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USACE / NAVFAC / AFCESA / NASA **UFGS-26 35 46.00 20 (April 2006)**

Preparing Activity: NAVFAC **Replacing without change UFGS-16280N (February 2003)**

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated 19 March 2007

Latest change indicated by CHG tags.
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DIVISION 26 - ELECTRICAL

SECTION 26 35 46.00 20

RADIO FREQUENCY INTERFERENCE POWER LINE FILTERS

04/06

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SECTION 26 35 46.00 20

RADIO FREQUENCY INTERFERENCE POWER LINE FILTERS
04/06

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NOTE: This guide specification covers the requirements for radio frequency filters for 50-, 60-, and 400-hertz power lines for general use only.

Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable items(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments and suggestions on this guide specification are welcome and should be directed to the technical proponent of the specification. A listing of technical proponents, including their organization designation and telephone number, is on the Internet.

Recommended changes to a UFGS should be submitted as a Criteria Change Request (CCR).
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NOTE: This specification is not applicable for filters to be used with a specific individual item of electronic equipment. Filters for use with specific individual items of equipment must be custom designed for their specific application.
****

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NOTE: TO DOWNLOAD UFGS GRAPHICS

Go to http://www.wbdg.org/ccb/NAVGRAPH/graphtoc.pdf.
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PART 1 GENERAL

1.1 REFERENCES

****
NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a RID outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.
****

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA ICS 6	(2006) Standard for Industrial Controls and Systems Enclosures

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70	(2005; TIA 2005) National Electrical Code

U.S. DEPARTMENT OF DEFENSE (DOD)

MIL-PRF-15733	(Rev H; Supp 1; Am 1; Am 2) Filters and Capacitors, Radio Frequency Interference
MIL-STD-202	(Rev G; Notice 1) Electronic and Electrical Component Parts
MIL-STD-220	(Rev B; Notice 1) Method of Insertion-Loss Measurement

UNDERWRITERS LABORATORIES (UL)

UL 1283	(2005) Electromagnetic Interference Filters
UL 486A-486B	(2003; Rev thru Aug 2006) Standard for Wire Connectors

1.2 RELATED REQUIREMENTS

Section 26 00 00.00 20 BASIC ELECTRICAL MATERIALS AND METHODS, applies to

this section, with the additions and modifications specified herein.

1.3 SUBMITTALS

****
NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control.

A "G" following a submittal item indicates that the submittal requires Government approval. Some submittals are already marked with a "G". Only delete an existing "G" if the submittal item is not complex and can be reviewed through the Contractor's Quality Control system. Only add a "G" if the submittal is sufficiently important or complex in context of the project.

For submittals requiring Government approval on Army projects, a code of up to three characters within the submittal tags may be used following the "G" designation to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.
****

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are [for Contractor Quality Control approval.][for information only. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government.] The following shall be submitted in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Filter assemblies

Installation details shall show location, number, and method of penetrating shielding material.

SD-03 Product Data

****
NOTE: Revise or amplify this paragraph where necessary in order to cover special project requirements.
****

Filter units

Filter enclosure

[Power factor correction coils]

For filter units, submit data for each ampere rating [, frequency,] and voltage.

SD-09 Manufacturer's Field Reports

Insertion loss test

Voltage drop test

Harmonic distortion test

Terminal strength test

Temperature rating test

Current rating and overload test

RF radiation test of load terminal compartment

Dielectric withstand voltage test

RF current attenuation test

Submit reports indicating results of tests specified in paragraph entitled "Source Quality Control."

SD-10 Operation and Maintenance Data

Filter assemblies, Data Package 5

Submit in accordance with Section 01 78 23 OPERATION AND MAINTENANCE DATA.

PART 2 PRODUCTS

2.1 PRODUCT COORDINATION

Radio frequency interference (RFI) power line filters for shielded enclosures specified in [Section 08 56 46.10 20 RADIO FREQUENCY SHIELDED ENCLOSURES DEMOUNTABLE TYPE] [Section 08 56 46.20 20 RADIO FREQUENCY SHIELDED ENCLOSURES WELDED TYPE] shall be as specified in this section [and shall be manufactured by the shielded enclosure manufacturer]. Telephone, communication, and signal line filters are specified in the shielded enclosure Section [08 56 46.10 20 RADIO FREQUENCY SHIELDED ENCLOSURES DEMOUNTABLE TYPE] [08 56 46.20 20 RADIO FREQUENCY SHIELDED ENCLOSURES WELDED TYPE].

