section 7.16.1.2.2.
  2. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or Table 10.12.
  3. Perform thermographic survey in accordance with Section 9.
6. Test all electrical and mechanical interlock systems for correct operation and sequencing.
7. Verify correct barrier and shutter installation and operation.
8. Exercise all active components and confirm correct operation of all indicating devices.
9. Inspect contactors.
  1. Verify mechanical operation.
  2. Inspect and adjust contact gap, wipe, alignment, and pressure in accordance with manufacturer's published data.
10. Compare overload protection rating with motor nameplate to verify correct size. Set adjustable or programmable devices according to the protective device coordination study.
11. Lubrication requirements
  1. Verify appropriate lubrication on moving current-carrying parts.
  2. Verify appropriate lubrication on moving and sliding surfaces.
12. Perform as-left tests.

## 7. INSPECTION AND TEST PROCEDURES

### 7.16.1.2 Motor Control, Motor Starters, Medium-Voltage (cont.)

#### 2. Electrical Tests

1. Perform resistance measurements through bolted connections with a low-resistance ohmmeter, if applicable, in accordance with Section 7.16.1.2.1.
2. Perform insulation-resistance tests on contactor(s), phase-to-ground, phase-to-phase, and across the open contacts for one minute in accordance with Table 10.1.
3. Perform insulation-resistance tests on all control wiring with respect to ground. Applied potential shall be 500 volts dc for 300 volt rated cable and 1000 volts dc for 600 volt rated cable. Test duration shall be one minute. For units with solid-state components, follow manufacturer's recommendation.
4. Perform system function test in accordance with Section 8.
5. Test control power transformers in accordance with Section 7.1.2.8.
6. Perform an overpotential test in accordance with manufacturer's published data. If manufacturer has no recommendation for this test, it shall be in accordance with Table 10.9.
7. Perform vacuum bottle integrity test (overpotential), if applicable, across each vacuum bottle with the contacts in the open position in strict accordance with manufacturer's published data. Do not exceed maximum voltage stipulated for this test.
8. Perform contact resistance tests.
9. Measure blowout coil circuit resistance.
10. Measure resistance of power fuses.
11. Energize contactor using an auxiliary source. Adjust armature to minimize operating vibration where applicable.
12. Test motor protection devices in accordance with manufacturer's published data. In the absence of manufacturer's data, use Section 7.9.
13. Test starting transformers, if applicable, in accordance with Section 7.2.1.
14. Test starting reactors, if applicable, in accordance with 7.20.3.
15. Verify operation of cubicle space heater.

## 7. INSPECTION AND TEST PROCEDURES

### 7.16.1.2 Motor Control, Motor Starters, Medium-Voltage (cont.)

#### 3. Test Values

1. Compare bolted connection resistances to values of similar connections.
2. Bolt-torque values should be in accordance with Table 10.12 unless otherwise specified by manufacturer.
3. Microhm or millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. If manufacturer's data is not available, investigate any values which deviate from similar connections by more than 50 percent of the lowest value.
4. Starter insulation resistance shall be in accordance with Table 10.1.
5. Control wiring minimum insulation-resistance values should be comparable to previously obtained results but not less than two megohms.
6. The insulation shall withstand the overpotential test voltage applied.
7. Resistance values shall not deviate by more than 15 percent between identical fuses.
8. Motor protection parameters shall be in accordance with manufacturer's published data.

## 7. INSPECTION AND TEST PROCEDURES

### 7.18.1.1 Direct-Current Systems, Batteries, Flooded Lead-Acid

#### 1. Visual and Mechanical Inspection

1. Verify ventilation of battery room or enclosure
2. Verify existence of suitable eyewash equipment.
3. Inspect physical and mechanical condition.
4. Inspect anchorage, alignment and grounding.
5. Perform as-found tests, if applicable.
6. Verify electrolyte level. Measure electrolyte specific gravity and temperature levels.
7. Verify presence of flame arresters.
8. Verify adequacy of batter support racks, mounting, anchorage, and clearances.
9. Neutralize acid on exterior surfaces and rinse with water.
10. Clean corroded/oxidized terminals and apply an oxide inhibitor.
11. Inspect bolted electrical connections for high resistance using one of the following methods:
  1. Use of low-resistance ohmmeter in accordance with Section 7.18.1.1.2
  2. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or Table 10.12.
  3. Perform Thermographic survey under load in accordance with Section 9.
12. Perform as-left tests.

#### 2. Electrical Tests

1. Perform resistance measurements through all bolted connections with a low-resistance ohmmeter, if applicable, in accordance with Section 7.18.1.1.1.
2. Measure charger float and equalizing voltage levels. Adjust to battery manufacturer's recommended settings.
3. Verify all charger functions and alarms.
4. Measure each cell voltage and total battery voltage with charger energized and in float mode of operation.
5. Measure intercell connection resistances.
6. Perform internal ohmic measurement tests.

## 7. INSPECTION AND TEST PROCEDURES

### 7.18.1.1 Direct-Current Systems, Batteries, Flooded Lead-Acid

7. Perform a load test in accordance with manufacturer's specifications or ANSI/IEEE 450, *Recommended Practice for Maintenance, Testing and Replacement of Large Lead Storage Batteries for Generating Stations and Substations.*

#### 3. Test Values

1. Electrolyte level and specific gravity shall be within normal limits.
2. Compare bolted connection resistances to values of similar connections.
3. Bolt-torque levels shall be in accordance manufacturer's recommended data.
4. Microhm or millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. If manufacturer's data is not available, investigate any values which deviate from similar connections by more than 50 percent of the lowest value.
5. Charger float and equalize voltage levels shall be in accordance with battery manufacturer's published data.
6. Cell voltages should be within 0.05 volt of each other or in accordance with manufacturer's published data.
7. Cell internal ohmic values (resistance, impedance or conductance) values should not vary by more than 25 percent between identical cells that are in a fully charged state.

## 7. INSPECTION AND TEST PROCEDURES

### 7.18.2 Direct Current Systems, Chargers

#### 1. Visual and Mechanical Inspection

1. Inspect for physical and mechanical condition.
2. Inspect anchorage, alignment, and grounding.
3. Prior to cleaning the unit, perform as-found tests.
4. Clean the unit.
5. Inspect all bolted electrical connections for high resistance using one of the following methods:
  1. Use of low-resistance ohmmeter in accordance with Section 7.18.2.2.
  2. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or Table 10.12.
  3. Perform thermographic survey under load in accordance with Section 9.
6. Inspect filter and tank capacitors.
7. Verify operation of cooling fans. Clean filters if provided.
8. Perform as-left tests.

#### 2. Electrical Tests

1. Perform resistance measurements through all bolted connections with a low-resistance ohmmeter, if applicable, in accordance with Section 7.18.2.1.
2. Verify float voltage, equalize voltage, and high voltage shutdown settings.
3. Verify current limits.
4. Verify correct load sharing (parallel chargers).
5. Verify calibration of voltmeter and ammeter.
6. Verify operation of alarms.
7. Measure and record input and output voltage and current.
8. Perform full load testing of charger.

#### 3. Test Values

1. Compare bolted connection resistances to values of similar connections.
2. Bolt-torque levels shall be in accordance with manufacturer's published data or Table 10.12.

## 7. INSPECTION AND TEST PROCEDURES

### 7.18.2 Direct Current Systems, Chargers

3. Microhm or millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. If manufacturer's data is not available, investigate any values which deviate from similar connections by more than 50 percent of the lowest value.
4. Float and equalize voltage settings shall be in accordance with the battery manufacturer's published data.
5. Current limit shall be within manufacturer's recommended maximum.
6. Charger shall be capable of manufacturer's specified full load.

## 7. INSPECTION AND TEST PROCEDURES

### 7.19.2 Surge Arresters, Medium- and High-Voltage Surge Protection Devices

#### 1. Visual and Mechanical Inspection

1. Inspect physical and mechanical condition.
2. Inspect anchorage, alignment, and grounding.
3. Prior to cleaning the unit, perform as-found tests.
4. Clean the unit.
5. Inspect bolted electrical connections for high resistance using one of the following methods:
  1. Use of low-resistance ohmmeter in accordance with Section 7.19.2.2.
  2. Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method in accordance with manufacturer's published data or Table 10.12.
6. Verify that the ground lead on each device is individually attached to a ground bus or ground electrode.
7. Verify that stroke counter, if present, is correctly mounted and electrically connected.
8. Perform as-left tests.

#### 2. Electrical Tests

1. Perform resistance measurements through bolted connections with a low-resistance ohmmeter, if applicable, in accordance with Section 7.19.2.1.
2. Perform an insulation-resistance test at voltage levels in accordance with Table 10.1.
3. Test grounding connection in accordance with Section 7.13.
4. Perform a watts-loss test.

## 7. INSPECTION AND TEST PROCEDURES

### 7.19.2 Surge Arresters, Medium- and High-Voltage Surge Protection Devices (cont.)

#### 3. Test Values

1. Compare bolted connection resistances to values of similar connections.
2. Bolt-torque levels should be in accordance with Table 10.12 unless otherwise specified by the manufacturer.
3. Microhm or millivolt drop values shall not exceed the high levels of the normal range as indicated in the manufacturer's published data. If manufacturer's data is not available, investigate any values which deviate from similar connections by more than 50 percent of the lowest value.
4. Insulation-resistance values should be in accordance with Table 10.1.
5. Resistance between the arrester ground terminal and the ground system shall be less than 0.5 ohm.
6. Compare watts loss to similar units.

## 8. SYSTEM FUNCTION TESTS

### 8.1 System Function Tests

It is the purpose of system function tests to prove the correct interaction of all sensing, processing, and action devices.

Perform system function tests upon completion of the maintenance tests defined, as system conditions allow.

1. Develop test parameters and perform tests for the purpose of evaluating performance of all integral components and their functioning as a complete unit within design requirements and manufacturer's published data.
2. Verify the correct operation of all interlock safety devices for fail-safe functions in addition to design function.
3. Verify the correct operation of all sensing devices, alarms, and indicating devices.

## 9. THERMOGRAPHIC SURVEY

### 9.1 Visual and Mechanical Inspection

1. Inspect physical and mechanical condition.
2. Remove all necessary covers prior to thermographic inspection.

### 9.2 Equipment to be inspected shall include all current-carrying devices.

### 9.3 Provide report including the following:

1. Each reported Thermographic image must be date and time stamped.
2. The following items must be identified for each Thermographic image:
  1. Location of the equipment
  2. Description of the reported component including part numbers.
  3. Break, fuse or switch sized including all relevant values including voltage, amperage, phase, coil ratings, etc.
  4. Current readings at the time the image was taken
  5. Wire size on bus size to and from the device being reported component.
  6. An observation outlining what is specifically wrong with the reported component.
  7. Specific repair or replacement recommendations.
  8. Temperature differential between deficient areas and reference areas.
  9. Repair priority ratings.
  10. Photographs both thermal and digital of the reported areas with the deficiencies clearly identified.
  11. A summary sheet shall be supplied for management of repairs. The summary sheet must include:
    1. All deficient equipment.
    2. The location of each piece of equipment.
    3. The repair priority of each piece of equipment.
    4. An area for the signature of the repair electrician.
    5. An area for the date that the repair was made.
    6. An area for the description of the completed repairs.

## 9. THERMOGRAPHIC SURVEY

### 9.4 Test Parameters

1. Inspect distribution systems with imaging equipment capable of detecting a minimum temperature difference of 1°C at 30°C.
2. Equipment shall detect emitted radiation and convert detected radiation to visual signal.
3. Thermographic surveys should be performed during periods of maximum possible loading. But not less than 40 percent of rated load of the electrical equipment being inspected. Refer to ANSI/NFPA 70B, Section 18-16.

### 9.5 Test Results

Suggested actions based on temperature rise can be found in Table 10.18.

### 9.6 Thermographer Qualifications

1. The thermographer must have the following minimum qualifications:
  1. Level 2 Certified Thermographer
  2. Journeyman Electrician
  3. Certified to work with and in the area of exposed 15,000 volt equipment including required safety and operations training.
2. The cover removal and replacement electricians must have the minimum qualifications:
  3. Journeyman Electrician
  4. Certified to work with and in the area of exposed 15,000 volt equipment including required safety and operations training.

#### Note:

1. The thermographer and cover removal electricians must have and wear, when applicable, proper safety clothing, high voltage suit and face shields.
2. Exceptions to 9.6.1 and 9.6.2 will not be accepted.

**TABLE 10.1**

**Insulation Resistance Test Values  
Electrical Apparatus and Systems**

Nominal Rating of Equipment in Volts	Minimum Test Voltage, DC	Recommended Minimum Insulation Resistance in Megohms
250	500	25
600	1,000	100
1,000	1,000	100
2,500	1,000	500
5,000	2,500	1,000
8,000	2,500	2,000
15,000	2,500	5,000
25,000	5,000	20,000
35,000	15,000	100,000
46,000	15,000	100,000
69,000 and above	15,000	100,000

In the absence of consensus standards dealing with insulation-resistance tests, the Standards Review Council suggests the above representative values.

See Table 10.14 for temperature correction factors.

Test results are dependent on the temperature of the insulating material and the humidity of the surrounding environment at the time of the test.

Insulation-resistance test data may be used to establish a trending pattern. Deviations from the baseline information permit evaluation of the insulation.

TABLE 10.2

Switchgear Withstand Test Voltages

Type of Switchgear	Rated Maximum Voltage (kV) (rms)	Maximum Test Voltage kV	
		AC	DC
Low-Voltage Power Circuit Breaker Switchgear	.254/ .508/ .635	1.6	2.3
Metal-Clad Switchgear	4.76	14	20
	8.25	27	37
	15.0	27	37
	27.0	45	*
	38.0	60	*
Station-Type Cubicle Switchgear	15.5	37	*
	38.0	60	*
	72.5	120	*
Metal Enclosed Interrupter Switchgear	4.76	14	20
	8.25	19	27
	15.0	27	37
	15.5	37	52
	25.8	45	*
	38.0	60	*

Derived from ANSI/IEEE C37.20.1-1993, Paragraph 5.5, *Standard for Metal-Enclosed Low-Voltage Power Circuit-Breaker Switchgear*, C37.20.2-1993, Paragraph 5.5, *Standard for Metal-Clad and Station-Type Cubicle Switchgear* and C37.20.3-1987 (R1992), Paragraph 5.5, *Standard for Metal-Enclosed Interrupter Switchgear*, and includes 0.75 multiplier with fraction rounded down.

