SPECIAL OCCUPANCY TAC
WITH COMMENTS

This document created by the Florida Department of Business and Professional Regulation -
850-487-1824

Total Mods for report: 17

TAC: Special Occupancy

Total Mods for **Special Occupancy** in **Approved as Modified: 2**

Total Mods for report: 17

Sub Code: Building

SP7209

1

Date Submitted	11/7/2018	**Section**	449.3.15	**Proponent**	Bryan Holland
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Approved as Modified
Commission Action Pending Review

Comments

General Comments **Yes** **Alternate Language** **No**

Related Modifications

7210, 7211, and 7212

Summary of Modification

This proposed modification revises the requirements for lightning and surge protection for added clarity and effective enforcement.

Rationale

This proposed modification simply revises the language to clarify the rules. The change to .1 corrects the proper name for the NFPA 780 Standard. The changes to .2, .4, and .5 are minor editorial revisions for clarity. The change to .6 corrects the product name from "suppressors" to "protectors" as indicated by the UL 497 and UL 497A Standards.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposed modification does not add any new criteria so impacts to the local entity are minimal.

Impact to building and property owners relative to cost of compliance with code

This proposed modification will not change the cost of compliance to building or property owners.

Impact to industry relative to the cost of compliance with code

This proposed modification will not change the cost of compliance to industry.

Impact to small business relative to the cost of compliance with code

This proposed modification will not change the cost of compliance to small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed change clarifies the rules for lightning and surge protection which directly impacts the health, safety, and welfare of the general public.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposed modification improves the code by adding clarity and correcting used terms.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This proposed modification enhances the effectiveness of the code.

Text of Mod 7209-A2

449.3.15 Lightning protection.

449.3.15.1

A lightning protection system shall be provided for all new buildings and additions in accordance with NFPA 780, Standard for the Installation of Lightning Protection Systems.

449.3.15.2

Where additions are constructed to existing buildings, the existing building's lightning protection system, if present, shall be interconnected to the new lightning protection system.~~connected to the new lightning protection system, shall be inspected and brought into compliance with current standards.~~

449.3.15.3

A lightning protection system shall be installed on all buildings in which outpatient surgical procedures, cardiac catherization procedures, or pain management procedures that utilize I.V. drip sedation are provided.

449.3.15.4

~~There shall be surge protection~~ Surge protective devices (SPDs) shall be installed in accordance with NFPA 70, National Electrical Code, as required by NFPA 780, Standard for the Installation of Lightning Protection Systems for all normal and emergency electrical services.

449.3.15.5

Additional surge protection shall be provided for all low voltage and power connections to all electronic equipment in critical care areas and life safety systems and equipment such as fire alarm, nurse call and other critical systems. Protection shall be in accordance with NFPA 70, National Electrical Code and the appropriate IEEE Standards for the type of equipment protected.

449.3.15.6

All ~~low-voltage system main or branch circuits~~ communication systems entering or exiting the structure shall have surge ~~suppressors~~protectors installed for each pair of conductors and shall have visual indication for protector failure to the maximum extent feasible.

Alternate Language

1st Comment Period History

7209-A2

Proponent Bryan Holland **Submitted** 1/8/2019 **Attachments** Yes

Rationale

The only alternative language being proposed is under Section 449.3.15.6 where "low voltage system main or branch circuits" is being replaced with "communication systems". No other changes being recommended for this proposed modification. This will match the language in SP7255, SP7218, and a SP7211 comment.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This comment does not add any new criteria, just clarification, so impacts to the local entity are minimal.

Impact to building and property owners relative to cost of compliance with code

This comment will not change the cost of compliance to building and property owners.

Impact to industry relative to the cost of compliance with code

This comment will not change the cost of compliance to industry.

Impact to Small Business relative to the cost of compliance with code

This proposed modification will not change the cost of compliance to small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This comment adds clarification which directly impacts health, safety, and welfare of the general public.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This comment improves the code by correcting the terminology of the revised section.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This comment does not discriminate against materials, products, or systems of construction.