2.2 RADIO FREQUENCY FILTERS

****

NOTE: Use 100 dB insertion loss at 14 kHz to 10 GHz for applications such as Red/Black communications

installations. Refer to MIL-HDBK-232A for filter installation requirements in communications facilities. For other applications, insert appropriate insertion loss and frequency range for the specific product. Most often, 400-Hz power line filters require power factor correction of the capacitors in the power line filters to reduce excessive reactive current. Consult filter manufacturer for detailed requirements. Consult manufacturer also when leakage current is important, such as in life safety areas. There is a tradeoff between leakage current and insertion loss when insertion loss is measured according to MIL-STD-220 because of the test connection and the line-to-ground capacitance.

****

Provide filter units for operation on electric power lines of [50] [60] [and] [400] Hz rated [[_____] volts and amperes] [as indicated]. Design filters to reduce conducted RF energy in electric power lines according to MIL-PRF-15733 and UL 1283 for facility type power line filters. Insertion loss between load side of filter and power supply side shall be not less than [100 dB at 14 kHz to 10 GHz] [[_____] dB at [_____] to [_____]]. [Provide power factor correction coils for each filter unit.]

2.3 FILTER UNITS

****

NOTE: When the use of a filter is required for the neutral conductor, modify this paragraph as appropriate. The use of a filter in the neutral conductor shall be in accordance with the requirements of MIL-HDBK-232A, "RED/BLACK Engineering - Installation Guidelines."

****

Each filter unit shall be capable of being mounted individually and shall include one filter for each phase conductor of the power line [and the neutral conductor].

2.3.1 Filter Enclosure

****

NOTE: The intent of this paragraph is to preserve the integrity of the filter and to shield the input and output circuits from each other. Usually, this is accomplished by mounting the filters in an RF modified NEMA Type 1 enclosure with separate compartments for the input and the output terminals. If a weatherproof or hazardous area type enclosure is needed, it must be so specified.

****

Provide filter units in [RF modified NEMA Type [1] [_____] in accordance with NEMA ICS 6] enclosures made of steel not less than 14 gage with welded seams. Enclosures shall be hot tin dipped or primed with a coat of primer after fabrication and welding.

2.3.2 Internal Configuration

****
NOTE: When installation of the filter unit inside of the shielded enclosure is required, the power input terminal compartment shall be RF tight instead of the load terminal compartment; and the filters shall be located in the load terminal compartment. This arrangement is necessary to prevent radiated RF energy within the shielded enclosure from inducing RF energy in the power conductors between the filters and the point where the conductors pass through the shielded enclosure wall. To provide for this arrangement, change the wording as necessary, i.e., change the word "Load" to read "Power Input" and change the words "Power Input" to read "Power Output" or "Load," as appropriate.
****

Separate load terminal compartment from power input compartment by a solid steel barrier plate of same gage as filter unit enclosure extending across entire width of enclosure. Power input compartment shall house individual power line filters and power input terminals of filters.

2.3.3 Individual Filter Mounting

****
NOTE: When installation of the filter unit inside of the shielded enclosure is required, the power input terminal compartment shall be RF tight instead of the load terminal compartment; and the filters shall be located in the load terminal compartment. This arrangement is necessary to prevent radiated RF energy within the shielded enclosure from inducing RF energy in the power conductors between the filters and the point where the conductors pass through the shielded enclosure wall. To provide for this arrangement, change the wording as necessary, i.e., change the word "Load" to read "Power Input" and change the words "Power Input" to read "Power Output" or "Load," as appropriate.
****

Attach load terminal end of individual filter cases to RF barrier plate between the two compartments to provide an RF tight seal between RF barrier plate and filter case. Load terminals of filters shall project through openings in the RF barrier plate into the load terminal compartment. Attach case of each filter to enclosure to prevent stress from being applied to RF seal between filter case and RF barrier plate.

2.3.4 Neutral Connection

****
NOTE: If the use of a filter is required for the neutral conductor, delete this paragraph.
****

When neutral conductor is not filtered, route it through the enclosure and connect it to a stud welded to each side of the RF barrier plate, so that

the neutral is electrically connected to the filter unit enclosure.