The column headed "DC" is given as a reference only for those using dc tests to verify the integrity of connected cable installations without disconnecting the cables from the switchgear. It represents values believed to be appropriate and approximately equivalent to the corresponding power frequency withstand test values specified for voltage rating of switchgear. The presence of this column in no way implies any requirement for a dc withstand test on ac equipment or that a dc withstand test represents an acceptable alternative to the low-frequency withstand tests specified in these specifications, either for design tests, production tests, conformance tests, or field tests. When making dc tests, the voltage should be raised to the test value in discrete steps and held for a period of one minute.

Because of the variable voltage distribution encountered when making dc withstand tests, the manufacturer should be contacted for recommendations before applying dc withstand tests to the switchgear. Voltage transformers above 34.5 kV should be disconnected when testing with dc. Refer to ANSI/IEEE C57.13-1993 (*IEEE Standard Requirements for Instrument Transformers*) paragraph 8.8.2.

\* Consult Manufacturer

**TABLE 10.3**

**Maintenance Test Values  
Recommended Dissipation Factor/Power Factor at 20°C  
Liquid-Filled Transformers**

	<b>Oil Maximum</b>	<b>Silicone Maximum</b>	<b>Tetrachloroethylene Maximum</b>	<b>High Fire Point Hydrocarbon Maximum</b>
<b>Power Transformers</b>	2.0%	0.5%	3.0%	2.0%
<b>Distribution Transformers</b>	3.0%	0.5%	3.0%	3.0%

In the absence of consensus standards dealing with transformer dissipation/power factor values, the NETA Standards Review Council suggests the above representative values.

TABLE 10.4

Suggested Limits for Service-Aged Insulating Fluids

Mineral Oil <sup>a</sup>				
Test	ASTM Method	69 kV and Below	Above 69 kV through 288 kV	345 kV and Above
Dielectric breakdown, kV minimum	D877	26	26	26
Dielectric breakdown, kV minimum @ 0.04 gap	D1816	23	26	26
Dielectric breakdown, kV minimum @ 0.08 gap	D1816	34	45	45
Interfacial tension, mN/m minimum	D971	24	26	30
Neutralization number, mg KOH/g maximum	D974	0.2	0.2	0.1
Water content, ppm maximum	D1533	35	25	20
Power factor at 25°C, %	D924	1.0 <sup>d</sup>	1.0 <sup>d</sup>	1.0 <sup>d</sup>
Power factor at 100°C, %	D924	1.0 <sup>d</sup>	1.0 <sup>d</sup>	1.0 <sup>d</sup>

Test	ASTM Method	Silicone <sup>b</sup>	Less Flammable Hydrocarbon <sup>c</sup>	Tetrachloroethylene <sup>e</sup>
Dielectric Breakdown, kV minimum	D877	25	24	26
Visual	D2129	Colorless, clear, free of particles	--	Clear with purple iridescence
Water Content, ppm maximum	D1533	100	4.5	35
Dissipation/power factor, % maximum @ 25°C	D924	0.2	1.0	12.0
Viscosity, cSt @ 25°C	D445	47.5 - 52.5	--	0
Fire Point, °C, minimum	D92	340	300	--
Neutralization number, mg KOH/g maximum	D974	0.2	--	.25
Neutralization number, mg KOH/g maximum	D664	N/A	0.25	--
Interfacial Tension, mN/m minimum @ 25°C	D971	N/A	22	--

- a. IEEE C57.106-1991 *Guide for Acceptance and Maintenance of Insulating Oil in Equipment*, Table 5.
- b. IEEE C57.111-1989 *Guide for Acceptance of Silicone Insulating Fluid and Its Maintenance in Transformers*, Table 3.
- c. IEEE C57.121-1988 *Guide for Acceptance and Maintenance of Less Flammable Hydrocarbon Fluid in Transformers*, Table 3.
- d. IEEE Standard. 637-1985 *IEEE Guide for the Reclamation of Insulating Oil and Criteria for Its Use*.
- e. ABB Bulletin: PC-2000 *Instruction Book PC-2000 for Wecoso™ Fluid-Filled Primary and Secondary Unit Substation Transformers*, Westinghouse Electric Corporation, Small Power Transformer Division, South Boston, VA 24592.

**TABLE 10.5**

**Maintenance Testing  
Transformer Insulation Resistance**

Transformer Coil Rating Type in Volts	Minimum DC Test Voltage	Recommended Minimum Insulation Resistance in Megohms	
		Liquid Filled	Dry
0 - 600	1000	100	500
601 - 5000	2500	1000	5000
Greater than 5000	5000	5000	25000

In the absence of consensus standards, the NETA Standards Review Council suggests the above representative values. See Table 10.14 for temperature correction factors.

NOTE: Since insulation resistance depends on insulation rating (kV) and winding capacity (kVA), values obtained should be compared to manufacturer's published data.

TABLE 10.6

Medium-Voltage Cables  
Maximum Maintenance Test Voltages (kV, DC)

Insulation Type	Rated Cable Voltage (kV)	Insulation Level (Percent)	Test Voltage kV, DC
Elastomeric: Butyl and Oil Base	5	100	19
	5	133	19
	15	100	41
	15	133	49
	25	100	60
Elastomeric: EPR	5	100	19
	5	133	19
	8	100	26
	8	133	26
	15	100	41
	15	133	49
	25	100	60
	25	133	75
	28	100	64
	35	100	75
Polyethylene (see Note 4)	5	100	19
	5	133	19
	8	100	26
	8	133	26
	15	100	41
	15	133	49
	25	100	60
	25	133	75
	35	100	75
	35	100	75

Derived from ANSI/IEEE Standard 141-1993 Table 12-9 and by factoring the applicable ICEA/NEMA Standards by 75% as recommended in Section 18-9.2.4 of NFPA 70B, 1998 Edition *Standard for Electrical Equipment Maintenance*.

- NOTE 1: Selection of test voltage for in-service cables depends on many factors. The owner should be consulted and/or informed of the intended test voltage prior to performing the test. Caution should be used in selecting the maximum test voltage and performing the test since cable failure during the test will require repair or replacement prior to re-energizing.
- NOTE 2: AEIC C55 and C56 list test voltages approximately 20 percent higher than the ICEA values for the first five years of service. These values are based on 65 percent of the factory test voltages. A reduction to 40 percent is recommended for a cable in service longer than five years.
- NOTE 3: ANSI/IEEE 400-1991 specifies much higher voltages than either the ICEA or the AEIC. These voltages overstress cables and are intended to find marginal cable during shutdown to avoid in-service failures. These test voltages should not be used without the concurrence of the owner. If the cable is still in warranty, the cable manufacturer should be consulted for their concurrence. (See the Standard for a discussion of the pros and cons of high direct-voltage tests.)
- NOTE 4: See Electric Power Research Institute Report, EPRI TR-101245, *Effect of DC Testing on Extruded Cross-Linked Polyethylene Insulated Cables*. DC high potential testing of aged XLPE-insulated cable in wet locations may reduce remaining life.

TABLE 10.7

Molded-Case Circuit Breakers  
Inverse Time Trip Test  
(At 300% of Rated Continuous Current of Circuit Breaker)

Range of Rated Continuous Current (Amperes)	Maximum Trip Time in Seconds For Each Maximum Frame Rating <sup>a</sup>	
	≤ 250 V	251 - 600V
0-30	50	70
31-50	80	100
51-100	140	160
101-150	200	250
151-225	230	275
226-400	300	350
401-600	.....	450
601-800	.....	500
801-1000	.....	600
1001 - 1200	.....	700
1201-1600	.....	775
1601-2000	.....	800
2001-2500	.....	850
2501-5000	.....	900
6000	.....	1000

Derived from Table 5-3, NEMA Standard AB 4-1996.

- a. Trip times may be substantially longer for integrally-fused circuit breakers if tested with the fuses replaced by solid links (shorting bars).

TABLE 10.8

Instantaneous Trip Tolerances  
for Field Testing of Circuit Breakers

Breaker Type	Tolerance of Settings	Tolerances of Manufacturer's Published Trip Range	
		High Side	Low Side
Adjustable	+40%		
	-30%	.....	.....
Nonadjustable	.....	+25%	-25%

Reproduction of Table 5-4 from NEMA publication AB4-1996.

For circuit breakers with nonadjustable instantaneous trips, tolerances apply to the manufacturer's published trip range, i.e., +40 percent on high side, -30 percent on low side.

TABLE 10.9

Instrument Transformer Dielectric Tests  
Field Maintenance

Nominal System (kV)	BIL (kV)	Periodic Dielectric Withstand Test Field Test Voltage (kV)	
		AC	DC*
0.6	10	2.6	4
1.1	30	6.5	10
2.4	45	9.7	15
4.8	60	12.3	19
8.32	75	16.9	26
13.8	95	22.1	34
13.8	110	22.1	34
25	125	26.0	40
25	150	32.5	50
34.5	150	32.5	50
34.5	200	45.5	70
46	250	61.7	+
69	350	91.0	+
115	450	120.0	+
115	550	149.0	+
138	550	149.0	+
138	650	178.0	+
161	650	178.0	+
161	750	211.0	+
230	900	256.0	+
230	1050	299.0	+

Table 10.9 is derived from Paragraph 8.8.2 and Tables 2 and 7 of ANSI/IEEE C57.13, *Standard Requirements for Instrument Transformers*.

+ Periodic dc potential tests are not recommended for transformers rated higher than 34.5 kV.

\* Under some conditions transformers may be subjected to periodic insulation test using direct voltage from kenotron sets. In such cases the test direct voltage should not exceed the original factory test rms alternating voltage. Periodic kenotron tests should not be applied to (instrument) transformers of higher than 34.5 kV voltage rating.

TABLE 10.10

Maximum Allowable Vibration Amplitude

RPM @ 60 Hz	Velocity in/s peak	Velocity mm/s	RPM @ 50 Hz	Velocity in/s peak	Velocity mm/s
3600	0.15	3.8	3000	0.15	3.8
1800	0.15	3.8	1500	0.15	3.8
1200	0.15	3.8	1000	0.13	3.3
900	0.12	3.0	750	0.10	2.5
720	0.09	2.3	600	0.08	2.0
600	0.08	2.0	500	0.07	1.7

Derived from NEMA publication MG 1-7.08, Table 7-1. Table is unfiltered vibration limits for resiliently mounted machines. For machines with rigid mounting multiply the limiting values by 0.8.

**TABLE 10.11**

**Periodic Electrical Test Values for Insulating Aerial Devices  
Insulating Aerial Devices with a Lower Test Electrode System  
(Category A and Category B)**

Unit Rating	60 Hertz (rms) Test			Direct Current Test		
	Voltage kV (rms)	Maximum Allowable Current Microamperes	Time	Voltage kV	Maximum Allowable Current Microamperes	Time
46 kV & below	40	40	1 minute	56	28	3 minutes
69 kV	60	60	1 minute	84	42	3 minutes
138 kV	120	120	1 minute	168	84	3 minutes
230 kV	200	200	1 minute	240	120	3 minutes
345 kV	300	300	1 minute	360	180	3 minutes
500 kV	430	430	1 minute	602	301	3 minutes
765 kV	660	660	1 minute	924	462	3 minutes

**Insulating Aerial Devices without Lower Test Electrode System  
(Category B)**

Unit Rating	60 Hertz (rms) Test			Direct Current Test		
	Voltage kV (rms)	Maximum Allowable Current Microamperes	Time	Voltage kV	Maximum Allowable Current Microamperes	Time
46 kV & below	40	400	1 minute	56	56	3 minutes

**Insulating Aerial Ladders and Insulating Vertical Aerial Towers**

Unit Rating	60 Hertz (rms) Test			Direct Current Test		
	Voltage kV (rms)	Maximum Allowable Current Microamperes	Time	Voltage kV	Maximum Allowable Current Microamperes	Time
46 kV & below	40	400	1 minute	56	56	3 minutes
20 kV & below	20	200	1 minute	28	28	3 minutes

**Chassis Insulating Systems and Lower Insulated Booms**

60 Hertz (rms) Test			Direct Current Test		
Voltage kV (rms)	Maximum Allowable Current Milliamperes	Time	Voltage kV	Maximum Allowable Current Microamperes	Time
35	3.0	3 minutes	50	50	3 minutes

Derived from ANSI/SIA A92-2-1990.

A method of calculating test voltages for units rated other than those tabulated here is as follows:

The 60 Hz test values are equal to line to ground at the unit rating value time 1.5.

**TABLE 10.12**  
**US Standard Fasteners<sup>a</sup>**  
**Bolt Torque Values for Electrical Connections**

Part 1 Heat-Treated Steel - Cadmium or Zinc Plated				
Grade	SAE 1&2	SAE 5	SAE 7	SAE 8
Head Marking				
Minimum Tensile (Strength) (lb/in <sup>2</sup> )	64K	105K	133K	150K
Bolt Diameter in Inches	Torque (Pound-Feet)			
1/4	4	6	8	8
5/16	7	11	15	18
3/8	12	20	27	30
7/16	19	32	44	48
1/2	30	48	68	74
9/16	42	70	96	105
5/8	59	96	135	145
3/4	96	160	225	235
7/8	150	240	350	380
1.0	225	370	530	570

Part 2 Silicon Bronze Fasteners <sup>b</sup>		
Bolt Diameter in Inches	Torque (Pound-Feet)	
	Nonlubricated	Lubricated
5/16	15	10
3/8	20	14
1/2	40	25
5/8	55	40
3/4	70	60

- a. Consult manufacturer for equipment supplied with metric fasteners.
- b. This table is based on bronze alloy bolts having a minimum tensile strength of 70,000 pounds per square inch.

TABLE 10.12- CONTINUED

US Standard Fasteners<sup>a</sup>  
Bolt Torque Values for Electrical Connections

Part 3 Aluminum Alloy Fasteners <sup>c</sup> Torque (Pound-Feet)	
Bolt Diameter in Inches	Lubricated
5/16	8.0
3/8	11.2
1/2	20.0
5/8	32.0
3/4	48.0

Part 4 Stainless Steel Fasteners <sup>d</sup> Torque (Pound-Feet)	
Bolt Diameter in Inches	Uncoated
5/16	14
3/8	25
1/2	45
5/8	60
3/4	90

- a. Consult manufacturer for equipment supplied with metric fasteners.
- c. This table is based on aluminum alloy bolts having a minimum tensile strength of 55,000 pounds per square inch.
- d. This table is to be used for the following hardware types:  
Bolts, cap screws, nuts, flat washers, locknuts (18-8 alloy)  
Belleville washers (302 alloy).

