



Operation & Maintenance Manual
for
Lightning Protection

SPECIFICATION SECTION 264113

WASTEWATER TREATMENT PLANT #2
BUILDINGS

KANSAS CITY, MISSOURI

JOB NUMBER: MO-2015-084

ELECTRICAL CONTRACTOR: *LINDER & ASSOC. ELECTRICAL CONTR.*

840 NORTH MAIN

WICHITA, KANSAS 67203

MATERIALS BY: *PREFERRED LIGHTNING PROTECTION*

2100 E. FIRST STREET

MARYVILLE, MISSOURI 64468

PH. 660-562-2771

TOLL FREE. 866-299-7406

INSTALLATION BY *PETTLON LIGHTNING PROTECTION*

2100 E. FIRST STREET

MARYVILLE, MISSOURI 64468

PH. 660-562-2771

DATE

JUNE 2, 2021

WARRANTY

ALL OUR PRODUCTS ARE MANUFACTURED TO THE HIGHEST STANDARDS. ALL MATERIALS ARE UL LISTED AND ARE REGULARLY INSPECTED BY UL INSPECTORS AT THE FACTORY. WE GUARANTEE AGAINST DEFECTS IN MATERIALS AND WORKMANSHIP FOR A PERIOD OF ONE YEAR FROM DATE OF PURCHASE.

DATE OF PURCHASE: DATE OF SUBSTANTIAL COMPLETION

THE SYSTEM DESIGN IS TO THE OWNER'S SPECIFICATIONS.

PREFERRED LIGHTNING PROTECTION, INC.

UL LISTING NUMBER: E236181

PETTLON LIGHTNING PROTECTION, INC.

UL LISTING NUMBER: E217550

KEN PETTLON, PRESIDENT

Annex D Inspection and Maintenance of Lightning Protection Systems

This annex is not a part of the requirements of the NFPA document but is included for informational purposes only.

D.1 Inspection of Lightning Protection Systems

D.1.1 Frequency of Inspections. It is understood that all new lightning protection systems must be inspected following completion of their installation. Recommended guidelines for the maintenance of the lightning protection system should be provided to the owner at the completion of installation.

It is important to make periodic inspections of existing systems. The interval between inspections should be determined by factors such as the following:

- (1) Classification of structure or area protected
- (2) Level of protection afforded by the system
- (3) Immediate environment (corrosive atmospheres)
- (4) Materials from which components are made
- (5) Type of surface to which the lightning protection components are attached
- (6) Trouble reports or complaints

D.1.1.1 In addition to regular periodic inspections, a lightning protection system should be inspected whenever any alterations or repairs are made to a protected structure, as well as following any known lightning discharge to the system.

D.1.1.2 It is recommended that lightning protection systems be visually inspected at least annually. In some areas where severe climatic changes occur, it might be advisable to visually inspect systems semiannually or following extreme changes in ambient temperatures. Complete, in-depth inspections of all systems should be completed every 3 to 5 years. It is recommended that critical systems be inspected every 1 to 3 years depending on occupancy or the environment where the protected structure is located.

D.1.1.3 In most geographical areas, and especially in areas that experience extreme seasonal changes in temperature and rainfall, it is advisable to stagger inspections so that earth resistance measurements, for

example, are made in the hot, dry months, as well as the cool, wet months. Such staggering of inspections and testing is important in assessing the effectiveness of the lightning protection system during the various seasons throughout the year.

D.1.2 Visual Inspection Visual inspections are made to ascertain the following:

- (1) The system is in good repair.
- (2) There are no loose connections that might result in high-resistance joints.
- (3) No part of the system has been weakened by corrosion or vibration.
- (4) All down conductors and ground terminals are intact (nonsevered).
- (5) All conductors and system components are fastened securely to their mounting surfaces and are protected against accidental mechanical displacement as required.
- (6) There have not been additions or alterations to the protected structure that would require additional protection.
- (7) There is not visual indication of damage to surge suppression (overvoltage) devices.
- (8) The system complies in all respects with the current edition of this standard.