2.3.5 Conduit Connections to Enclosures

****
NOTE: If no drawings are furnished with the specification, revise this paragraph to specify the hub locations and size. The conduit hub size shall meet the minimum requirement of NFPA 70 for wire sizes required to carry the full load current of the filter.
****

Load terminal and power input compartments shall have no knockouts, and each compartment shall have one threaded conduit hub. Seam weld hubs in place and size and locate hubs as required for conduits indicated.

2.3.6 Access Openings and Cover Plates

****
NOTE: When installation of the filter unit inside of the shielded enclosure is required, the power input terminal compartment shall be RF tight instead of the load terminal compartment; and the filters shall be located in the load terminal compartment. This arrangement is necessary to prevent radiated RF energy within the shielded enclosure from inducing RF energy in the power conductors between the filters and the point where the conductors pass through the shielded enclosure wall. To provide for this arrangement, change the wording as necessary, i.e., change the word "Load" to read "Power Input" and change the words "Power Input" to read "Power Output" or "Load," as appropriate.
****

Provide access from front of enclosure. Access opening for load terminal compartment shall provide clear access to filter load terminals and standoff insulator terminals or insulated terminal blocks specified herein. Provide power input compartment opening with clear access to filter power input terminals and standoff insulator terminals or insulated terminal blocks specified herein. Provide for easy removal of individual filters from enclosure. Provide two access cover plates. One plate shall cover the access opening to the load terminal compartment only and when secured in place shall provide an RF tight seal with the compartment it covers. Second access cover plate may abut or overlap cover plate for load terminal compartment and shall cover power input compartment. Provide an RF gasket for load terminal compartment cover plate. Secure cover plate with bolts having maximum spacing of 75 mm 3 inches. Fabricate access cover plates of steel not less than 14 gage, and having the same finish as specified for the enclosure. Attach plates so they may be easily removed and replaced.

2.3.7 RF Attenuation Requirements for Load Terminal Compartment

****
NOTE: Use 100 dB insertion loss at 14 kHz to 10 GHz for applications such as Red/Black communications installations. Refer to MIL-HDBK-232A for filter installation requirements in communications

facilities. For other applications, insert appropriate insertion loss and frequency range for the specific product. Most often, 400-Hz power line filters require power factor correction of the capacitors in the power line filters to reduce excessive reactive current. Consult filter manufacturer for detailed requirements. Consult manufacturer also when leakage current is important, such as in life safety areas. There is a tradeoff between leakage current and insertion loss when insertion loss is measured according to MIL-STD-220 because of the test connection and the line-to-ground capacitance.

****

Load terminal compartment shall provide an attenuation of not less than [100] [_____] dB to radiated RF energy from [14 kHz to 10 GHz] [[_____] to [_____]] with individual power line filters mounted and access cover plate attached.

2.4 FILTER CONNECTIONS

****

NOTE: When installation of the filter unit inside of the shielded enclosure is required, the power input terminal compartment shall be RF tight instead of the load terminal compartment; and the filters shall be located in the load terminal compartment. This arrangement is necessary to prevent radiated RF energy within the shielded enclosure from inducing RF energy in the power conductors between the filters and the point where the conductors pass through the shielded enclosure wall. To provide for this arrangement, change the wording as necessary, i.e., change the word "Load" to read "Power Input" and change the words "Power Input" to read "Power Output" or "Load," as appropriate.

****

****

NOTE: If no drawings are furnished with the specifications, specify the wire size.

****

Equip individual filters within a unit with insulated terminals and incorporate suitably sized flexible leads from insulated filter terminals to standoff insulator terminals or insulated terminal blocks. Mount standoff insulator terminals or insulated terminal blocks in terminal compartments. Provide solderless lugs for connecting phase and neutral wires to filter units. Lugs shall be hex head bolt or screw type and shall conform to UL 486A-486B. Space live parts in accordance with UL 1283. Filter leads shall be copper.

2.5 INDIVIDUAL FILTERS

2.5.1 Filter Construction

After filter is filled with an impregnating or encapsulating compound, weld seams. When solid potting compound is used to fill filter, filters may be

mechanically secured and sealed with solder. Use hermetically sealed impregnated capacitors, or vacuum impregnate complete filter assembly. Fabricate individual filter cases from not less than number 16-gage steel and finish cases with a corrosion-resistant plating.