TABLE 10.13

SF<sub>6</sub> Gas Tests

Test	Method	Serviceability Limits <sup>a</sup>
Moisture	Hygrometer	Per manufacturer or ≥ 200 ppm <sup>b</sup>
SF <sub>6</sub> decomposition byproducts	ASTM D 2685	≥ 500 ppm
Air	ASTM D 2685	≥ 5000 ppm <sup>c</sup>
Dielectric breakdown Hemispherical contacts	0.10 inch gap at atmospheric pressure	11.5 - 13.5 kV <sup>d</sup>

- a. In the absence of consensus standards dealing with SF<sub>6</sub> circuit breaker gas tests, the NETA Standards Review Council suggests the above representative values.
  - b. According to some manufacturers.
  - c. Dominelli, N. and Wylie, L., *Analysis of SF<sub>6</sub> Gas as a Diagnostic Technique for GIS*, Electric Power Research Institute, Substation Equipment Diagnostics Conference IV, February 1996.
  - d. Per Even, F.E., and Mani, G. Sulfur Fluorides, Kirk, *Othmer Encyclopedia of Chemical Technology*, 4th ed., 11,428, 1994.
- Reference: IEC 61634 High-Voltage Switchgear and Controlgear - *Use and Handling of Sulfur Hexafluoride (SF<sub>6</sub>) in High-Voltage Switchgear and Controlgear*.

TABLE 10.14

Insulation Resistance Conversion Factors  
Test Temperature to 20° C

Temperature		Multiplier	
°C	°F	Apparatus Containing Immersed Oil Insulation	Apparatus Containing Solid Insulation
-10	14	0.125	0.25
-5	23	0.180	0.32
0	32	0.25	0.40
5	41	0.36	0.50
10	50	0.50	0.63
15	59	0.75	0.81
20	68	1.00	1.00
25	77	1.40	1.25
30	86	1.98	1.58
35	95	2.80	2.00
40	104	3.95	2.50
45	113	5.60	3.15
50	122	7.85	3.98
55	131	11.20	5.00
60	140	15.85	6.30
65	149	22.40	7.9
70	158	31.75	10.00
75	167	44.70	12.60
80	176	63.50	15.80
85	185	89.789	20.00
90	194	127.00	25.20
95	203	180.00	31.60
100	212	254.00	40.00
105	221	359.15	50.40
110	230	509.00	63.20

Derived from *Stitch in Time...The Complete Guide to Electrical Insulation Testing*, AVO/Biddle Instruments.  
Formula:

$$R_c = R_a \times K$$

Where:  $R_c$  is resistance corrected to 20°C  
 $R_a$  is measured resistance at test temperature  
 $K$  is applicable multiplier

Example: Resistance test on oil-immersion insulation at 104°F

$$R_a = 2 \text{ megohms @ } 104^\circ\text{F}$$

$$K = 3.95$$

$$R_c = R_a \times K$$

$$R_c = 2.0 \times 3.95$$

$$R_c = 7.90 \text{ megohms @ } 20^\circ\text{C}$$

TABLE 10.15

High-Potential Test Voltage  
for Automatic Circuit Reclosers

Nominal Voltage Class, kV	Maximum Voltage, kV	Rated Impulse Withstand Voltage, kV	Maximum Field Test Voltage, kV, AC
14.4 (1 $\phi$ and 3 $\phi$ )	15.0	95	26.2
14.4 (1 $\phi$ and 3 $\phi$ )	15.5	110	37.5
24.9 (1 $\phi$ and 3 $\phi$ )	27.0	150	45.0
34.5 (1 $\phi$ and 3 $\phi$ )	38.0	150	52.5
46.0 (3 $\phi$ )	48.3	250	78.7
69.0 (3 $\phi$ )	72.5	350	120.0

Derived from ANSI/IEEE C37.61-1973(R1993) (*Standard Guide for the Application, Operation, and Maintenance of Automatic Circuit Reclosers*), C37.60-1981(R1993) (*Standard Requirements for Overhead, Pad-Mounted, Dry-Vault, and Submersible Automatic Circuit Reclosers and Fault Interrupters for AC Systems*).

TABLE 10.16

High-Potential Test Voltage  
for Periodic Test of Line Sectionalizers

Nominal Voltage Class kV	Maximum Voltage kV	Rated Impulse Withstand Voltage kV	Maximum Field Test Voltage kV, AC	DC 15 Minute Withstand (kV)
14.4 (1 $\phi$ )	15.0	95	26.2	39
14.4 (1 $\phi$ )	15.0	125	31.5	39
14.4 (3 $\phi$ )	15.5	110	37.5	39
24.9 (1 $\phi$ )	27.0	125	45.0	58
34.5 (3 $\phi$ )	38.0	150	52.5	77

Derived from ANSI/IEEE C37.63-1984(R1990) Table 2 (*Standard Requirements for Overhead, Pad-Mounted, Dry-Vault, and Submersible Automatic Line Sectionalizers of ac Systems*).

The table includes a 0.75 multiplier with fractions rounded down.

In the absence of consensus standards, the NETA Standards Review Council suggests the above representative values.

NOTE: Values of ac voltage given are dry test one minute factory test values.

TABLE 10.17

Metal-Enclosed Bus Dielectric Withstand Test Voltages

Type of Bus	Rated kV	Maximum Test Voltage, kV	
		AC	DC
Isolated Phase for Generator Leads	24.5	37.0	52.0
	29.5	45.0	--
	34.5	60.0	--
Isolated Phase for Other than Generator Leads	15.5	37.0	52.0
	25.8	45.0	--
	38.0	60.0	--
Nonsegregated Phase	0.635	1.6	2.3
	4.76	14.2	20.0
	15.0	27.0	37.0
	25.8	45.0	63.0
	38.0	60.0	--
Segregated Phase	15.5	37.0	52.0
	25.8	45.0	63.0
	38.0	60.0	--
DC Bus Duct	0.3	1.6	2.3
	0.8	2.7	3.9
	1.2	3.4	4.8
	1.6	4.0	5.7
	3.2	6.6	9.3

Derived from ANSI-IEEE C37.23-1987, Tables 3A, 3B, 3C, 3D and paragraph 6.4.2. The table includes a 0.75 multiplier with fractions rounded down.

Note:

The presence of the column headed "DC" does not imply any requirement for a dc withstand test on ac equipment. This column is given as a reference only for those using dc tests and represents values believed to be appropriate and approximately equivalent to the corresponding power frequency withstand test values specified for each class of bus.

Direct current withstand tests are recommended for flexible bus to avoid the loss of insulation life that may result from the dielectric heating that occurs with rated frequency withstand testing.

Because of the variable voltage distribution encountered when making dc withstand tests and variances in leakage currents associated with various insulation systems, the manufacturer should be consulted for recommendations before applying dc withstand tests to this equipment.

TABLE 10.18

Thermographic Survey  
Suggested Actions Based on Temperature Rise

Temperature difference ( $\Delta T$ ) based on comparisons between similar components under similar loading.	Temperature difference ( $\Delta T$ ) based upon comparisons between component and ambient air temperatures.	Recommended Action
1°C - 3°C	1°C - 16°C	Possible deficiency; warrants investigation
4°C - 15°C	11°C - 20°C	Indicates probable deficiency; repair as time permits
.....	21°C - 40°C	Monitor until corrective measures can be accomplished
>15°C	>40°C	Major discrepancy; repair immediately

Temperature specifications vary depending on the exact type of equipment. Even in the same class of equipment (i.e., cables) there are various temperature ratings. Heating is generally related to the square of the current; therefore, the load current will have a major impact on  $\Delta T$ . In the absence of consensus standards for  $\Delta T$ , the values in this table will provide reasonable guidelines.

An alternative method of evaluation is the standards-based temperature rating system as discussed in Section 8.9.2, Conducting an IR Thermographic Inspection, *Electrical Power Systems Maintenance and Testing*, by Paul Gill, PE.

It is a necessary and valid requirement that the person performing the electrical inspection be thoroughly trained and experienced concerning the apparatus and systems being evaluated as well as knowledgeable of thermographic methodology.

TABLE 10.19

Overpotential Test Voltages for Electrical Apparatus  
Other than Inductive Equipment

Nominal System (Line) Voltage <sup>a</sup> (kV)	Insulation Class	AC Factory Test (kV)	Maximum Field Applied AC Test (kV)	Maximum Field Applied DC Test (kV)
1.2	1.2	10	6.0	8.5
2.4	2.5	15	9.0	12.7
4.8	5.0	19	11.4	16.1
8.3	8.7	26	15.6	22.1
14.4	15.0	34	20.4	28.8
18.0	18.0	40	24.0	33.9
25.0	25.0	50	30.0	42.4
34.5	35.0	70	42.0	59.4
46.0	46.0	95	57.0	80.6
69.0	69.0	140	84.0	118.8

In the absence of consensus standards, the NETA Standards Review Council suggests the above representative values.

- a. Intermediate voltage ratings are placed in the next higher insulation class.

**TABLE 10.20**

**Rated Control Voltages and Their Ranges for Circuit Breakers**

When measured at the control power terminals of the operating mechanisms with the maximum operating current flowing, nominal voltages and their permissible ranges for the control power supply of circuit breakers shall be as shown below.

Direct Current Voltage Ranges (1) (2) (3) (5) (8) (9)				Alternating Current Voltage Ranges (1) (2) (3) (4) (8)	
Closing and Auxiliary Functions				Nominal Voltage (60 Hz)	Closing, Tripping, and Auxiliary Functions
Nominal Voltage	Indoor Circuit Breakers	Outdoor Circuit Breakers	Tripping Functions All Types	Single Phase 120 240	Single Phase 104-127 (7) 208-254 (7)
24 (6)	--	--	14-28	Polyphase 208Y/120 240	Polyphase 108Y/104 - 220Y/127 208 - 254
48 (6)	38-56	36-56	28-56		
125	100 - 140	90 - 140	70 - 140		
250	200 - 280	180 - 280	140 - 280		

**Notes:**

- (1) Relays, motors, or other auxiliary equipment that function as a part of the control for a device shall be subject to the voltage limits imposed by this standard, whether mounted at the device or at a remote location.
- (2) Circuit breaker devices, in some applications, may be exposed to control voltages exceeding those specified here due to abnormal conditions such as abrupt changes in line loading. Such applications require specific study, and the manufacturer should be consulted. Also, application of switchgear devices containing solid-state control, exposed continuously to control voltages approaching the upper limits of ranges specified herein, require specific attention and the manufacturer should be consulted before application is made.
- (3) Some solenoid operating mechanisms are not capable of satisfactory performance over the range of voltage specified in the standard; moreover, two ranges of voltage may be required for such mechanisms to achieve an acceptable standard of performance. For those solenoid operated devices, the following applies:

Rated Voltage	Closing Voltage Ranges for Power Supply
125 dc	90 - 115 or 105 - 130
250 dc	180 - 230 or 210 - 260
230 ac	190 - 230 or 210 - 260

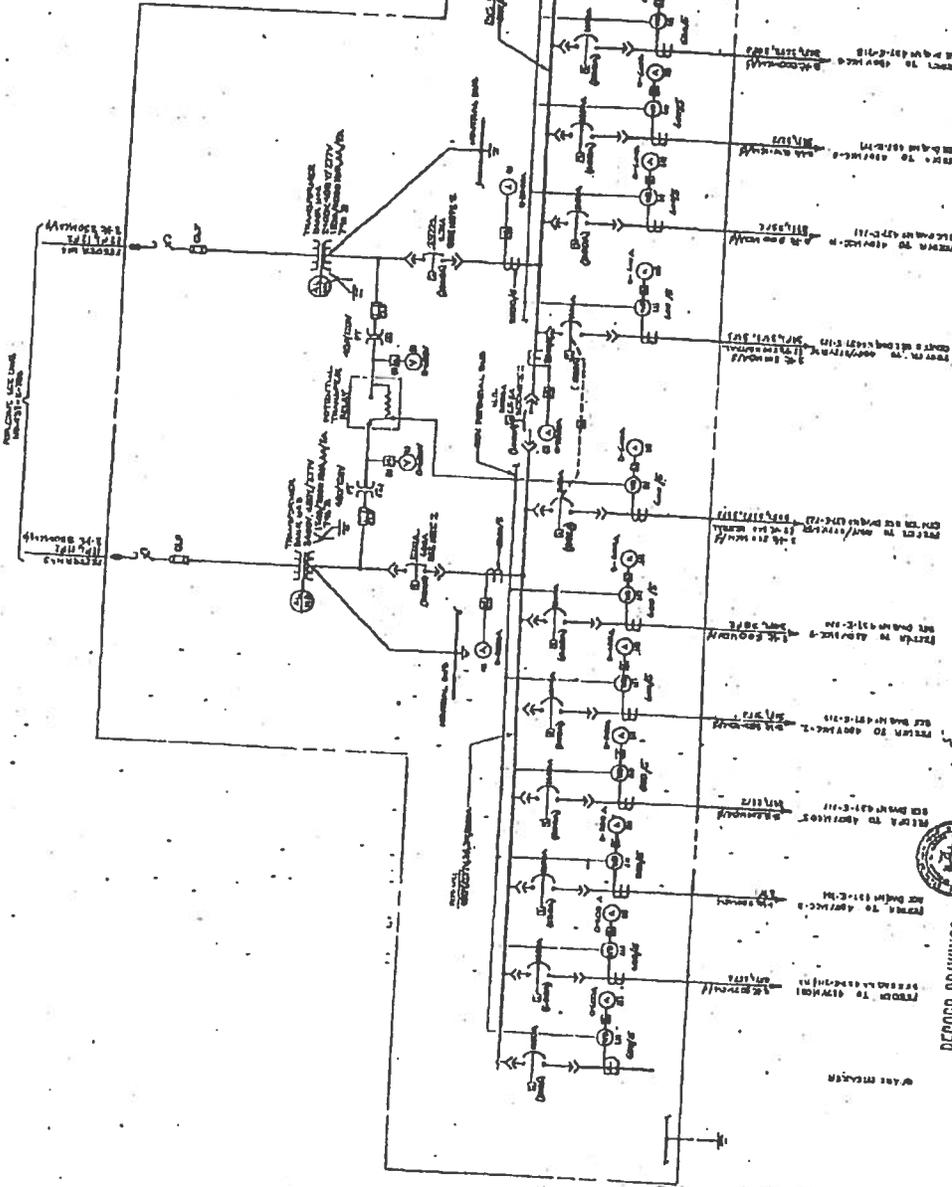
The preferred method of obtaining the double range of closing voltage is by use of tapped coils. Otherwise it will be necessary to designate one of the two closing voltage ranges listed above as representing the condition existing at the device location due to battery or lead voltage drop or control power transformer regulation. Also, caution should be exercised to ensure that the maximum voltage of the range used is not exceeded.