D.1.3 Complete Testing and Inspection. Complete testing and inspection included the visual inspections described in D.1.2 and the following:

- (1) Tests to verify continuity of those parts of the system that were concealed (built in) during the initial installation and that are not now available for visual inspection.
- (2) Ground resistance tests of the ground termination system and its individual ground electrodes, if adequate disconnection means have been provided. These test results should be compared with previous or original results or current accepted values, or both, for the soil conditions involved. If it is found that the test values differ substantially from previous values obtained under the same test procedures, additional investigations should be made to determine the reason for the difference.
- (3) Continuity tests to determine if suitable equipotential bonding has been established for any new services or constructions that have been

added to the interior of the structure since the last inspection.

D.1.4 Inspection Guides and Records. Inspection guides or forms should be prepared and made available to the authority responsible for conducting inspections of lightning protection systems. These guides should contain sufficient information to guide the inspector through the inspection process so that he or she can document all areas of importance relating to the methods of installation, the type and condition of system components, test methods, and the proper recording of the test data obtained.

D.1.5 Records and Test Data. The inspector or inspection authority should compile and maintain records pertaining to the following:

- (1) General condition of air terminals, conductors, and other components
- (2) General condition of corrosion-protection measures
- (3) Security of attachment of conductors and components
- (4) Resistance measurements of various parts of the ground terminal system
- (5) Any variations from the requirements contained in this standard

D.2 Maintenance of Lightning Protection Systems

D.2.1 General. Maintenance of a lightning protection system is extremely important even though the lightning protection design engineer has taken special precautions to provide corrosion protection and has sized the components according to their particular exposure to lightning damage. Many system components tend to lose their effectiveness over the years because of corrosion factors, weather-related damage, and stroke damage. The physical as well as the electrical characteristics of the lightning protection system must be maintained in order to maintain compliance with design requirements.

D.2.2 Maintenance Procedures

D.2.2.1 Periodic maintenance programs should be established for all lightning protection systems. The frequency of maintenance procedures is dependent on the following:

- (1) Weather-related degradation
- (2) Frequency of stroke damage
- (3) Protection level required
- (4) Exposure to stroke damage

D.2.2.2 Lightning protection system maintenance procedures should be established for each system and should become a part of the overall maintenance program for the structure it protects.

A maintenance program should contain a list of more or less routine items that can serve as a checklist and establish a definite maintenance procedure that can be followed regularly. It is the repeatability of the procedures that enhances the effectiveness of a good maintenance program.

A good maintenance program should contain provisions for the following:

- (1) Inspection of all conductors and system components
- (2) Tightening of all clamps and splicers
- (3) Measurement of lightning protection system resistance
- (4) Measurement of resistance of ground terminals
- (5) Inspection or testing, or both, of surge suppression devices to determine their effectiveness compared with similar new devices
- (6) Refastening and tightening of components and conductors as required
- (7) Inspection and testing as required to determine if the effectiveness of the lightning protection system has been altered due to additions to, or changes in, the structure

D.2.3 Maintenance Records. Complete records should be kept of all maintenance procedures and routines and should include corrective actions that have been or will be taken. Such records provide a means of evaluating system components and their installation. They also serve as a basis for reviewing maintenance procedures as well as updating preventive maintenance programs.

KS21014

WWT #2 UV Buildings

P783-G

Adhesive



M-1 Structural Adhesive/Sealant - 10.1 oz. tube - Gray - A tough, elastic, waterproof, multipurpose structural adhesive/sealant designed for difficult bonding and sealing in a wide range of construction applications. It bonds aggressively to most roofing materials, metal flashing, coping, skylights, masonry, vinyl, fiberglass, wood, glass, aluminum, polystyrene foam and many engineering plastics.

A1216ST

Air Terminals



Aluminum Safety Tipped Air Terminal 1/2" x 16" - made with solid aluminum rod. UL 96 Listed

A50

Aluminum Conductors, Threaded Rod & Bus Bar



Aluminum Smooth Weave Cable (LP Class I) - 24 Strands of .065 inch (14 ga) aluminum wire - diameter 0.413 inches (10.5 mm) - 98,640 cm of conductivity - Weight per 1000' - 98 lbs. UL 96 Listed

A64

Aluminum Conductors, Threaded Rod & Bus Bar



Aluminum Secondary Solid Bonding Wire (#4 AWG) - .2044 inch (5.18 mm) soft solid aluminum wire - 41,740 cm of conductivity - Weight per 1000' - 40 lbs. UL 96 Listed

Images shown are intended to show design of part only - may not depict material in description.