2.5.2 Impregnating or Potting Compound

Fill filter with an impregnating or potting compound meeting requirements of MIL-PRF-15733 and having a flashpoint for operating temperature range B as defined in Table VIII of MIL-PRF-15733.

2.5.3 Overload Requirements

Provide as specified in MIL-PRF-15733.

2.5.4 Current Rating

****
NOTE: Indicate maximum current rating on the drawings. If no drawings are furnished with the specifications, specify the current rating here.
****

Provide filters in ratings indicated.

2.5.5 Pass Band

Provide pass band suitable for use with [50] [60] [400]-Hz power source. Total harmonics generated by the insertion of a power line filter shall not increase line voltage distortion more than [5] [2.5] percent with a unity power factor load.

2.5.6 Voltage Rating

****
NOTE: Indicate power line voltage on the contract drawings. If no drawings are furnished with the specifications, specify the power line voltage.
****

As required for circuits indicated. Direct current (resistive) voltage drop through filter shall not exceed 0.5 volt when filter is operating at rated current. The [50] [60] [400]-Hz ac voltage, within resistive load variations from 10 percent to 100 percent rated load, shall vary not more than plus or minus one percent of rated line voltage at unity power factor.

2.5.7 Drainage of Stored Charge

Provide filters with bleeder resistors to drain stored charge from capacitors when power is shut off. Provide drainage of stored charge in accordance with NFPA 70, Article 460-6.

2.5.8 Temperature Rise

Temperature rise shall not exceed 25 degrees C when operating at full rated load in a free space environment equivalent to that specified in MIL-PRF-15733 with an ambient temperature of 65 degrees C. When filters are mounted in an enclosure as specified herein, temperature rise of hottest filter shall not exceed 40 degrees C at full load when operating in

an ambient temperature of 65 degrees C. Materials and components of filter shall not exceed maximum acceptable temperatures specified in UL 1283.

2.5.9 Dielectric Withstand Voltage

Provide filters which, as a minimum, conform to values of dielectric withstand voltage specified in [MIL-PRF-15733] [UL 1283].

2.6 MARKING OF FILTER UNITS

Provide manufacturer's nameplate on each filter unit stating rated current, rated voltage, operating frequency, number of phases for which filter unit is designed, manufacturer's name, total filter unit weight, and model number. Mount nameplate on filter unit to be visible after installation without removing cover plates or disturbing interior parts or wiring. Mark each individual filter case with rated current, rated voltage, manufacturer's name, type of impregnating or potting compound, operating frequency, and model number. In addition, mark individual filter cases and the filter enclosures with the following nameplate: "WARNING: Before working on filters, terminals must be temporarily grounded to ensure discharge of capacitors." Attach nameplates with epoxy, rivets, or sheet metal screws.

2.7 MARKING OF PANELBOARDS

Provide nameplate on exterior surface of supply and load panelboards of filter circuits. Nameplate shall read: "WARNING: Before working on circuits connected to power line filters, the circuits must be temporarily grounded to ensure discharge of capacitors." Attach nameplates with epoxy, rivets, or sheet metal screws.

2.8 SOURCE QUALITY CONTROL

Perform factory tests for each filter unit and filter assembly. The Contracting Officer [will] [reserves the right to] witness the specified factory tests. Notify Contracting Officer at least 30 days before factory tests are scheduled to be performed. Test data shall include a detailed description of the test instrumentation and equipment, including calibration dates, a detailed description of test procedure, and recorded test data. Apply electrical ratings, tests, and requirements specified herein to unity power factor loads on the filter. Perform dielectric withstand voltage production line test in accordance with UL 1283.

2.8.1 Insertion Loss Test

****

NOTE: Use 100 dB insertion loss at 14 kHz to 10 GHz for applications such as Red/Black communications installations. Refer to MIL-HDBK-232A for filter installation requirements in communications facilities. For other applications, insert appropriate insertion loss and frequency range for the specific product. Most often, 400-Hz power line filters require power factor correction of the capacitors in the power line filters to reduce excessive reactive current. Consult filter manufacturer for detailed requirements. Consult manufacturer also when leakage current is important, such as in life safety areas. There is a tradeoff

between leakage current and insertion loss when insertion loss is measured according to MIL-STD-220 because of the test connection and the line-to-ground capacitance.