- (4) Includes supply for pump or compressor motors. Note that rated voltages for motors and their operating ranges are covered by ANSI/NEMA MG-1-1978.
- (5) It is recommended that the coils of closing, auxiliary, and tripping devices that are connected continually to one dc potential should be connected to the negative control bus so as to minimize electrolytic deterioration.
- (6) 24-volt or 48-volt tripping, closing, and auxiliary functions are recommended only when the device is located near the battery or where special effort is made to ensure the adequacy of conductors between battery and control terminals. 24-volt closing is not recommended.
- (7) Includes heater circuits
- (8) Extended voltage ranges apply to all closing and auxiliary devices when cold. Breakers utilizing standard auxiliary relays for control functions may not comply at lower extremes of voltage ranges when relay coils are hot, as after repeated or continuous operation.
- (9) Direct current control voltage sources, such as those derived from rectified alternating current, may contain sufficient inherent ripple to modify the operation of control devices to the extent that they may not function over the entire specified voltage ranges.
- (10) This table also applies for circuit breakers in gas insulated substation installations.

Derived from Table 9, ANSI C37.06.

NOTES:

- 1. THIS DRAWING IS A PART OF THE CONTRACT DOCUMENTS FOR THE 24 KV-80V/27V UNIT SUB-STATION.
- 2. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS AND APPROVALS FROM THE LOCAL AND STATE AUTHORITIES.
- 3. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF ALL EXISTING UTILITIES AND STRUCTURES.
- 4. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF ALL EXISTING UTILITIES AND STRUCTURES.
- 5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF ALL EXISTING UTILITIES AND STRUCTURES.
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- 9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF ALL EXISTING UTILITIES AND STRUCTURES.
- 10. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE PROTECTION OF ALL EXISTING UTILITIES AND STRUCTURES.



24 KV-80V/27V UNIT SUB-STATION

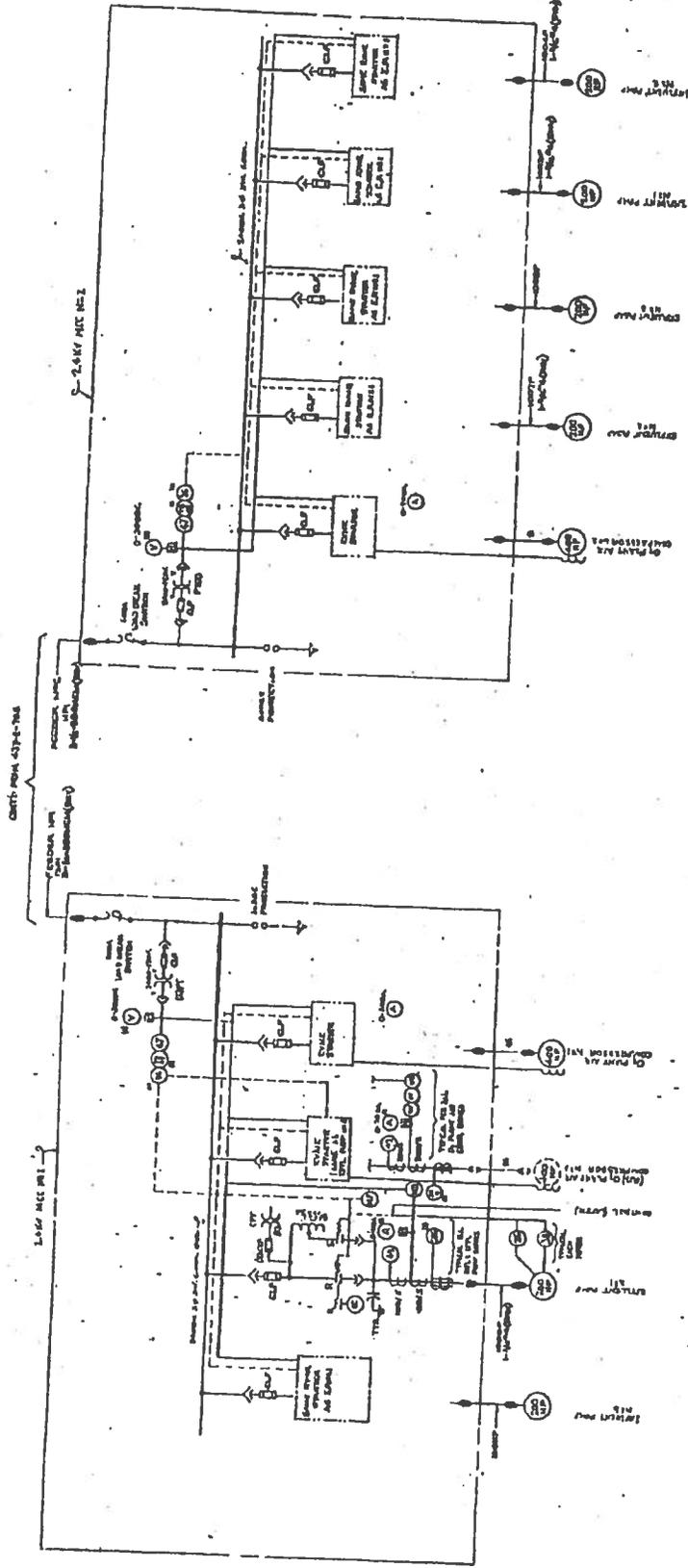
RECORD DRAWINGS

		ERIE COUNTY SOLUTIONS SEWAGE TREATMENT AGENCY POLLUTION ABATEMENT PROJECT NUMBER 0-249-100	
		COURTESY ADVANCED WATERBURY TREATMENT FACILITIES CONTRACT NO. E.	
PROJECT NO. 0-249-100 SHEET NO. 237		24 KV-80V/27V SYSTEM SINGLE LINE DIAGRAM CONTRACT NO. 437-E-710-0	



**NOTES:**

1. ALL WORK SHALL BE IN ACCORDANCE WITH THE CITY OF ENID SPECIFICATIONS FOR SEWERAGE AND SANITATION. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS FROM THE CITY OF ENID AND THE STATE OF OKLAHOMA. THE CONTRACTOR SHALL BE RESPONSIBLE FOR OBTAINING ALL NECESSARY PERMITS FROM THE CITY OF ENID AND THE STATE OF OKLAHOMA.



RECORD DRAWINGS



ENID COUNTY - SOUTHTOWNS  
SEWERAGE TREATMENT AGENCY  
POLLUTION ABATEMENT PROJECT  
NUMBER C-24-101

DATE	BY	REVISION

2.15V MOTOR CONTROL CENTER  
EAGLE LINE DRAWING  
457-E-709-0

SOUTHTOWNS ADVANCED  
WASTEWATER TREATMENT FACILITY  
CONTRACT NO. E

**County of Erie**  
**DIVISION OF PURCHASE**  
**INSTRUCTIONS TO BIDDERS (FORMAL)**

1. BID SHALL BE SUBMITTED ON THESE COUNTY OF ERIE BID FORMS or bid will not be considered. Bid must be typed or printed in ink. Original autograph signatures in ink are required. Facsimile or rubber stamp signatures will not be accepted. ALL PAGES OF THIS BID DOCUMENT MUST BE RETURNED INTACT.
2. LATE PROPOSALS. Any bids received in the Erie County Division of Purchase after the date and time prescribed will not be considered for contract award.
3. EMERGENCY CLOSINGS. In the event the closing of certain County facilities and/or operations and/or services due to any flood, fire, fire drill, power failure, uncontrolled weather conditions or other cause beyond the Division of Purchase control, only bids received in the Division of Purchase prior to the date and time or postmarked as of the date prescribed will be considered for contract award.
4. ANY CHANGE IN WORDING OR INTERLINEATION BY A BIDDER OF THE INQUIRY AS PUBLISHED BY THE COUNTY OF ERIE shall be reason to reject the proposal of such bidder, or in the event that such change in the Invitation to Bid is not discovered prior to entering into a contract, to void any contract entered into pursuant to such bid.
5. THE COUNTY RESERVES THE RIGHT TO REJECT any and all bids, to accept either in whole or in part any one bid or combination of bids, as may be provided in the bid specifications, or to waive any informalities in bids. The County does not obligate itself to accept the lowest or any other proposal.
6. AWARD TO THE LOWEST RESPONSIBLE BIDDER. For the purpose of determining which bidder is the lowest qualified responsible bidder, it shall be the lowest three bidders' responsibility, within FIVE DAYS of being so notified by the Division of Purchase, to present information and documentation to the Division of Purchase, to satisfy the County that the bidder possesses sufficient capital resources, skill, judgment and experience to perform the work or deliver the material, as per bid specifications.
7. CONTRACT(S) OR PURCHASE ORDER(S) WILL BE AWARDED after due consideration of the suitability of goods and/or services bid to satisfy these specifications, the total cost of such goods and/or services including all cost elements, and the timeliness of the agreed upon delivery date.
8. This EXECUTORY CLAUSE shall be a part of any agreement entered into pursuant to this bid:  
  
IT IS UNDERSTOOD BY THE PARTIES THAT THIS AGREEMENT SHALL BE EXECUTORY ONLY TO THE EXTENT OF THE MONIES AVAILABLE TO THE COUNTY OF ERIE AND APPROPRIATED THEREFOR, AND NO LIABILITY ON ACCOUNT THEREOF SHALL BE INCURRED BY THE COUNTY BEYOND THE MONIES AVAILABLE AND APPROPRIATED FOR THE PURPOSE THEREOF.
9. FAILURE TO MEET DELIVERY SCHEDULE as per accepted bid may result in legal action by the County of Erie to recover damages.
10. PRICES SHALL BE QUOTED F.O.B. DESTINATION AND DELIVERED INSIDE. "Tailgate delivery" will not be accepted unless specified by the County.
11. COLLECT TRANSPORTATION CHARGES WILL NOT BE PAID BY THE COUNTY. All freight, cartage, rigging, postage or other transportation charges shall be prepaid and included in the bid. There will be no additional charges for delivery.
12. NO TAXES ARE TO BE BILLED TO THE COUNTY. Bids shall not include any Federal, State, or local excise, sales, transportation, or other tax, unless Federal or State law specifically levies such tax on purchases made by a political subdivision. The County of Erie Purchase Order is an exemption certificate. Any applicable taxes from which the County is not exempt shall be listed separately as cost elements, and added into the total net bid.
13. THE SUCCESSFUL BIDDER shall comply with all laws, rules, regulations and ordinances of the Federal Government, State of New York and any other political subdivision of regulatory body which may apply to its performance under this contract.

**County of Erie**  
**DIVISION OF PURCHASE**

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14. GRATUITIES, ILLEGAL OR IMPROPER SCHEMES. The County may terminate this agreement if it is determined that gratuities in the form of entertainment, gifts or otherwise were offered or given by a vendor, his agent or representative to any County official or employee with a view towards securing favorable treatment with respect to the awarding of this bid or the performance of this agreement. The County may also terminate this agreement if it is determined that the successful bidder engaged in any other illegal or improper scheme promotive of favoritism or unfairness incidental to the bidding process or the performance of this agreement. In the event that it is determined that said improper or illegal acts occurred, the County shall be entitled to terminate this agreement and/or exercise any other remedy available to it under existing law.

15. INSURANCE shall be procured by the Successful Bidder before commencing work, no later than 14 days after notice of award and maintained without interruption for the duration of the Contract, in the kinds and amounts specified in Exhibit IC, unless otherwise stipulated in these Bid Specifications. IF THE INSURANCE IS NOT PROVIDED IN ACCEPTABLE FORM WITHIN THIS PERIOD OF TIME, THEN THE DIRECTOR OF PURCHASE MAY DECLARE THE VENDOR NONRESPONSIVE AND AWARD THE CONTRACT TO THE NEXT LOW RESPONSIBLE BIDDER.

CERTIFICATES OF INSURANCE shall be furnished by the successful bidder on Erie County Standard Insurance Certificate, Exhibit IC.

16. ANY CASH DISCOUNT which is part of bid will be considered as a reduction in the bid prices in determining the award of the bid. Date of invoice must not precede date of delivery. The County policy is to pay all claims in a timely manner within the specified time. However, if for some reason payment is delayed, the County will take the discount when payment is made. The County will not pay any interest charges, nor refund discount amounts taken after the discount period. If this is unsatisfactory, please quote net.

17. CHANGES IN THE WORK. The County may, as the need arises, through the Director of Purchase, order changes in the work through additions, deletions, or modifications without invalidating the contract. Compensation, as it may be affected by any change, shall be adjusted by agreement between the contractor and County through the Director of Purchase.

18. BID OFFERING MATERIAL OTHER THAN THAT OF SPECIFIED MANUFACTURER OR TRADE NAME will be considered unless stated otherwise. The use of the name of a particular manufacturer, trade name, or brand in describing an item does not restrict a bidder to that manufacturer or specific article. However, the substituted article on which a proposal is submitted must be of such character or quality that it would serve the purpose for which it is to be used equally well as the manufacturer or brand specified. Proposals will be accepted in accordance with specifications on file or approved equal.

19. IF MATERIAL OR SERVICES OTHER THAN THOSE SPECIFIED IN THIS BID DOCUMENT ARE OFFERED, the bidder must so state and furnish at the time of bid opening, if so requested, and as part of his bid the following information in duplicate:

- (a) Complete description of the item offered, and detailed explanation of the differences between the item specified and the item offered. If, in the opinion of the Division of Purchase, sufficient detail is not presented as a part of the sealed bid to permit definitive evaluation of any substitute item, the bid will not be considered.
- (b) Descriptive literature of item offered, for evaluation.
- (c) List of installations in Erie County of the item offered.
- (d) List of other installations.

20. ANY ADDITIONAL INFORMATION for which bidder desires to add to the bid shall be written on a separate sheet of paper, attached to and submitted with the formal sealed bid, to be read at the formal opening.

21. WORKMANSHIP MUST MEET WITH THE APPROVAL OF THE DEPARTMENT HEAD(S) INVOLVED, AND SHALL BE FIRST CLASS in every respect without exception and shall be equal to the best modern practices. Materials furnished are to be new and unused. All materials furnished or work performed are to be guaranteed free from defects. Anything found defective or not meeting specifications, no matter in what stage of completion, may be rejected and shall be made good by the contractor at his own expense.

22. CONTRACTOR SHALL CLEAN UP and remove all debris and rubbish resulting from the work and leave the premises broom clean to the approval of the department head.