Preferred Lightning Protection

Phone: 866-299-7406 or 660-562-2771

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Maryville, Missouri 64468

Website: www.preferredlp.com

KS21014**WWT #2 UV Buildings****A20212****Bases**

Aluminum Multi-Purpose Base - A cast base threaded for mounting on horizontal or vertical surfaces using screws, 1/4" bolts, 1/4" drive-in anchors, or an adhesive. Bolt tension cap can be turned so cables can run horizontal or vertical. Accepts up to two conductors. For 1/2" air terminals. UL 96 Listed

A22912**Bases**

Aluminum Narrow Surface Base - This strap aluminum base can be mounted on a narrow surface or ridge roof with screws or nails. Base can be modified to accept other anchors. Bolt tension cap provides maximum cable support. For 1/2" air terminals. UL 96 Listed

A23712**Bases**

Aluminum Standing Seam Base - Base for standing seam roof has 3/4" groove to fit over most seams. Provided with a swivel adaptor for leveling points. Cable holder is adjustable so cables can run parallel or perpendicular. Two set screws secure base to seam. For 1/2" air terminals. UL 96 Listed

A25012**Bases**

Aluminum Stamped Vent Base - Stamped aluminum vent point base with no cable holder. Over 8 square inches of contact to direct mount air terminal on continuous metal surface. For 1/2" air terminals. UL 96 Listed

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WWT #2 UV Buildings

A258X412CH

Bases



Aluminum Cast Dual Mount U-bolt Base - Fits Pipe OD from 2.75" to 4.5" - With Cable Connection- Fits 1/2" Air Terminal. UL 96 Listed

A404

Bonding Clamps, Plates & Lugs



Aluminum Cast Bonding Plate - Cast aluminum bonding plate with 3 square inches of contact. Bolt tension cap can be turned so cables can run horizontal or vertical. For use with all full size cables. UL 96 Listed

A422

Bonding Clamps, Plates & Lugs



Aluminum U-Bolt Bonding Clamp - Cast aluminum u-bolt universal bonding or ground rod clamp. Fits pipe, rebar, round or square bar, or ground rods from 1.315" to 2" O.D. Can be used with cable and/or wire sizes from #6 to 4/0 AWG. Will accept up to 3 conductors. Provides 1-1/2" of contact on pipe and cable. UL 96 Listed

A430

Bonding Clamps, Plates & Lugs



Aluminum Secondary Bonding Clamp - Cast aluminum bolt tension secondary bonding lug for connections to VTR's, roof drains, flashings, etc. For use with secondary wire. UL 96 Listed

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WWT #2 UV Buildings

C422

Bonding Clamps, Plates & Lugs



Bronze U-Bolt Bonding Clamp - Cast bronze u-bolt universal bonding or ground rod clamp. Fits pipe, rebar, round or square bar, or ground rods from 1.315" to 2" O.D. Can be used with cable and/or wire sizes from #6 to 4/0 AWG. Will accept up to 3 conductors. Provides 1-1/2" of contact on pipe and cable. UL 96 Listed

C424

Bonding Clamps, Plates & Lugs



Bronze U-Bolt Bonding Clamp - Cast bronze u-bolt universal bonding or ground rod clamp. Fits pipe, rebar, round or square bar, or ground rods from 2.75" to 4.50" O.D. Can be used with cable and/or wire sizes from #6 to 4/0 AWG. Will accept up to 3 conductors. Provides 1-1/2" of contact on pipe and cable. UL 96 Listed

C434

Bonding Clamps, Plates & Lugs



Bronze Flange Clamp - Cast bolt tension bonding clamp with 1-1/2 square inches of contact for secondary applications. Secures to I-beams, purlin flange, etc. For use with secondary conductors. UL 96 Listed

C50

Copper Conductors, Threaded Rod & Bus Bar



Copper Smooth Weave Cable (LP Class I) - 29 Strands of .046 inch (17 ga) copper wire - diameter 0.338 inch (8.6 mm) - 61,350 cm of conductivity - Weight per 1000' - 189 lbs. UL 96 Listed

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TS115EZ

Exothermic Accessories



EZ Weld Metal with Ignitor - Cartridges used to make the weld connection packaged with the starting powder at the bottom and ignitors for each cartridge.