****

Perform insertion loss measurements using procedures defined in MIL-STD-220 with the buffer networks modified to permit valid measurements down to 14 kHz. The impedance of the modified buffer network shall be at least 10 times that of the filter under test when making the insertion loss test at 14 kHz. Perform insertion loss measurements at 25 percent rated load, 50 percent rated load, and 100 percent rated load over the frequency range of [14 kHz to 1 GHz] [[_____] to [_____]]. Results of insertion loss test shall be not less than [100] [_____] dB.

2.8.2 Voltage Drop Test

Measure ac voltage drop at output and input terminals of filter using the method of MIL-PRF-15733. Make ac voltage measurements at rated voltage and frequency at 25 percent, 50 percent, and 100 percent rated load.

2.8.3 Harmonic Distortion Test

Measure total harmonic distortion at the input and output terminals of the filter when operating at 25 percent load, 50 percent load, and 100 percent rated load with a unity power factor load. Make measurements using a spectrum analyzer having a dynamic range of 70 dB or greater and a minimum frequency range of 10 kHz to 1700 MHz.

2.8.4 Terminal Strength Test

Test standoff terminals and filter terminals with external threads in accordance with method 211 of MIL-STD-202, Test Condition E.Determine applied torque values from Table XIV of MIL-PRF-15733.

2.8.5 Temperature Rating Test

Perform temperature rating test in an environment having the test conditions and reference conditions specified in MIL-STD-202.

2.8.5.1 Individual Filters

Test temperature rise in accordance with MIL-PRF-15733.

2.8.5.2 Enclosed Filters

Test filters provided in enclosures as a unit with the enclosures.

2.8.6 Current Rating and Overload Test

Test current rating and overload in accordance with MIL-PRF-15733.

2.8.7 RF Radiation Test

****

NOTE: When installation of the filter unit inside of the shielded enclosure is required, the power input terminal compartment shall be RF tight instead of the load terminal compartment; and the filters

shall be located in the load terminal compartment. This arrangement is necessary to prevent radiated RF energy within the shielded enclosure from inducing RF energy in the power conductors between the filters and the point where the conductors pass through the shielded enclosure wall. To provide for this arrangement, change the wording as necessary, i.e., change the word "Load" to read "Power Input" and change the words "Power Input" to read "Power Output" or "Load," as appropriate.

****

Perform RF radiation test on the load terminal compartment of the filter unit in accordance with the manufacturer's standard method of test.

2.8.8 Dielectric Withstand Voltage Test

Perform the dielectric withstand voltage test in accordance with [MIL-PRF-15733] [UL 1283].

2.8.9 RF Current Attenuation Test

****

NOTE: This section represents an exception to the general policy of not including sketches and other supplementary material, located at end of section in the project specification. The Tables 1 and 2 and Figure 1 are to be included in project specifications.

****

Perform the following test if MIL-STD-220 tests are not performed on the specific filters provided under this Contract. Alternatively, the filter manufacturer may perform the following test in lieu of MIL-STD-220 tests. Perform RF current attenuation test on individual filters rated 1000 amperes and below by injecting RF current through the filters at 14 kHz, 100 kHz, 1 MHz, and 20 MHz; measuring the input and output RF current; and recording the results. Test setup shall be as shown in Figure 1. Testing and measuring equipment required to perform the test shall be selected from Table 1. Filters failing this test shall be rejected, regardless of the results of other tests specified in this section. Test procedure shall be as follows:

a. Set up signal generator and current source and data acquisition equipment in the configuration indicated and perform calibrations.

b. Weld a wire lug to the filter's case in the output terminal compartment and attach a wire sized to carry filter rated current between the lug and filter output terminal as shown. Wire shall be no longer than necessary to make connections at each end.

c. Inject a current into the circuit under test at the lowest available output from the signal generator and current source.

d. Observe readout from spectrum analyzer to ensure proper equipment connections, operator safety, and expected equipment response before injecting rated current into test setup.

e. Apply filter rated current for 5 minutes before measuring output

RF current at 14 kHZ. Repeat this procedure at each of the other frequencies specified and record the results after each test at each frequency.

f. Filters specified as meeting MIL-STD-220 limits shall fall within the /\ dB limits shown in Table 2.

g. Deenergize the test setup, remove the filter, insert the next filter to be tested, and repeat the specified test procedure.