## County of Erie

### DIVISION OF PURCHASE

23. THIS BID IS FIRM AND IRREVOCABLE for a period of 45 days from the date and time of the bid opening. If a contract is not awarded within the 45 day period, a bidder to whom the bid has not been awarded, may withdraw his bid by serving written notice of his intention to do so upon the Division of Purchase. Upon withdrawal of the bid pursuant to this paragraph, the Division of Purchase will forthwith return the bidder's security deposit.
24. PRICES CHARGED TO THE COUNTY OF ERIE are to be no higher than those offered to any other governmental or commercial consumer. If a bidder has a New York State or a Federal GSA contract for any of the items covered in this bid or any similar items, he shall so indicate that he has said contract on these bid papers and automatically supply a copy of this contract within five days after notification of award.
25. PRICE IS FIRM. The unit prices bid shall remain firm, and any other charges bid shall also remain firm, for delivery of the equipment, material, work, or services described in this bid. No cost increase shall be charged for any reason whatsoever.
26. EXTENSION OF PRICE PROTECTION. Any contract entered into pursuant to this bid to supply the County's requirements of goods and/or services for a definite period of time as stated in the attached specifications may be extended for not more than two successive periods of equal length at the same bid price upon the mutual agreement of the successful bidder and the County. All extensions shall be submitted in writing and shall have prior approval by the County of Erie, Director of Purchase.
27. IN EXECUTING THIS BID, THE BIDDER AFFIRMS that all of the requirements of the specifications are understood and accepted by the bidder, and that the prices quoted include all required materials and services. The undersigned has checked all of the bid figures, and understands that the County will not be responsible for any errors or omissions on the part of the undersigned in preparing this bid. Mistakes or errors in the estimates, calculations or preparation of the bid shall not be grounds for the withdrawal or correction of the bid or bid security. In case of error in extension of prices in the bid, the unit price will govern.
28. ACCOUNTABILITY. The undersigned shall be fully accountable for his or its performance under this bid, or any contract entered into pursuant to this bid, and agrees that he, or its officers, will answer under oath all questions relevant to the performance thereof and to any transaction, act or omission had, done or omitted in connection therewith if called before any Judicial, County or State officer or agency empowered to investigate the contract or his performance.
29. TERMINATION OF CONTRACT:
- a. At its option, the County may at any time for any reason terminate this agreement and the Contractor shall immediately cease all work under the agreement upon receipt of written notice of such termination from the County.
  - b. In the event of termination for any reason other than the fault of the Contractor, or the nonavailability of funds as provided in the above Executory Clause, the Contractor shall be paid the amount due to date of termination, and all reasonable expenses caused by such termination.
30. THE SUCCESSFUL BIDDER TO WHOM THE BID IS AWARDED SHALL INDEMNIFY AND HOLD HARMLESS the County of Erie and its agents and employees from and against all claims, damages, losses or causes of action arising out of or resulting from such vendor's performance pursuant to this bid.
31. STATUS AS AN INDEPENDENT CONTRACTOR: The successful Bidder to whom the bid is awarded and the County agree that the Bidder and its officers, employees, agents, contractors, subcontractors and/or consultants are independent contractors and not employees of the County or any department, agency or unit thereof. In accordance with their status as independent contractors, the Bidder covenants and agrees that neither the Bidder nor any of its officers, employees, agents, contractors, subcontractors and/or consultants will hold themselves out as, or claim to be, officers or employees of the County or any department, agency or unit thereof.
32. GOVERNED BY NEW YORK LAW: This Agreement shall be construed and enforced in accordance with the laws of the State of New York. In addition, the parties hereby agree that for any cause of action arising out of this Agreement shall be brought in the County of Erie.

# County of Erie

DIVISION OF PURCHASE

To facilitate correct drawing and execution of contract, bidder shall supply full information concerning legal status:

FIRM NAME Ferguson Electric Service Co., Inc.

ADDRESS OF PRINCIPAL OFFICE STREET 321 Ellicott Street

CITY Buffalo

AREA CODE 716 PHONE 853-3321 STATE New York ZIP 14203

Check one: CORPORATION  PARTNERSHIP  INDIVIDUAL

INCORPORATED UNDER THE LAWS OF THE STATE OF Delaware

If foreign corporation, state if authorized to do business in the State of New York:

YES  NO

TRADE NAMES: \_\_\_\_\_

ADDRESS OF LOCAL OFFICE STREET \_\_\_\_\_

CITY \_\_\_\_\_

AREA CODE \_\_\_\_\_ PHONE \_\_\_\_\_ STATE \_\_\_\_\_ ZIP \_\_\_\_\_

### NAMES AND ADDRESSES OF PARTNERS:

Paul C. Reilly 321 Ellicott Street, Buffalo NY 14203

Dale R. Peters 321 Ellicott Street, Buffalo NY 14203

Jeffrey H. Lattimer 321 Ellicott Street, Buffalo NY 14203

\_\_\_\_\_  
\_\_\_\_\_



# County of Erie

MARK C. POLONCARZ  
COUNTY EXECUTIVE

DIVISION OF PURCHASE

## ASSIGNMENT OF PUBLIC CONTRACTS

### GENERAL MUNICIPAL LAW - Section 109:

1. A clause shall be inserted in all specifications of contracts hereafter made or awarded by an officer, board or agency of a political subdivision, or any district therein, prohibiting any contractor, to whom any contract shall be let, granted or awarded, as required by law, from assigning, transferring, conveying, subletting or otherwise disposing of the same, or of his right, title or interest therein, or his power to execute such contract, to any other person or corporation without the previous consent in writing of the officer, board or agency awarding the contract.
2. If any contractor, to whom any contract is let, granted, or awarded, as required by law, by any officer, board or agency of a political subdivision, or of any district therein, without the previous written consent specified in subdivision one (1) of this section, assign, transfer, convey, sublet or otherwise dispose of such contract, or his right, title or interest therein, or his power to execute such contract to any other person or corporation, the officer, board or agency which let, made, granted or awarded such contract shall revoke and annul such contract, and the political subdivision or district therein, as the case may be, and such officer, board or agency shall be relieved and discharged from all liability and obligations growing out of such contract to such contractor, and to the person or corporation to which such contract shall have been assigned, transferred, conveyed, sublet or otherwise disposed of, and such contractor, and his assignee, transferee or sublessee shall forfeit and lose all monies, theretofore earned under such contract, except so much as may be required to pay his employees. The provisions of this section shall not hinder, prevent or affect any assignment by any such contractor for the benefit of his creditors made pursuant to the laws of the State.

NO ASSIGNMENT OF ANY AGREEMENT pursuant to this bid shall be made without specific prior approval, in writing, by the Erie County Director of Purchase.

(Rev. 12/01/93)



**COUNTY OF ERIE**  
**MARK C. POLONCARZ**  
**COUNTY EXECUTIVE**  
**DIVISION OF PURCHASE**

**PURCHASES BY OTHER LOCAL GOVERNMENTS OR SPECIAL DISTRICTS**

The Erie County Legislature has adopted the following resolution for the purpose of allowing the following-named local governmental or school districts to make purchases through the County bidding procedures.

Under the following conditions, the Director of Purchase may make purchasing services available to the following 88 participants:

1. When in the opinion of the Director of Purchase it will not create any burden or hardship upon the County and the anticipated prices will not be adversely affected thereby, the Director is authorized when he deems appropriate and as may be requested by the participants to provide in any particular County bid specification that the participants in Erie County shall have the right to make purchases based upon the bids received by the County.
2. The County Purchase Director, within the limits of his time and manpower, shall disseminate relevant contract information to the participants.
3. The participants in County contracts will issue purchase orders directly to vendors within the specified contract period referencing the County contract involved and be liable for any payments due on such purchase orders.

Bidders shall take notice that as a condition of the award of a County contract pursuant to these specifications, the successful bidder agrees to accept the award of a similar contract with any of the participants in Erie County if called upon to do so. The County, however, will not be responsible for any debts incurred by participants pursuant to this or any other agreement.

Necessary deviations from the County's specifications in the award of a participant's contract, particularly as such deviations may relate to quantities or delivery point, shall be a matter to be resolved between the successful bidder and participants. All inquiries regarding prospective contracts shall be directed to the attention of:

- AKRON CENTRAL SCHOOL DISTRICT, District Clerk, 47 Bloomingdale Ave., Akron, NY 14001
- AKRON VILLAGE OF, Clerk-Treasurer, 21 Main St., Akron, NY 14001
- ALDEN CENTRAL SCHOOL DISTRICT, District Clerk, 13190 Park St., Alden, NY 14004
- ALDEN TOWN OF, Town Clerk, Town Hall, 11901 Broadway, Alden, NY 14004
- ALDEN VILLAGE OF, Village Clerk, 13336 Broadway, Alden, NY 14004
- AMHERST CENTRAL SCHOOL DISTRICT, Business Manager, 4301 Main St., Amherst, NY 14226
- AMHERST TOWN OF, Highway Superintendent, Town Hall, 5583 Main St., Williamsville, NY 14221
- AMHERST TOWN OF, Town Supervisor, Town Hall, 5583 Main St., Williamsville, NY 14221
- ANGOLA VILLAGE OF, Clerk-Treasurer, 41 Commercial St., Angola, NY 14006
- AURORA TOWN OF, Town Clerk, Town Hall, 5 S. Grove St., E. Aurora, NY 14052
- BLASDELL VILLAGE OF, Clerk-Treasurer, 121 Miriam St., Blasdell, NY 14219
- BOCES, ERIE #1, Clifford N Crooks Svc. Ctr., 355 Harlem Rd. West Seneca NY 14224-1892
- BOCES, ERIE CATTARAUGUS #2, Assistant Superintendent, 3340 Baker Rd., Orchard Park, NY 14127
- BOSTON TOWN OF, Town Clerk, Town Hall, 8500 Boston State Rd., Boston, NY 14025
- BRANT TOWN OF, Town Clerk, Town Hall, Brant North Collins Rd., Brant, NY 14027
- BUFFALO BOARD OF EDUCATION, Purchasing Agent, 408 City Hall, Buffalo, NY 14202
- BUFFALO CITY OF, Division of Purchasing, 1901 City Hall, Buffalo, NY 14202
- BUFFALO SEWER AUTHORITY, General Manager, 1038 City Hall, Buffalo, NY 14202-3378
- CHEEKTOWAGA CENTRAL SCHOOL DISTRICT, 3600 Union Rd., Cheektowaga, NY 14225
- CHEEKTOWAGA-MARYVALE UNION FREE SCHOOL DISTRICT, District Clerk, 1050 Maryvale Dr., Cheektowaga, NY 14225-2386
- CHEEKTOWAGA-SLOAN UNION FREE SCHOOL DISTRICT, District Clerk, 166 Halstead Ave., Sloan, NY 14212-2295
- CHEEKTOWAGA TOWN OF, Town Hall, Broadway & Union Rds., Cheektowaga, NY 14227
- CLARENCE CENTRAL SCHOOL DISTRICT, Business Administrator, 9625 Main St., Clarence, NY 14031-2083
- CLARENCE TOWN OF, Town Clerk, 1 Town Place, Clarence, NY 14031
- CLEVELAND HILL FIRE DISTRICT NO. 6, Secretary, 440 Cleveland Dr., Cheektowaga, NY 14225
- CLEVELAND HILL U.F.S.D. @ CHEEKTOWAGA, Business Manager, 105 Mapleview Dr., Cheektowaga, NY 14225

EXHIBIT B PAGE 2

COLDEN TOWN OF, Deputy Town Clerk, Town Hall, S-8812 State Rd., Colden, NY 14033  
COLLINS TOWN OF, Supervisor, Town Hall, P.O. Box 420, Collins, NY 14035  
CONCORD TOWN OF, Town Clerk, Town Hall, Springville, NY 14141-0187  
DEPEW UNION FREE SCHOOL DISTRICT, District Clerk, 591 Terrace Blvd., Depew, NY 14043  
DEPEW VILLAGE OF, Village Clerk, Municipal Building, 85 Manitou St., Depew, NY 14043  
EAST AURORA VILLAGE OF, Village Clerk, Village Hall, 571 Main St., East Aurora, NY 14052  
EDEN TOWN OF, Town Clerk, 2795 East Church St., Eden, NY 14057  
EGGERTSVILLE FIRE DISTRICT, Secretary/Treasurer, 1880 Eggert Rd., Eggertsville, NY 14226-2233  
ELLWOOD FIRE DISTRICT #1, Secretary, Town of Tonawanda, 1000 Englewood Ave., Kenmore, NY 14223  
ELMA TOWN OF, Town Clerk, Town Hall, 1600 Bowen Rd., Elma, NY 14059  
ERIE COUNTY WATER AUTHORITY, Central Processing, 3030 Union Rd., Buffalo, NY 14227  
EVANS TOWN OF, Town Clerk, 42 N. Main St., Angola, NY 14006  
FARNHAM VILLAGE OF, Village Clerk-Treasurer, 526 Commercial St., Farnham, NY 14061  
FORKS FIRE DISTRICT #3, Commissioner, Town Cheektowaga, 3330 Broadway, Cheektowaga, NY 14227  
GOWANDA VILLAGE OF, Clerk/Treasurer, 27 East Main St., Gowanda, NY 14070  
GRAND ISLAND CENTRAL SCHOOL DISTRICT, District Clerk, 1100 Ransom Rd., Grand Island, NY 14072  
GRAND ISLAND TOWN OF, Town Clerk, 2255 Baseline Rd., Grand Island, NY 14072  
HAMBURG TOWN OF, Town Clerk, S-6100 S. Park Ave., Hamburg, NY 14075  
HAMBURG VILLAGE OF, Village Clerk/Treasurer, 100 Main St., Hamburg, NY 14075  
HOLLAND FIRE DISTRICT #1, Town of Holland, Holland, NY 14080  
HOLLAND TOWN OF, Town Clerk, 47 Pearl St., Holland, NY 14080  
HOPEVALE UNION FREE SCHOOL DISTRICT, District Clerk, 3780 Howard Rd., Hamburg, NY 14075  
IROQUOIS CENTRAL SCHOOL DISTRICT, Girdle Rd., Elma, NY 14059  
KENILWORTH FIRE DISTRICT #2, Commissioner, Tn. Tonawanda, 84 Hawthorne Ave., Buffalo, NY 14223  
KENMORE-TN OF TONAWANDA UNION FREE SCHOOL DISTRICT, District Clerk, 1500 Colvin Blvd., Buffalo NY 14223  
KENMORE VILLAGE OF, Village Clerk-Treasurer, Municipal Building, Kenmore, NY 14217  
LACKAWANNA CITY OF, City Clerk, Lackawanna City Hall, 714 Ridge Rd., Lackawanna, NY 14218  
LAKE VIEW FIRE DISTRICT, Fire Commissioner, Lakeview & Burke Roads, Lake View, NY 14085  
LANCASTER TOWN OF, Town Clerk, 21 Central Avenue, Lancaster, NY 14086  
LANCASTER VILLAGE OF, Clerk-Treasurer, Municipal Building, 5423 Broadway, Lancaster, NY 14086  
MARILLA TOWN OF, Marilla Town Hall, 1740 Two Rod Rd., Marilla, NY 14102  
NEWSTEAD TOWN OF, Town Clerk, Town Hall, P.O. Box 227, Akron, NY 14001  
NIAGARA FRONTIER TRANSPORTATION AUTHORITY, 181 Ellicott St., Buffalo, NY 14205  
NORTH COLLINS TOWN OF, Town Clerk 2015 Spruce St., North Collins, NY 14111  
NORTH COLLINS VILLAGE OF, Village Clerk, 10543 Main St., North Collins, NY 14111  
ORCHARD PARK CENTRAL SCHOOL DISTRICT, Asst. Supt. Bus. & Support Svcs. 3330 Baker Rd., Orchard Park, NY 14127  
ORCHARD PARK TOWN OF, Town Clerk, Municipal Bldg., 4295 S. Buffalo St., Orchard Park, NY 14127  
ORCHARD PARK VILLAGE OF, Clerk, Municipal Bldg., 4295 S. Buffalo St., Orchard Park, NY 14127  
SARDINIA TOWN OF, Town Clerk, Town Hall, Savage Rd., Sardinia, NY 14134  
SHERIDAN PARK FIRE DISTRICT NO. 4, Secretary, 738 Sheridan Dr., Tonawanda, NY 14150  
SLOAN VILLAGE OF, Clerk Treasurer, 425 Reiman St., Sloan, NY 14212  
SNYDER VOL. FIRE DEPT., Fire Commissioner, 4531 Main Street, Snyder, NY 14226  
SOUTH LINE FIRE DISTRICT #10, Fire Commissioner, 1049 S. French Rd., S. Cheektowaga, NY 14227  
SOUTH WALES FIRE DISTRICT #1, Secretary/Treasurer, P.O.Box 94, South Wales, NY 14139  
SPRING BROOK FIRE DISTRICT #1, Secretary, P.O. Box 97, Spring Brook, NY 14140  
SPRINGVILLE VILLAGE OF, Clerk Treasurer, Village Office, 5 W. Main St., Springville, NY 14141  
SWEET HOME CENTRAL SCHOOL DISTRICT, Director Finance & Plant Svcs., 1901 Sweet Home Rd., Amherst, NY 14228  
TONAWANDA CITY OF, Mayor, 200 Niagara St., Tonawanda, NY 14150  
TONAWANDA CITY OF, Superintendent, 150 Fillmore Avenue, Tonawanda, NY 14150  
TONAWANDA CITY SCHOOL DISTRICT, District Clerk, 100 Hinds St., Tonawanda, NY 14150-1815  
TONAWANDA TOWN OF, Town Clerk, Municipal Building, Kenmore, NY 14217  
U-CREST FIRE DISTRICT #4, Fire Commissioner, 255 Clover Place, Cheektowaga, NY 14225  
UNION FREE SCHOOL DISTRICT, Dist. Clerk, Tn. Tonawanda, 1500 Colvin Blvd., Kenmore, NY 14223  
WALDEN FIRE DISTRICT #2, Fire Commissioner, 20 Pine Ridge Road, Cheektowaga, NY 14211  
WALES TOWN OF, Town Clerk, Big Tree Rd., Wales Center, NY 14169  
WEST SENECA CENTRAL SCHOOL DISTRICT, District Treasurer, 1397 Orchard Park Rd., West Seneca, NY 14224-4098  
WEST SENECA FIRE DISTRICT #4, Fire Commissioner, 100 Lein Rd., West Seneca, NY 14224  
WEST SENECA FIRE DISTRICT #5, Fire Commissioner, 2801 Seneca St., West Seneca, NY 14224  
WEST SENECA TOWN OF, Town Clerk, 1250 Union Road, West Seneca, NY 14224  
WILLIAMSVILLE CENTRAL SCHOOL DISTRICT, District Clerk, 105 Casey Rd, PO Box 5000, East Amherst NY 14051  
WILLIAMSVILLE VILLAGE OF, 5565 Main St., Williamsville, NY 14231-1557  
WYOMING, COUNTY OF, Office of the Board of Supervisors, 143 N Main St., Warsaw, NY 14569