Does not degrade the effectiveness of the code

This comment enhances the effectiveness of the code.

2nd Comment Period

SP7209-G2

Proponent Michael Riley **Submitted** 5/23/2019 **Attachments** Yes

Comment:

Proposed code modification 7209 does not meet the statutory standards of Chapter 553. See attached comments.

2nd Comment Period

SP7209-G3

Proponent Bryan Holland **Submitted** 5/26/2019 **Attachments** No

Comment:

Please disregard general comment SP7209-G2. The comment is not valid as it attempts to address the existing requirements of the code and not the proposed modification that is currently open for comment. The editorial revisions made to this section by the modification did not add to or take away from any of the current requirements. Therefore, none of the statements made in the general comment are relevant.

1st Comment Period History

SP7209-G1

Proponent Vincent Della Croce **Submitted** 1/8/2019 **Attachments** No

Comment:

I support the proposed modification as it will ensure the Code includes the most current requirements for electrical installations that provide for the health, safety and general welfare of the public.

449.3.15 Lightning protection.

449.3.15.1

A lightning protection system shall be provided for all new buildings and additions in accordance with NFPA 780, Standard for the Installation of Lightning Protection Systems.

449.3.15.2

Where additions are constructed to existing buildings, the existing building's lightning protection system, if present, shall be interconnected to the new lightning protection system.~~connected to the new lightning protection system, shall be inspected and brought into compliance with current standards.~~

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449.3.15.4

~~There shall be surge protection~~ Surge protective devices (SPDs) shall be installed in accordance with NFPA 70, National Electrical Code, as required by NFPA 780, Standard for the Installation of Lightning Protection Systems for all normal and emergency electrical services.

449.3.15.5

Additional surge protection shall be provided for all low voltage and power connections to all electronic equipment in critical care areas and life safety systems and equipment such as fire alarm, nurse call and other critical systems. Protection shall be in accordance with NFPA 70, National Electrical Code and the appropriate IEEE Standards for the type of equipment protected.

449.3.15.6

All ~~low-voltage system main or branch circuits~~ communication systems entering or exiting the structure shall have surge ~~suppressors~~protectors installed for each pair of conductors and shall have visual indication for protector failure to the maximum extent feasible.

449.3.15 Lightning protection.

449.3.15.1

A lightning protection system shall be provided for all new buildings and additions in accordance with NFPA 780, Standard for the Installation of Lightning Protection Systems.

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Where additions are constructed to existing buildings, the existing building's lightning protection system, if present, shall be interconnected to the new lightning protection system.~~connected to the new lightning protection system, shall be inspected and brought into compliance with current standards.~~

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A lightning protection system shall be installed on all buildings in which outpatient surgical procedures, cardiac catherization procedures, or pain management procedures that utilize I.V. drip sedation are provided.

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~~There shall be surge protection~~ Surge protective devices (SPDs) shall be installed in accordance with NFPA 70, National Electrical Code, as required by NFPA 780, Standard for the Installation of Lightning Protection Systems for all normal and emergency electrical services.

449.3.15.5

Additional surge protection shall be provided for all low voltage and power connections to all electronic equipment in critical care areas and life safety systems and equipment such as fire alarm, nurse call and other critical systems. Protection shall be in accordance with NFPA 70, National Electrical Code and the appropriate IEEE Standards for the type of equipment protected.

449.3.15.6

All low-voltage system main or branch circuits entering or exiting the structure shall have surge ~~suppressors~~protectors installed for each pair of conductors and shall have visual indication for protector failure to the maximum extent feasible.