TS150EZ

Exothermic Accessories



EZ Weld Metal with Ignitor - Cartridges used to make the weld connection packaged with the starting powder at the bottom and ignitors for each cartridge.

M-5048

Exothermic Connections



Thermoweld Mold (CC-2) - Tee Splicer - LP Class I Cables and 2/0 AWG Concentric Cables (C50, C50T, C51, C52, C52T, C53, C56-19, C56-19T, C59-19 (Tap) to LP Class I Cables and 2/0 AWG Concentric Cables (C50, C50T, C51, C52, C52T, C53, C56-19, C56-19T, C59-19) (Run) - Cartridge Size TS115 - Price Key TM4 - Cadweld Equivalent TAC-8C8C

M-5105

Exothermic Connections



Thermoweld Mold (CR-2) - LP Class I Cables and 2/0 AWG Concentric Cables (C50, C50T, C51, C52, C52T, C53, C56-19, C56-19T, C59-19) to 3/4" Ground Rod - Cartridge Size TS150 - Price Key TM4 - Cadweld Equivalent GTC-188C

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KS21014**WWT #2 UV Buildings****A704****Fasteners**

Aluminum Loop - 5/8" wide strip to be secured with a single nail, screw, 1/4" bolt, or 1/4" drive-in anchor. For use with all cables or secondary bonding wires. UL 96 Listed

A712**Fasteners**

Aluminum Stamped Adhesive Clip - Three compression type fingers hold the cable securely to the roof. Middle finger stamped so the adhesive does not interfere with the anchoring process. For use with all cables and bonding wires. UL 96 Listed

A713**Fasteners**

Aluminum Standing Seam Clip - Cable holder for standing seam has 3/4" groove to fit over most seams. Cable holder is adjustable so cables can run perpendicular or parallel. Single set screw holds clip to seam. Loop and cable anchored to clip using self tapping screw (Part # S725). UL 96 Listed

C704**Fasteners**

Copper Loop - 5/8" wide strip to be secured with a single nail, screw, 1/4" bolt, or 1/4" drive-in anchor. For use with all cables or secondary bonding wires.

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WWT #2 UV Buildings

G706

Fasteners



Protector Pipe Strap - Galvanized strap with one fastening hole. Used to secure Part # P631 protector pipes. Fits pipe up to 3/4" O.D.

P729

Fasteners



1/4" x 1-1/4" Zinc Drive-In Anchor

S725

Fasteners



#10 x 1" Stainless Steel Self Drilling Screw

CC607

Grounding & Protector Pipes



3/4" x 10' Copper Clad Ground Rod - UL 96 Listed

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WWT #2 UV Buildings

P631

Grounding & Protector Pipes



PVC Protector Pipe - 3/4" O.D. polyvinylchloride (PVC) Schedule 40 - 10' long - for use where cables are subject to displacement or damage. Sunlight resistant. Secure to wall with Part # G706

A309

Splicers & Bimetallics



Aluminum Cast Parallel Splicer - Cast parallel splicer with one carriage bolt and 1-1/2" of contact on cables or wires. Designed so bolt does not come through bottom of splicer and penetrate roof membrane. May be used with full size cables and secondary bonding wire. UL 96 Listed

A320

Splicers & Bimetallics



Aluminum to Copper Bimetallic Splicer - Bimetallic splicer for making connections between aluminum and copper cables in a straight line. Two-bolt tension on each cable for making a strong connection. Use with all main size conductors. UL 96 Listed

A324

Splicers & Bimetallics



Bimetallic Splicer with Barrier - Cast bimetallic 1-bolt parallel cable splicer for connections between aluminum and copper. Dissimilar metals are separated by an approved barrier. For use with all main size conductors. UL 96 Listed

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WWT #2 UV Buildings

C309

Splicers & Bimetallics



Bronze Cast Parallel Splicer - Cast parallel splicer with one carriage bolt and 1-1/2" of contact on cables or wires. Designed so bolt does not come through bottom of splicer and penetrate roof membrane. May be used with full size cables and secondary bonding wire. UL 96 Listed

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