**County of Erie**  
 MARK C. POLONCARZ  
 COUNTY EXECUTIVE  
 DIVISION OF PURCHASE  
CONSTRUCTION/RECONSTRUCTION CONTRACTS

1. DISCRIMINATION. The successful bidder agrees:

(a) that in the hiring of employees for the performance of work under this contract or any subcontract hereunder, no contractor, subcontractor, nor any person acting on behalf of such contractor or subcontractor, shall by reason of race, creed, color, sex or national origin discriminate against any citizen of the State of New York who is qualified and available to perform the work to which the employment relates;

(b) that no contractor, subcontractor, nor any person on his behalf shall, in any manner, discriminate against or intimidate any employee hired for the performance of work under this contract on account of race, creed, color, sex or national origin;

(c) that there may be deducted from the amount payable to the contractor by the County of Erie under this contract a penalty of fifty dollars for each person for each calendar day during which such person was discriminated against or intimidated in violation of the provisions of the contract;

(d) that this contract may be cancelled or terminated by the County of Erie and all monies due or to become due hereunder may be forfeited, for a second or any subsequent violation of the terms or conditions of this section of the contract; and

(e) the aforesaid provisions of this section covering every contract for or on behalf of the County of Erie for the manufacture, sale or distribution of materials, equipment or supplies shall be limited to operations performed within the territorial limits of the State of New York. (N.Y. State Labor Law Article 8 Section 220-e)

(f) Provisions of the State Law Against Discrimination also prohibit discrimination in employment because of age.

2. CONSTRUCTION, RECONSTRUCTION, OR REPAIR CONTRACTS FOR PUBLIC WORKS FACILITIES are subject to minimum wage rates, as established by the State of New York Department of Labor. The successful bidder on any contract for public works to which the provisions of the New York State Labor Law Article 8 apply agrees that:

(a) No laborer, workman or mechanic in the employ of the contractor, subcontractor or other person doing or contracting to do the whole or a part of the work contemplated by the contract shall be permitted or required to work more than eight hours in any one calendar day or more than five days in any one week except in cases of extraordinary emergency including fire, flood or danger to life or property. (Section 220, subd. 2, N.Y. State Labor Law)

(b) Each laborer, workman or mechanic employed by the contractor, subcontractor or other person doing or contracting to do the whole or part of the work contemplated by the contract shall be paid not less than the hourly minimum rate of wage and provided supplements not less than the prevailing supplements as designated by the New York State Industrial Commission. (Section 220, subd. 3, N.Y. State Labor Law)

Wage and supplement rates are on file in the Division of Purchase.

3. AFFIRMATIVE ACTION PROGRAM AFFECTING CONSTRUCTION CONTRACTS. The Erie County Legislature has adopted a resolution directing that County Construction Contracts require the contractor to take affirmative action to secure equal opportunity for minority group workers and to comply with the Affirmative Action Program of the County of Erie. The Legislative resolution provides that a contract for the purchase of equipment involving installation work by building trade employees shall be considered a construction contract if the number of such employees on the job site shall at any time exceed ten (10). If the contractor intends to have more than ten (10) such employees on the job site at any one time, it shall be the contractor's obligation to make a written request to the Director of the Division of Purchase for a copy of the special conditions pertaining to affirmative action. The contractor shall not, at any time, place more than ten (10) such employees on the job site except in compliance with the said resolution and the said special conditions.

ERIE COUNTY OFFICE BUILDING, 95 FRANKLIN STREET, BUFFALO, NY 14202 (716) 858-6395



# County of Erie

MARK C. POLONCARZ  
COUNTY EXECUTIVE

DIVISION OF PURCHASE

## STANDARD AGREEMENT

This AGREEMENT, made as of the \_\_\_\_\_ day of \_\_\_\_\_,

by and between \_\_\_\_\_

of \_\_\_\_\_

hereinafter referred to as the Contractor, and the County of Erie, a municipal corporation of the State of New York, hereinafter referred to as the County:

WHEREAS, in accordance with public open competitive bidding, sealed proposals were received and publicly opened by the County of Erie, Division of Purchase

on \_\_\_\_\_ at \_\_\_\_\_

for: \_\_\_\_\_

WHEREAS, the bid of the Contractor submitted in accordance therewith, the sum

of \$ \_\_\_\_\_ Dollars,

was the lowest responsible bid submitted; and

WHEREAS, a contract is hereby awarded to the Contractor by the County, in accordance with the provisions therein contained; and

WHEREAS, the Notice to Bidders and Specifications make provisions for entering into a proper and suitable contract in connection therewith;

NOW, therefore, the Contractor does hereby for its heirs, executors, administrators and successors agree with the County of Erie that, the Contractor shall for the consideration mentioned, and in the manner set forth in Accepted Invitation to Bid No. \_\_\_\_\_, Specifications and Provisions of Law annexed hereto and forming a part of this contract, furnish the equipment and materials and perform the work and services described in the Accepted Bid for the above sum.

\_\_\_\_\_ Paid monthly upon presentation of invoices.

\_\_\_\_\_ Upon delivery, completion and approval of the work, as per specifications.

Please refer to the Invitation to Bid (Page 1) and the Instructions to Bidders which are part of this agreement.

IN WITNESS THEREOF, the parties hereto have hereunto set their hands and seals the day and year first above written.

COUNTY OF ERIE

Contractor \_\_\_\_\_

by \_\_\_\_\_  
Director of Purchase

by \_\_\_\_\_

Title \_\_\_\_\_

APPROVED AS TO FORM

\_\_\_\_\_  
Assistant County Attorney  
County of Erie, New York

\_\_\_\_\_ (date)



County of Erie  
MARK C. POLONCARZ  
COUNTY EXECUTIVE

DIVISION OF PURCHASE

**MBE/WBE COMMITMENT**

The Erie County Legislature enacted Local Law No. 5 requiring a minority and women-owned business utilization commitment by persons or firms contracting with the County of Erie for supplies, materials, equipment, and insurance.

SECTION 1.

A. The supplier of all purchase contracts involving an expenditure of more than \$15,000.00 shall take affirmative action to utilize bona fide minority business enterprises (MBE) and women business enterprises (WBE) on all contracts with the County. Affirmative action shall include, but not limited to:

1. Utilizing a source list of MBEs and WBEs; and
2. Solicitation of bids from MBEs and WBEs; and
3. Providing MBEs and WBEs sufficient time to submit proposals in response to solicitations; and
4. Maintaining records showing utilization of MBEs and/or WBEs specific efforts to identify and utilize these companies; and
5. A goal of awarding at least ten percent (10%) of the total dollar value of the contract to MBEs and at least two percent (2%) of the total dollar value of the contract to WBEs or, for those contracts governed by federal or state regulations with respect to MBE and/or WBE hiring the prevailing percentage set forth therein, whichever is higher, subject to waiver as provided below.

B. All bidders must submit, with a bid, a list of all MBEs and WBEs from whom the supplier has solicited bids, or with whom the supplier has signed a binding contractual agreement, or with whom the contractor is presently negotiating an agreement, for the purpose of meeting the MBE and WBE utilization goals provided in subdivision (A) (5) above. A supplier's bid shall not be considered where the supplier fails to submit a list as provided for herein. A supplier's bid shall not be considered where examination of said list of MBEs and WBEs evidences failure by the supplier to comply with the affirmative action requirements provided herein, except that the County may, upon written request by the supplier, grant a complete or partial waiver of the provisions of subdivision (A) (5) where the availability of MBEs and/or WBEs in the market area of the contract is less than the ten percent (10%) MBE goal and two percent (2%) WBE goal.

C. As evidence of compliance with the goals set forth in subdivision (A) (5) above, the supplier shall submit to the Director or Purchasing, at the bid opening, a schedule for MBE and WBE participation listing the MBEs and WBEs with whom the supplier intends to utilize; specifying the agreed upon price to be paid for such goods and identifying in detail the contract item or items to be supplied by each MBE and WBE. A copy of the participating schedule will be forwarded to the Division of E.E.O. from the Division of Purchasing. Contingent upon a contract award, a letter of intent to enter into a purchase agreement, signed by both the supplier and the MBE and WBE (unless a waiver is requested in one of those categories), indicating the agreed upon price and scope of work, shall be provided.

D. As evidence of compliance with the goals set forth in subdivision (A) (5) above, the supplier shall provide to the County Division of E.E.O., copies of all the subcontracts and/or purchase agreements with the MBEs and WBEs within fifteen (15) days of contract award.

E. For the purpose of this section, the term "minority business enterprise" shall mean a business which performs a commercially useful function, at least fifty-one percent (51%) of which is owned by minority group members or, in the case of a publicly-owned business, at least fifty-one percent (51%) of all stock is owned by minority group members. Such ownership shall be certified by the County Division of E.E.O.

For the purposes of this paragraph, "minority group members" are citizens of the United States who are African-American, Hispanic, Asian-American and American-Indian.

F. For the purposes of this section, the term "women-owned business enterprise" shall mean a business which performs a commercially useful function, at least fifty-one percent (51%) of which is owned by a woman or women or, in the case of publicly-owned business, at least fifty-one percent (51%) of all stock is owned by a woman or women. Such ownership shall be certified by the County Division of E.E.O.

NOTE:

It is the prime vendor's responsibility to obtain MBE/WBE vendors and NOT the County of Erie. However, some vendors may be obtained from:

Director  
Erie County Division of E.E.O.  
95 Franklin Street  
6<sup>TH</sup> Floor  
Buffalo, NY 14202  
(716) 858-7542

BID WILL NOT BE CONSIDERED IF THIS FORM IS NOT SUBMITTED WITH BID AS REQUIRED, REGARDLESS OF THE BID AMOUNT.

BID NO.: 212127-002  
BID DATE: 04.26.2012

### ERIE COUNTY MINORITY/ WOMEN BUSINESS ENTERPRISE UTILIZATION REPORT - PART A

COMPANY: Ferguson Electric Service Co., Inc.  
AUTHORIZED REPRESENTATIVE: Paul C. Reilly  
ADDRESS: 321 Ellicott Street, Buffalo New York 14203  
TELEPHONE NUMBER: (716) 853-3321  
BID NAME: Electrical Preventive Maintenance Program at Southtown's Wastewater Treatment Plant

I. List actions taken to identify, solicit, and contact Minority Business Enterprises (MBE)/Women Business Enterprises (WBE) to bid on subcontracts for this project.

- 1. Not Applicable
- 2.
- 3.
- 4.
- 5.
- 6.

II. List all bona fide Minority/Women Business Enterprise subcontractors and suppliers solicited, contracted, or presently negotiating a contract in accordance with the minority business utilization goal set forth by the County of Erie. (Attach additional sheets if necessary.)

MBE/WBE OWNED FIRMS	SUPPLY/SERVICE	AMOUNT OF PROPOSAL	PRIOR CERTIFICATION	CONTRACT EXECUTED	REASON IF CONTRACT NOT AWARDED
Name: _____ Address: _____ _____ Telephone No. _____ IRS # _____				YES _____ NO _____	
Name: _____ Address: _____ _____ Telephone No. _____ IRS # _____				YES _____ NO _____	



**MBE/WBE UTILIZATION REPORT - PART B**

**FINAL CERTIFICATION OF EXPENDITURES TO MBEs/WBEs**

(To be completed by the prime vendor and submitted to the  
Erie County Division of E.E.O. when contract is complete)

Erie County reserves the right to require documentation, including,  
but not limited to, cancelled checks to verify these amounts.