The controlling statutory standards for approving an amendment or modification to the Florida Building Code are as follows. Proposed code modification 7209 does not meet the statutory standards:

1. *Is needed in order to accommodate the specific needs of this state.*
2. *Has a reasonable and substantial connection with the health, safety, and welfare of the general public.*

It is undisputed that structural fire incidents are declining – not increasing – in the United States from 1977 to 2015 so there is no reason for FBC to impose this new tax for LPS and SPD on Florida's economy. Haynes, *Fire Loss in the United States 2015*, NFPA, September 2016, Figure 1 at p. 11. Haynes concludes that "[t]he total number of fires continues to be on a downward trend, as does the number of outside fires, structure fires and vehicle fires." P. 35. Direct property damage from lightning fires has declined as well from 1977 to 2015 in 2015 dollars. More specifically, the amount of direct property damage to non-home structures caused by lightning fires dropped over 70% annually from 1980 to 2014 ($249 million to $65 million). Ahrens, *Structure Fires Started by Lightning*, NFPA, April 2017, at Table 2, p. 4. http://www.nfpa.org/news-and-research/fire-statistics-and-reports/fire-statistics/fire-causes/lightning-fires-and-lightning-strikes

In 2011 Fire Departments reported 27,100 total lightning fires in the United States. Of these reported fires 20,400, or 75% of the total, were outside fires or non-structure fires. Only 7% of lightning fires from 2007-2011 were "non-home structure fires." Ahrens, *Lightning Fires and Lightning Strikes*, NFPA, Fire Analysis and Research Div., June 2013, p. 1. Exhibit C. There were only 1,800 "non-home structure" fires. *Lightning Fires and Lightning Strikes* at Table 4, p. 14. By 2014, the number of "non-home structure fires" was even lower (1,400). *Structure Fires Started by Lightning*, at Table 2, p. 4.

Therefore, the Proposed Code Modification is not needed and does not have a reasonable and substantial connection with the health, safety and welfare of Floridians. The Proposed Code Modification overstates the risk and costs of lightning damage to structures in Florida and given the overstated threat of damage caused by lightning strikes, the costs of complying with the proposed LPS and SPD requirements exceed the benefits of their installation in Florida.

3. *Strengthens or improves the Florida Building Code, or in the case of innovation or new technology, will provide equivalent or better products or methods or systems of construction.*
4. *Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.*

The restriction of approved LPS to only NFPA 780-compliant systems provides no equivalent products, methods, or systems of construction and is entirely discriminatory as to all other products, methods and systems. The Proposed Code Modification would wholly exclude from Florida construction projects UL Certified Lightning Protection Systems and specific Components and Systems such as UL96A Master Labeled LPSs and UL Letter of Findings LPS.

Further the modification excludes LPS such as IEC 62305, DOD DDESB 6055.9, DOE M440.1-1, FAA Std – 019e, FAA 6950.19A, NASA E-0012F, API – 2003, and any new LPS technology that may be developed and otherwise certified.

5. *Does not degrade the effectiveness of the Florida Building Code.*

An inherent conflict exists in the Proposed Code Modification. While LPS must be NFPA 780-compliant, SPD must be installed in accordance with NFPA 70, National Electric Code. These codes conflict as to installation of SPDs and where they are required to be installed in a structure.

§553.73 (9) (a)

Further, a proposed amendment must include a fiscal impact statement that documents the costs and benefits of the proposed amendment:

The proposed modification would needlessly – but substantially – unfairly tax the Florida economy. The narrative for Proposed Code Modification 6460 in 2017 providing for new LPS building requirements admitted that "[t]he average cost of a complete LPS is approximately 1% to 5% of total construction cost of the building." Dr. Issa's draft report presented to the Technical Advisory Committee at that time directly acknowledges these additional costs:

> "[t]he largest cost impact for the 2015 Florida specific changes came from proposed code change E6460, the installation of Lightning Protection Systems (LPS). The anticipated cost of the LPS was estimated to add 5% to the buildings total cost. Up to 80% of that cost reportedly could be offset through insurance reductions, **however such insurance reductions are not guaranteed and were therefore omitted from this cost estimate.**" (emphasis supplied) Issa, *Evaluation of the Cost Impact of Florida's specific changes to 2015 I-Codes "Prescriptive Code Changes"*, Draft Final Report, April 17, 2017, at Executive Summary p. 1.