PART 3 EXECUTION

****
NOTE: If this section is used as a procurement specification, delete the paragraphs in PART 3. For procurement specifications, it may be helpful to the Contractor to show the proposed mounting requirements on a sketch.
****

3.1 INSTALLATION

****
NOTE: Designer shall ensure that project architect and structural engineer are aware of significant wall and floor loading caused by three-phase, enclosed power filters. Filter assemblies can weigh from 227 kg to over 454 kg 500 pounds to over 1000 pounds depending on ampere rating. Show sufficient mounting details on plans to support the filters. Also coordinate filter installation with project mechanical engineer to ensure the provision of adequate ventilation from heat dissipation.
****

NFPA 70. Install filter assemblies on the [outer] [inner] surface of the shielded enclosure and support them independently from the shielding. Coordinate mounting of power filter units with other filters and shielded enclosure penetrations.

3.2 GROUNDING

Ground filters in accordance with Section [08 56 46.10 20 RADIO FREQUENCY SHIELDED ENCLOSURES DEMOUNTABLE TYPE] [08 56 46.20 20 RADIO FREQUENCY SHIELDED ENCLOSURES WELDED TYPE]. [Provide brass ground stud on line side in filter terminal compartment.]

3.3 PAINTING OF FILTER UNITS

****
NOTE: If painting is not required, delete this paragraph. If painting of filters is only painting in project, insert in this paragraph the applicable paragraphs of Section 09 90 00, PAINTS AND COATINGS.
****

Paint exterior surface of [individually mounted filters] [filter unit assemblies] as specified in [Section 09 90 00 PAINTS AND COATINGS] [Section 26 00 00.00 20 BASIC ELECTRICAL MATERIALS AND METHODS]. Paint color shall

be [manufacturer's standard] [as directed by Contracting Officer] [as indicated]. Clean grounding surfaces so that they are free of paint and insulating material.

TABLE 1
Equipment List and Sources for
Filter Attenuation Test Using Current Injection Probe

Equipment Component/Model	Source
A. Signal Generator	Hewlett-Packard Company 3000 Hanover Street Palo Alto, CA 94304
B. Current Injection Probe	
GIP-7418	Genisco Technology Corporation 18435 Susana Road Rancho Dominguez, CA 90221 213-537-4750
F-103	Fischer Custom Communications, Inc. 3121 W. 139th Street, Unit F Hawthorne, CA 90250 213-644-0728
C. Current Sensing Probe	
PCL-25	Electro-Metrics 100 Church Street Amsterdam, NY 12010 518-843-2600
9464-1	AILTECH Eaton Corporation Electronic Instrumentation Division
GCP-5130A	Genisco Technology Corporation
D. EMI Meter/Spectrum Analyzer	
3585A	Hewlett-Packard Company 3000 Hanover Street Palo Alto, CA 94034 415-857-1501
EMC-30	Electro-Metrics
NM-17/27A-SL	AILTECH
E. Power Amplifier	
550L	ENI, Inc. 100 Highpower Road Rochester, NY 14623 716-427-8300
F. Current Source (Variac/Circuit Breaker Tester)	

TABLE 1
Equipment List and Sources for
Filter Attenuation Test Using Current Injection Probe

Equipment Component/Model	Source
CB-150 (older model - no longer available) CB-845	Multi-Amp Corporation 4271 Bronze Way Dallas, TX 75237-1088 214-333-3533 800-527-6461

TABLE 2
Equivalent Attenuation Values for
Bench Test Measurements

125 V, 100 dB at 14 kHz

Current Rating (Amps)	MIL-STD-220A + /\ Attenuation at 14 kHz (dB)
2.5	+6
5	+0
10	-6
20	-12
25	-14
30	-16
50	-20
60	-22
75	-24
100	-26
150	-30
200	-32
300	-36
400	-38
500	-40
600	-42
1000	-44

277 V, 100 dB at 14 kHz

Current Rating (Amps)	Attenuation at 14 kHz (dB)
30	-9
60	-15
100	-19
250	-27
500	-34

-- End of Section --