VENDOR: \_\_\_\_\_ BID NO. \_\_\_\_\_

MBE	TOTAL AMOUNT EXPENDED

WBE	TOTAL AMOUNT EXPENDED

TOTAL OF ALL MBE SUBCONTRACTS	\$ _____
TOTAL OF ALL WOMEN SUBCONTRACTS	\$ _____
AMOUNT OF CONTRACT (PRIME)	\$ _____
FINAL MBE PERCENTAGE	\$ _____
FINAL WBE PERCENTAGE	\$ _____

I \_\_\_\_\_, as an official representative of \_\_\_\_\_, do hereby certify that the information listed above is correct and complete.

SIGNATURE	TITLE	DATE
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MAIL TO: Erie County Division of E.E.O.  
95 Franklin Street  
6<sup>th</sup> Floor  
Buffalo, NY 14202

**WAIVER RECOMMENDATION**

COMPANY: Ferguson Electric Service Co., Inc.

ADDRESS: 321 Ellicott Street, Buffalo New York 14203

TELEPHONE NUMBER: ( 716 ) 853-3321 BID NO.: 212127-002

1. Vendor has made a good faith effort to subcontract on this bid for which minority/women's business enterprises bids could be solicited; and

2. The total percentage of the bid which could be subcontracted for which minority business enterprises bids could be solicited is less than 10% for MBEs and/or 2% WBEs.

A waiver as provided for by Erie County Local Law, is hereby requested on the grounds that there are no/insufficient (circle the appropriate term) minority/women's business enterprises in the market area of this bid.

- 1. \_\_\_\_\_
- 2. \_\_\_\_\_
- 3. \_\_\_\_\_
- 4. \_\_\_\_\_
- 5. \_\_\_\_\_
- 6. \_\_\_\_\_
- 7. \_\_\_\_\_
- 8. \_\_\_\_\_
- 9. \_\_\_\_\_
- 10. \_\_\_\_\_

(Use additional sheets if necessary.)

If a partial waiver is granted, the Vendor will make a good faith effort to meet the reduced goal.

04/25/2012  
DATE

[Signature]  
SIGNATURE OF AUTHORIZED  
COMPANY REPRESENTATIVE

Granted in Whole: \_\_\_\_\_

Granted in Part: \_\_\_\_\_

Comments:  
\_\_\_\_\_  
\_\_\_\_\_

DIRECTOR OF E.E.O.

DATE



# CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY)

05/10/12

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

**IMPORTANT:** If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

<b>PRODUCER</b> Walsh Duffield 801 Main St. Buffalo, NY 14203-1215	716-853-3820 716-847-1360	<b>CONTACT NAME:</b> Beverly A. Zolnowski, CPCU <b>PHONE (A/C, No, Ext):</b> 716-362-7324 <b>FAX (A/C, No):</b> 716-847-1360 <b>E-MAIL ADDRESS:</b> bzolnowski@walshins.com															
<b>INSURED</b> <b>Ferguson Electric Service Co., Inc.</b> 333 Ellicott Street Buffalo, NY 14203		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 80%;">INSURER(S) AFFORDING COVERAGE</th> <th style="width: 20%;">NAIC #</th> </tr> </thead> <tbody> <tr> <td>INSURER A : <b>Wausau Underwriters Ins Co</b></td> <td></td> </tr> <tr> <td>INSURER B : <b>Old Republic Insurance Co.</b></td> <td style="text-align: center;">24147</td> </tr> <tr> <td>INSURER C : <b>Liberty Mutual Fire Ins Co.</b></td> <td style="text-align: center;">23035</td> </tr> <tr> <td>INSURER D :</td> <td></td> </tr> <tr> <td>INSURER E :</td> <td></td> </tr> <tr> <td>INSURER F :</td> <td></td> </tr> </tbody> </table>		INSURER(S) AFFORDING COVERAGE	NAIC #	INSURER A : <b>Wausau Underwriters Ins Co</b>		INSURER B : <b>Old Republic Insurance Co.</b>	24147	INSURER C : <b>Liberty Mutual Fire Ins Co.</b>	23035	INSURER D :		INSURER E :		INSURER F :	
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## COVERAGES

CERTIFICATE NUMBER:

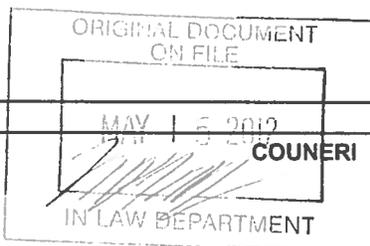
REVISION NUMBER:

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSR	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS
A	GENERAL LIABILITY			TBJZ11260608022  PER FORM LG3180 (09-07) XCU INCLUDED	04/01/12	04/01/13	EACH OCCURRENCE \$ 1,000,000
	<input checked="" type="checkbox"/> COMMERCIAL GENERAL LIABILITY <input type="checkbox"/> CLAIMS-MADE <input checked="" type="checkbox"/> OCCUR <input checked="" type="checkbox"/> Primary <input checked="" type="checkbox"/> Contractual GEN'L AGGREGATE LIMIT APPLIES PER: <input type="checkbox"/> POLICY <input checked="" type="checkbox"/> PRO-JECT <input type="checkbox"/> LOC	X					DAMAGE TO RENTED PREMISES (Ea occurrence) \$ 300,000 MED EXP (Any one person) \$ 10,000 PERSONAL & ADV INJURY \$ 1,000,000 GENERAL AGGREGATE \$ 2,000,000 PRODUCTS - COMP/OP AGG \$ 2,000,000
A	AUTOMOBILE LIABILITY			ASKZ11260608012	04/01/12	04/01/13	COMBINED SINGLE LIMIT (Ea accident) \$ 1,000,000
	<input checked="" type="checkbox"/> ANY AUTO ALL OWNED AUTOS <input checked="" type="checkbox"/> HIRED AUTOS <input type="checkbox"/> SCHEDULED AUTOS NON-OWNED AUTOS	X					BODILY INJURY (Per person) \$ BODILY INJURY (Per accident) \$ PROPERTY DAMAGE (Per accident) \$
C	UMBRELLA LIAB			TH7621093964012	04/01/12	04/01/13	EACH OCCURRENCE \$ 5,000,000
	<input checked="" type="checkbox"/> EXCESS LIAB <input type="checkbox"/> DED <input checked="" type="checkbox"/> RETENTION \$ 10,000	X					AGGREGATE \$ 5,000,000
B	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY			MWC 117440 00	04/01/12	04/01/13	<input checked="" type="checkbox"/> WC STATUTORY LIMITS <input type="checkbox"/> OTHER
	ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	Y/N N	N/A				E.L. EACH ACCIDENT \$ 1,000,000 E.L. DISEASE - EA EMPLOYEE \$ 1,000,000 E.L. DISEASE - POLICY LIMIT \$ 1,000,000

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (Attach ACORD 101, Additional Remarks Schedule, if more space is required)

Electrical Preventive Maintenance Program at Southtown's Wastewater Treatment Plant. County of Erie is named as an Additional Insured on a primary and non-contributory basis with respect to work performed if required by signed written contract.



CERTIFICATE HOLDER

CANCELLATION

The County of Erie  
 c/o Dept. of Law  
 95 Franklin Street, Room 1634  
 Buffalo, NY 14202

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

*Edward F. Webb Jr*

**STATE OF NEW YORK  
WORKERS' COMPENSATION BOARD  
CERTIFICATE OF NYS WORKERS' COMPENSATION INSURANCE COVERAGE**

<p>1a. Legal Name and address of Insured (Use street address only)</p> <p><b>Ferguson Electric Service Co., Inc.</b> 333 Ellicott Street Buffalo, NY 14203</p> <p><i>Work Location of Insured (Only required if coverage is specifically limited to certain locations in New York State, i.e. a Wrap-Up Policy)</i></p>	<p>1b. Business Telephone Number of Insured 716-852-2010</p> <p>1c. NYS Unemployment Insurance Employer Registration Number of Insured</p> <p>1d. Federal Employer Identification Number of Insured or Social Security Number <b>160430730</b></p>
<p>2. Name and Address of the Entity Requesting Proof of Coverage (Entity Being Listed as the Certificate Holder)</p> <p><b>The County of Erie</b> c/o Dept. of Law 95 Franklin Street, Room 1634 Buffalo, NY 14202</p> <p><b>Re: Electrical Preventive Maintenance Program at Southtown's Wastewater Treatment Plant.</b></p>	<p>3a. Name of Insurance Carrier <b>Old Republic Insurance Co.</b></p> <p>3b. Policy Number of entity listed in box "1a": <b>MWC 117440 00</b></p> <p>3c. Policy effective period: <b>04/01/12 to 04/01/13</b></p> <p>3d. The Proprietor, Partners or Executive Officers are:</p> <p><input checked="" type="checkbox"/> <b>included.</b> (Only check box if all partners/officers included)</p> <p><input type="checkbox"/> <b>all excluded or certain partners/officers excluded.</b></p>

This certifies that the insurance carrier indicated above in box "3" insures the business referenced above in box "1a" for workers' compensation under the New York State Workers' Compensation Law. (To use this form, New York (NY) must be listed under **Item 3A** on the INFORMATION PAGE of the workers' compensation insurance policy). The Insurance Carrier or its licensed agent will send this Certificate of Insurance to the entity listed above as the certificate holder in box "2".

*The Insurance Carrier will also notify the above certificate holder within 10 days IF a policy is canceled due to nonpayment of premiums or within 30 days IF there are reasons other than nonpayment of premiums that cancel the policy or eliminate the insured from the coverage indicated on this Certificate. (These notices may be sent by regular mail.) Otherwise, this Certificate is valid for one year after this form is approved by the insurance carrier or its licensed agent, or until the policy expiration date listed in box "3c", whichever is earlier.*

**Please Note: Upon the cancellation of the workers' compensation policy indicated on this form, if the business continues to be named on a permit, license or contract issued by a certificate holder, the business must provide that certificate holder with a new Certificate of Workers' Compensation Coverage or other authorized proof that the business is complying with the mandatory coverage requirements of the New York State Workers' Compensation Law.**

**Under penalty of perjury, I certify that I am an authorized representative or licensed agent of the insurance carrier referenced above and that the named insured has the coverage as depicted on this form.**

Approved by: Beverly A. Zolnowski  
(Print name of authorized representative or licensed agent of insurance carrier)

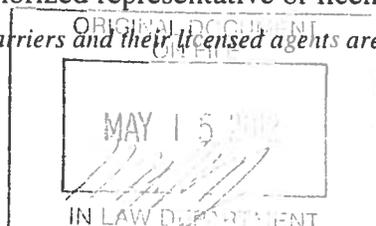
Approved by: *Beverly A Zolnowski* 5/10/12  
(Signature) (Date)

Title: Vice President

Telephone Number of authorized representative or licensed agent of insurance carrier: 716 853-3820

**Please Note: Only insurance carriers and their licensed agents are authorized to issue the C-105.2 form. Insurance brokers are NOT authorized to issue it.**

C-105.2 (9-07)



## Workers' Compensation Law

### **Section 57. Restriction on issue of permits and the entering into contracts unless compensation is secured.**

1. The head of a state or municipal department, board, commission or office authorized or required by law to issue any permit for or in connection with any work involving the employment of employees in a hazardous employment defined by this chapter, and notwithstanding any general or special statute requiring or authorizing the issue of such permits, shall not issue such permit unless proof duly subscribed by an insurance carrier is produced in a form satisfactory to the chair, that compensation for all employees has been secured as provided by this chapter. Nothing herein, however, shall be construed as creating any liability on the part of such state or municipal department, board, commission or office to pay any compensation to any such employee if so employed.
2. The head of a state or municipal department, board, commission or office authorized or required by law to enter into any contract for or in connection with any work involving the employment of employees in a hazardous employment defined by this chapter, notwithstanding any general or special statute requiring or authorizing any such contract, shall not enter into any such contract unless proof duly subscribed by an insurance carrier is produced in a form satisfactory to the chair, that compensation for all employees has been secured as provided by this chapter.

STATE OF NEW YORK  
WORKERS' COMPENSATION BOARD

CERTIFICATE OF INSURANCE COVERAGE UNDER THE NYS DISABILITY BENEFITS LAW

**PART 1. To be completed by Disability Benefits Carrier or Licensed Insurance Agent of that Carrier**

<p>1a. Legal Name and Address of Insured (Use street address only)</p> <p>Ferguson Electric Construction Co. Inc. 333 Ellicott Street Buffalo, NY 14203</p>	<p>1b. Business Telephone Number of Insured 716-852-2010</p> <p>1c. NYS Unemployment Insurance Employer Registration Number of Insured 17-050143</p> <p>1d. Federal Employer Identification Number of Insured or Social Security Number 16-0430730</p>
<p>2. Name and Address of the Entity Requesting Proof of Coverage (Entity Being Listed as the Certificate Holder)</p> <p>The County of Erie C/O Dept. of Law 95 Franklin Street, Rm. 1634 Buffalo, NY 14202</p>	<p>3a. Name of Insurance Carrier Zurich North America Insurance Co</p> <p>3b. Policy Number of entity listed in box "1a": 5462850-001</p> <p>3c. Policy effective period: 1/1/2012 to 12/31/2012</p>

4. Policy covers:

a.  All of the employer's employees eligible under the New York Disability Benefits Law

b.  Only the following class or classes of the employer's employees:

Under penalty of perjury, I certify that I am an authorized representative or licensed agent of the insurance carrier referenced above and that the named insured has NYS Disability Benefits insurance coverage as described above.

Date Signed 5/10/2012 By Edward F. Walsh, Jr.  
(Signature of insurance carrier's authorized representative or NYS Licensed Insurance Agent of that insurance carrier)

Telephone Number (716) 853-3820 Title Edward F. Walsh, Jr., President & Chief Operating Officer

**IMPORTANT:** If box "4a" is checked, and this form is signed by the insurance carrier's authorized representative or NYS Licensed Insurance Agent of that carrier, this certificate is COMPLETE. Mail it directly to the certificate holder.  
If box "4b" is checked, this certificate is NOT COMPLETE for purposes of Section 220, Subd. 8 of the Disability Benefits Law. It must be mailed for completion to the Workers' Compensation Board, DB Plans Acceptance Unit, 20 Park Street, Albany, New York 12207.