§553.73 (9) (b)

SP7803

Date Submitted	12/9/2018	**Section**	449	**Proponent**	James gregory
Chapter	4	**Affects HVHZ**	No	**Attachments**	No
TAC Recommendation	Approved as Modified				
Commission Action	Pending Review				

Comments

General Comments **Yes** **Alternate Language** **Yes**

Related Modifications

None

Summary of Modification

Revises where audible and visual devices are permitted. Deletes redundant language.

Rationale

Revises where audible and visual devices are permitted to be located. This is part of the private mode fire alarm requirement. Only staff, not visitors or patients are to be notified. This revision will help to reduce the deafening loudness of the FA devices in a health care facility and help improve positive patient outcomes.

Deletes redundant language found in other codes.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

There is no fiscal impact on the local entity relative to enforcement.

Impact to building and property owners relative to cost of compliance with code

There is no fiscal impact to building and property owners relative to the cost of compliance.

Impact to industry relative to the cost of compliance with code

There is no fiscal impact to industry relative to the cost of compliance.

Impact to small business relative to the cost of compliance with code

There is no fiscal impact to small business relative to the cost of compliance.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Has a reasonable and substantial connection with the health and safety an welfare of the general public.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Strengthens or improves the code by making the code requirements clearer to the user and by making hospitals safer for patients.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

Does not degrade the effectiveness of the code.

Text of Mod 7803 including A4

450.3.12.2 In all inpatient care rooms, spaces and areas, including sleeping, treatment, diagnostic, and therapeutic, the private operating mode as permitted and described in NFPA 72, National Fire Alarm and Signaling Code, shall be required. Only the attendants and other personnel required to evacuate occupants from a zone, area, room, floor, or building shall be required to be notified. Audible and visual notification devices shall only be permitted to be located at the care providers' stations, the soiled workroom, soiled holding room, clean workroom, staff lounge, medication preparation room, and nurse or supervisor's office.

~~450.3.12.3 The disconnecting device or circuit breaker for the fire alarm control unit shall be clearly identified and secured from unauthorized operation.~~

450.3.16.2 In all inpatient care rooms, spaces and areas, including sleeping, treatment, diagnostic, and therapeutic, the private operating mode as permitted and described in NFPA 72, National Fire Alarm and Signaling Code, shall be required. Only the attendants and other personnel required to evacuate occupants from a zone, area, room, floor, or building shall be required to be notified. Audible and visual notification devices shall only be permitted to be located at the care providers' stations, the soiled workroom, soiled holding room, clean workroom, staff lounge, medication preparation room, ~~and~~ nurse or supervisor's office, and other staff rooms or areas as determined by the governing body of the facility.

Alternate Language

2nd Comment Period

7803-A7

Proponent James gregory **Submitted** 5/10/2019 **Attachments** Yes

Rationale

This is only an editorial correction. The section for this paragraph was accidentally changed from the original modification from section 449.3.12.3 to section 450.3.16.2. Section 449 is for hospitals and section 450 is for nursing homes. Modification #7954-A1 is for nursing homes. This modification #7803 is the same language but is for hospitals.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact. Editorial Revision only.

Impact to building and property owners relative to cost of compliance with code

No impact. Editorial Revision only.

Impact to industry relative to the cost of compliance with code

No impact. Editorial Revision only.

Impact to Small Business relative to the cost of compliance with code

There is no fiscal impact to small business relative to the cost of compliance.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

No impact on health, safety, and welfare. Editorial Revision only.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code for clarity. Editorial Revision only.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No discrimination. Editorial Revision only.

Does not degrade the effectiveness of the code

Does not degrade the code. Editorial Revision only.

Alternate Language

1st Comment Period History

7803-A4

Proponent James gregory **Submitted** 2/16/2019 **Attachments** Yes

Rationale

Provides options for the governing body, not the AHJ, to determine other areas for staff use.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Has no impact on local enforcement.

Impact to building and property owners relative to cost of compliance with code

Has no impact on property owners.

Impact to industry relative to the cost of compliance with code

Has no impact of industry.

Impact to Small Business relative to the cost of compliance with code

There is no fiscal impact to small business relative to the cost of compliance.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Allows more areas to have F/A devices for unusual conditions or designs.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Strengthens the code by providing more spaces for F/A possible areas.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate against materials products or methods to achieve the intent.

Does not degrade the effectiveness of the code

Does not degrade the effectiveness of the code but makes it stronger.

2nd Comment Period

SP7803-G1

Proponent	James gregory	**Submitted**	5/9/2019	**Attachments**	No

Comment:

The revised version of this modification has the incorrect section attached to it. The original modification was for hospitals, section 449, not nursing homes section 450. The revision incorrectly switched the number sections. SP7954 is already approved for nursing homes. This modification is SP7803 and should be numbered as follows: 449.3.12.2. This is the hospital section where this modification belongs...Not 450 which is for nursing homes.

~~450.3.16.2~~ 449.3.12.2 In all inpatient care rooms, spaces and areas, including sleeping, treatment, diagnostic, and therapeutic, the private operating mode as permitted and described in NFPA 72, National Fire Alarm and Signaling Code, shall be required. Only the attendants and other personnel required to evacuate occupants from a zone, area, room, floor, or building shall be required to be notified. Audible and visual notification devices shall only be permitted to be located at the care providers' stations, the soiled workroom, soiled holding room, clean workroom, staff lounge, medication preparation room, and nurse or supervisor's office, and other staff rooms or areas as determined by the governing body of the facility.

~~450.3.12.3~~ ~~449.3.12.3 The disconnecting device or circuit breaker for the fire alarm control unit shall be clearly identified and secured from unauthorized operation.~~

450.3.16.2 In all inpatient care rooms, spaces and areas, including sleeping, treatment, diagnostic, and therapeutic, the private operating mode as permitted and described in NFPA 72, National Fire Alarm and Signaling Code, shall be required. Only the attendants and other personnel required to evacuate occupants from a zone, area, room, floor, or building shall be required to be notified. Audible and visual notification devices shall only be permitted to be located at the care providers' stations, the soiled workroom, soiled holding room, clean workroom, staff lounge, medication preparation room, ~~and~~ nurse or supervisor's office, and other staff rooms or areas as determined by the governing body of the facility.

449.3.12.2 In all inpatient care rooms, spaces and areas, including sleeping, treatment, diagnostic, and therapeutic, the private operating mode as permitted and described in NFPA 72, National Fire Alarm and Signaling Code, shall be required. Only the attendants and other personnel required to evacuate occupants from a zone, area, room, floor, or building shall be required to be notified. Audible and visual notification devices shall only be permitted to be located at the care providers' stations, the soiled workroom, soiled holding room, clean workroom, staff lounge, medication preparation room, and nurse or supervisor's office.

~~449.3.12.3 The disconnecting device or circuit breaker for the fire alarm control unit shall be clearly identified and secured from unauthorized operation.~~

TAC: Special Occupancy

Total Mods for **Special Occupancy** in **Approved as Submitted: 8**

Total Mods for report: 17

Sub Code: Building

SP7218

3

Date Submitted	11/8/2018	**Section**	453.17.7	**Proponent**	Bryan Holland
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Approved as Submitted

Commission Action Pending Review

Comments

General Comments **Yes** | **Alternate Language** **No**

Related Modifications

7209, 7210, 7211, and 7212

Summary of Modification

This proposed modification revises the section to match the language for lightning and surge protection for hospitals (449.3.15), nursing homes (450.3.19), and as proposed for assisted living facilities (464.4.7).