**PART 2. To be completed by NYS Workers' Compensation Board (Only if box "4b" of Part 1 has been checked)**

State Of New York  
Workers' Compensation Board

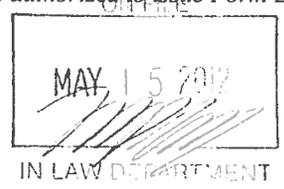
According to information maintained by the NYS Workers' Compensation Board, the above-named employer has complied with the NYS Disability Benefits Law with respect to all of his/her employees.

Date Signed \_\_\_\_\_ By \_\_\_\_\_  
(Signature of NYS Workers' Compensation Board Employee)

Telephone Number \_\_\_\_\_ Title \_\_\_\_\_

**Please Note:** Only insurance carriers licensed to write NYS disability benefits insurance policies and NYS licensed insurance agents of those insurance carriers are authorized to issue Form DB-120.1. Insurance brokers are NOT authorized to issue this form.

DB-120.1 (5-06)



## Additional Instructions for Form DB-120.1

By signing this form, the insurance carrier identified in box "3" on this form is certifying that it is insuring the business referenced in box "1a" for disability benefits under the New York State Disability Benefits Law. The Insurance Carrier or its licensed agent will send this Certificate of Insurance to the entity listed as the certificate holder in box "2". *This Certificate is valid for the earlier of one year after this form is approved by the insurance carrier or its licensed agent, or the policy expiration date listed in box "3c".*

Please Note: Upon the cancellation of the disability benefits policy indicated on this form, if the business continues to be named on a permit, license or contract issued by a certificate holder, the business must provide that certificate holder with a new Certificate of NYS Disability Benefits Coverage or other authorized proof that the business is complying with the mandatory coverage requirements of the New York State Disability Benefits Law.

### DISABILITY BENEFITS LAW

#### §220. Subd. 8

(a) The head of a state or municipal department, board, commission or office authorized or required by law to issue any permit for or in connection with any work involving the employment of employees in employment as defined in this article, and notwithstanding any general or special statute requiring or authorizing the issue of such permits, shall not issue such permit unless proof duly subscribed by an insurance carrier is produced in a form satisfactory to the chair, that the payment of disability benefits for all employees has been secured as provided by this article. Nothing herein, however, shall be construed as creating any liability on the part of such state or municipal department, board, commission or office to pay any disability benefits to any such employee if so employed.

(b) The head of a state or municipal department, board, commission or office authorized or required by law to enter into any contract for or in connection with any work involving the employment of employees in employment as defined in this article, and notwithstanding any general or special statute requiring or authorizing any such contract, shall not enter into any such contract unless proof duly subscribed by an insurance carrier is produced in a form satisfactory to the chair, that the payment of disability benefits for all employees has been secured as provided by this article.



COUNTY OF ERIE

MARK C. POLONCARZ  
COUNTY EXECUTIVE

DIVISION OF PURCHASE

PERFORMANCE BOND

BOND NO. 9072838

KNOW ALL MEN BY THESE PRESENTS, that we, Ferguson Electric Service Co., Inc.  
of 321 Ellicott Street, Buffalo, NY 14203 (hereinafter called PRINCIPAL) and the Fidelity and Deposit  
Company of Maryland a corporation of the State of Maryland having its principal office in  
the City of Baltimore, Maryland and authorized to do business in the State of New York (hereinafter  
called SURETY) and held and firmly bound into the County of Erie, 95 Franklin Street, Buffalo, NY 14202 (hereinafter  
called OBLIGEE), in the amount of Fifty Two Thousand Four Hundred Sixty Four and 00/100 New York  
\$ 52,464.00 Dollars, lawful money of the United States of  
America, for the payment of which the PRINCIPAL and the SURETY hereby bind themselves, their heirs, executors,  
administrators, successors and assigns jointly and severally, firmly by these presents.

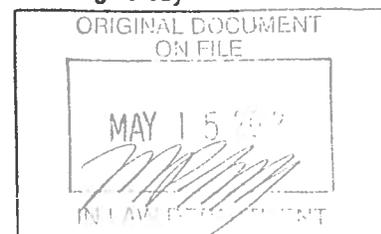
WHEREAS the above bounden PRINCIPAL has by written agreement dated May 1st, 2012  
entered into a contract with the OBLIGEE for \$ Fifty Two Thousand Four Hundred Sixty Four and 00/100  
Dollars (\$52,464.00) which contract and documents included therein by reference is by reference made a part  
hereof (hereinafter called CONTRACT), covering the following project.  
Electrical Preventive Maintenance Program at Southtowns Wastewater Treatment Plant for the Period  
May 17, 2012 thru May 16, 2015

(Describe Project)

NOW, THEREFORE, the condition of this obligation is such that if the PRINCIPAL shall:

1. well and truly perform and fulfill all the undertakings, covenants, terms, conditions and agreements of said Contract during the original term of said Contract and any extensions thereof that may be granted by the OBLIGEE, with or without notice to the SURETY, and during the life of any guarantee required under the Contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions and agreements of any and all modifications of said Contract that may hereafter be made, with or without notice to the SURETY.
2. promptly make payment to all persons having a direct Contract with the PRINCIPAL or with a subcontractor of the PRINCIPAL supplying labor and material in the prosecution of the work provided for in said Contract and any and all modifications of said Contract that may hereinafter be made, notice of which modifications to the SURETY being hereby waived;

then this obligation shall be void, otherwise to remain in full force and effect.



PROVIDED, HOWEVER, and this bond is executed and accepted upon the following express conditions:

1. That all persons who have supplied labor and material as aforesaid shall have a direct right of action hereunder against the PRINCIPAL and the SURETY, subject, however, to the prior right of the OBLIGEE to recover hereunder on account of any loss or damage caused to it by the failure of the PRINCIPAL to perform the Contract as aforesaid.
2. The SURETY for value received hereby stipulates and agrees, if requested to do so by the OBLIGEE, to fully perform and complete the work and furnish the materials mentioned and described in said Contract pursuant to terms, conditions and covenants thereof, if for any cause said PRINCIPAL fails or neglects to so fully perform said work; the said SURETY further agrees to commence said work of completion twenty (20) days after notice thereof from the OBLIGEE.
3. That the OBLIGEE shall notify the SURETY by registered letter addressed and mailed to its Home Office, of any breach of said Contract within sixty (60) days after such breach shall have come to the knowledge of the OBLIGEE. (Owner)
4. That the SURETY shall not be liable hereunder for any damage or compensation recoverable under any Worker's Compensation or Employer's Liability Statute.
5. That no suit, action or proceeding for loss or damage caused by a breach of any of the conditions of this bond shall be brought against the SURETY by the OBLIGEE after one (1) year from the day of final acceptance of the work by the Owner.
6. That no suit, action or proceeding for loss caused by the failure of the PRINCIPAL to pay all persons supplying labor and material in the prosecution of the work under said Contract shall be brought against the SURETY after six (6) months from the day on which final payment of the Contract is made.

Signed, sealed and dated this 1st day of May 2012

Ferguson Electric Service Co., Inc.  
(PRINCIPAL)

By: [Signature]  
President, Vice President, Secretary-Treasurer,  
Dale R. Peters, Vice President

Fidelity and Deposit Company of Maryland (SEAL)  
(SURETY)

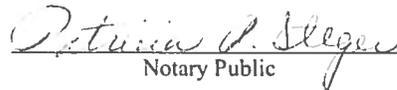
By: [Signature]  
Sean P. Keenan, Attorney-in-fact

EXECUTED POWERS OF ATTORNEY TO BE SUBMITTED WITH PERFORMANCE BOND.

**Acknowledgment by Principal (If a Corporation)**

State of New York    )  
                                  ) ss:  
County of Erie         )

On this 1<sup>st</sup> day of May, 2012 before me personally came Dale R. Peters to me known, who being by me duly sworn, did depose and say that he resides in Buffalo, New York, that he is the Vice President of the Ferguson Electric Service Co., Inc., the corporation described in and which executed the foregoing instrument; that he knew the seal of said corporation; that the seal affixed to said instrument was such corporate seal; that it was so affixed by order of the Board of Directors of said corporation and that he signed his name thereto by like order.

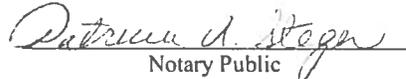
  
Notary Public

PATRICIA A. STEGER  
Notary Public, State of New York  
Qualified in Erie County  
My Commission Expires June 23, 20<sup>14</sup>

**Acknowledgment by Surety Company**

State of New York    )  
                                  ) ss:  
County of Erie         )

On the 1<sup>st</sup> day of May, 2012 before me personally came Sean P. Keenan to me known, who being by me duly sworn, did depose and say that he resides in Buffalo, New York, that he is the Attorney-in-fact of the Fidelity and Deposit Company of Maryland, the corporation described in and which executed the within instrument; that he knows the seal of said corporation; that the seal affixed to said instrument is such corporate seal; that it was so affixed by the order of the Board of Directors of said corporation and that he signed his name thereto by like order; and that the liabilities of said company do not exceed its assets as ascertained in the manner provided by the laws of the State of New York.

  
Notary Public

PATRICIA A. STEGER  
Notary Public, State of New York  
Qualified in Erie County  
My Commission Expires June 23, 20<sup>14</sup>

# FIDELITY AND DEPOSIT COMPANY

OF MARYLAND

600 Red Brook Blvd., Suite 600, Owings Mills, MD 21117

## Statement of Financial Condition

As Of December 31, 2011

### ASSETS

Bonds .....	\$ 167,477,539
Stocks .....	23,576,974
Cash and Short Term Investments .....	235,580
Reinsurance Recoverable .....	12,886,175
Other Accounts Receivable.....	39,980,988
<b>TOTAL ADMITTED ASSETS .....</b>	<b>\$ 244,157,256</b>

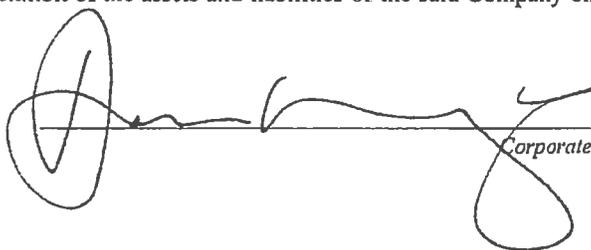
### LIABILITIES, SURPLUS AND OTHER FUNDS

Reserve for Taxes and Expenses .....	\$ 127,987
Ceded Reinsurance Premiums Payable .....	48,215,682
Securities Lending Collateral Liability .....	1,022,500
<b>TOTAL LIABILITIES.....</b>	<b>\$ 49,366,169</b>
Capital Stock, Paid Up .....	\$ 5,000,000
Surplus .....	189,791,087
Surplus as regards Policyholders.....	194,791,087
<b>TOTAL .....</b>	<b>\$ 244,157,256</b>

Securities carried at \$59,049,993 in the above statement are deposited as required by law.

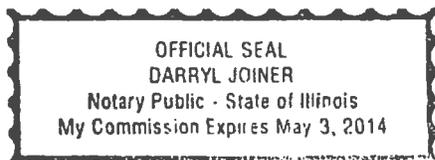
Securities carried on the basis prescribed by the National Association of Insurance Commissioners. On the basis of December 31, 2011 market quotations for all bonds and stocks owned, the Company's total admitted assets would be \$253,778,028 and surplus as regards policyholders \$204,411,859.

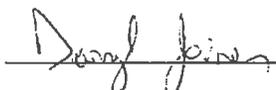
I, DENNIS F. KERRIGAN, Corporate Secretary of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, do hereby certify that the foregoing statement is a correct exhibit of the assets and liabilities of the said Company on the 31st day of December, 2011.

  
\_\_\_\_\_  
Corporate Secretary

State of Illinois }  
City of Schaumburg } SS:

Subscribed and sworn to, before me, a Notary Public of the State of Illinois, in the City of Schaumburg, this 15th day of March, 2012.



  
\_\_\_\_\_  
Notary Public

**Power of Attorney  
FIDELITY AND DEPOSIT COMPANY OF MARYLAND**

KNOW ALL MEN BY THESE PRESENTS: That the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, a corporation of the State of Maryland, by M. P. HAMMOND, Vice President, and GREGORY E. MURRAY, Assistant Secretary, in pursuance of authority granted by Article VI, Section 2, of the By-Laws of said Company, which are set forth on the reverse side hereof and are hereby certified to be in full force and effect on the date hereof does hereby nominate, constitute and appoint **Edward F. WALSH, John N. WALSH, III, Edward F. WALSH, JR., Michael K. WALSH, Beverly A. ZOLNOWSKI and Sean P. KEENAN, all of Buffalo, New York, EACH** its true and lawful agent and Attorney-in-Fact, to make, execute, seal and deliver for and on its behalf as surety, and as its act and deed: **any and all bonds and undertakings**, and the execution of such bonds or undertakings in pursuance of these presents, shall be as binding upon said Company, as fully and amply, to all intents and purposes, as if they had been duly executed and acknowledged by the regularly elected officers of the Company at its office in Baltimore, Md., in their own proper persons. This power of attorney revokes that issued on behalf of John N. WALSH, JR., Edward F. WALSH, John N. WALSH, III, Edward F. WALSH, JR., Michael K. WALSH, Beverly A. ZOLNOWSKI, Sean P. KEENAN, dated December 15, 2006.

The said Assistant Secretary does hereby certify that the extract set forth on the reverse side hereof is a true copy of Article VI, Section 2, of the By-Laws of said Company, and is now in force.

IN WITNESS WHEREOF, the said Vice-President and Assistant Secretary have hereunto subscribed their names and affixed the Corporate Seal of the said FIDELITY AND DEPOSIT COMPANY OF MARYLAND, this 28th day of June, A.D. 2011.

ATTEST:

**FIDELITY AND DEPOSIT COMPANY OF MARYLAND**



*Gregory E. Murray*

*Gregory E. Murray* Assistant Secretary

By:

*M. P. Hammond*

*M. P. Hammond*

*Vice President*

State of Maryland }  
City of Baltimore } ss:

On this 28th day of June, A.D. 2011, before the subscriber, a Notary Public of the State of Maryland, duly commissioned and qualified, came M. P. HAMMOND, Vice President, and GREGORY E. MURRAY, Assistant Secretary of the FIDELITY AND DEPOSIT COMPANY OF MARYLAND, to me personally known to be the individuals and officers described in and who executed the preceding instrument, and they each acknowledged the execution of the same, and being by me duly sworn, severally and each for himself deposed and saith, that they are the said officers of the Company aforesaid, and that the seal affixed to the preceding instrument is the Corporate Seal of said Company, and that the said Corporate Seal and their signatures as such officers were duly affixed and subscribed to the said instrument by the authority and direction of the said Corporation.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my Official Seal the day and year first above written.



*Maria D. Adamski*

*Maria D. Adamski*

*Notary Public*

My Commission Expires: July 8, 2015