Rationale

The current language of the section is vague and nondescript. The proposed language aligns the section with lightning and surge protection requirements found in 449.3.15 for hospitals, 450.3.19 for nursing homes, and as proposed in 464.4.7 for assisted living facilities. These prescriptive details will assist design professionals, installers, and AHJs when applying and enforcing this rule.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposed modification will not impact the local entity.

Impact to building and property owners relative to cost of compliance with code

This proposed modification will not change the cost of construction for building and property owners of SREF structures.

Impact to industry relative to the cost of compliance with code

This proposed modification will have no fiscal impact on industry.

Impact to small business relative to the cost of compliance with code

This proposed modification will have no impact on small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed modification is directly connected to the health, safety, and welfare of the general public by harmonizing all lightning and surge protection requirements of the FBC-B.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposed modification improves the code by adding prescriptive and clear rules for compliance.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This proposed modification enhances the effectiveness of the code.

2nd Comment Period

SP7218-G2

Proponent	Michael Riley	**Submitted**	5/24/2019	**Attachments**	Yes

Comment:

Proposed code modification 7218 does not meet the statutory standards of Chapter 553. See attached comments.

2nd Comment Period

SP7218-G3

Proponent	Bryan Holland	Submitted	5/26/2019	Attachments	No

Comment:

Please disregard general comment SP7218-G2. The comment is not valid as it attempts to address the existing requirements of the code and not the proposed modification that is currently open for comment. The editorial revisions made to this section by the modification did not add to or take away from any of the current requirements. Therefore, none of the statements made in the general comment are relevant.

2nd Comment Period

SP7218-G4

Proponent	Joe Bigelow	Submitted	5/28/2019	Attachments	Yes

Comment:

Submitted by Shroder Joseph & Associates via FedEX

1st Comment Period History

SP7218-G1

Proponent	Vincent Della Croce	Submitted	1/8/2019	Attachments	No

Comment:

I support the proposed modification as it will ensure the Code includes the most current requirements for electrical installations that provide for the health, safety and general welfare of the public.

453.17.7 Lightning protection.

~~All facilities in high lightning risk areas shall be evaluated using the Risk Assessment Guide in NFPA 780 and other standards which address lightning protection, and shall be protected accordingly.~~

453.17.7.1

A lightning protection system shall be provided for all new buildings and additions in accordance with NFPA 780, Standard for the Installation of Lightning Protection Systems.

453.17.7.2

Where additions are constructed to existing buildings, the existing building's lightning protection system, if present, shall be interconnected to the new lightning protection system.

453.17.7.3

Surge protective devices (SPDs) shall be installed in accordance with NFPA 70, National Electrical Code, as required by NFPA 780, Standard for the Installation of Lightning Protection Systems for all normal and emergency electrical services.

453.17.7.4

All communication systems entering or exiting the structure shall have surge protectors installed for each pair of conductors and shall have visual indication for protector failure to the maximum extent feasible.

The controlling statutory standards for approving an amendment or modification to the Florida Building Code are as follows. Proposed code modification 7218 does not meet the statutory standards:

1. *Is needed in order to accommodate the specific needs of this state.*
2. *Has a reasonable and substantial connection with the health, safety, and welfare of the general public.*

It is undisputed that structural fire incidents are declining – not increasing – in the United States from 1977 to 2015 so there is no reason for FBC to impose this new tax for LPS and SPD on Florida's economy. Haynes, *Fire Loss in the United States 2015*, NFPA, September 2016, Figure 1 at p. 11. Haynes concludes that "[t]he total number of fires continues to be on a downward trend, as does the number of outside fires, structure fires and vehicle fires." P. 35. Direct property damage from lightning fires has declined as well from 1977 to 2015 in 2015 dollars. More specifically, the amount of direct property damage to non-home structures caused by lightning fires dropped over 70% annually from 1980 to 2014 ($249 million to $65 million). Ahrens, *Structure Fires Started by Lightning*, NFPA, April 2017, at Table 2, p. 4. http://www.nfpa.org/news-and-research/fire-statistics-and-reports/fire-statistics/fire-causes/lightning-fires-and-lightning-strikes

In 2011 Fire Departments reported 27,100 total lightning fires in the United States. Of these reported fires 20,400, or 75% of the total, were outside fires or non-structure fires. Only 7% of lightning fires from 2007-2011 were "non-home structure fires." Ahrens, *Lightning Fires and Lightning Strikes*, NFPA, Fire Analysis and Research Div., June 2013, p. 1. Exhibit C. There were only 1,800 "non-home structure" fires. *Lightning Fires and Lightning Strikes* at Table 4, p. 14. By 2014, the number of "non-home structure fires" was even lower (1,400). *Structure Fires Started by Lightning*, at Table 2, p. 4.

Therefore, the Proposed Code Modification is not needed and does not have a reasonable and substantial connection with the health, safety and welfare of Floridians. The Proposed Code Modification overstates the risk and costs of lightning damage to structures in Florida and given the overstated threat of damage caused by lightning strikes, the costs of complying with the proposed LPS and SPD requirements exceed the benefits of their installation in Florida.

3. *Strengthens or improves the Florida Building Code, or in the case of innovation or new technology, will provide equivalent or better products or methods or systems of construction.*
4. *Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.*

The restriction of approved LPS to only NFPA 780-compliant systems provides no equivalent products, methods, or systems of construction and is entirely discriminatory as to all other products, methods and systems. The Proposed Code Modification would wholly exclude from Florida construction projects UL Certified Lightning Protection Systems and specific Components and Systems such as UL96A Master Labeled LPSs and UL Letter of Findings LPS. Further the modification excludes LPS such as IEC 62305, DOD DDESB 6055.9, DOE M440.1-

1, FAA Std – 019e, FAA 6950.19A, NASA E-0012F, API – 2003, and any new LPS technology that may be developed and otherwise certified.

5. *Does not degrade the effectiveness of the Florida Building Code.*

An inherent conflict exists in the Proposed Code Modification. While LPS must be NFPA 780-compliant, SPD must be installed in accordance with NFPA 70, National Electric Code. These codes conflict as to installation of SPDs and where they are required to be installed in a structure.

§553.73 (9) (a)

Further, a proposed amendment must include a fiscal impact statement that documents the costs and benefits of the proposed amendment:

The proposed modification would needlessly – but substantially – unfairly tax the Florida economy. The narrative for Proposed Code Modification 6460 in 2017 providing for new LPS building requirements admitted that "[t]he average cost of a complete LPS is approximately 1% to 5% of total construction cost of the building." Dr. Issa's draft report presented to the Technical Advisory Committee at that time directly acknowledges these additional costs:

> "[t]he largest cost impact for the 2015 Florida specific changes came from proposed code change E6460, the installation of Lightning Protection Systems (LPS). The anticipated cost of the LPS was estimated to add 5% to the buildings total cost. Up to 80% of that cost reportedly could be offset through insurance reductions, **however such insurance reductions are not guaranteed and were therefore omitted from this cost estimate.**" (emphasis supplied) Issa, *Evaluation of the Cost Impact of Florida's specific changes to 2015 I-Codes "Prescriptive Code Changes"*, Draft Final Report, April 17, 2017, at Executive Summary p. 1.

§553.73 (9) (b)

Schröder Joseph & Associates LLP
ATTORNEYS AT LAW

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May 23, 2019

Via Federal Express

Florida Building Commission
Special Occupancy Technical Advisory Committee
2601 Blair Stone Road
Tallahassee, Florida 32399

Via Email (rsbrowdy@aol.com)

Richard S. Browdy
Chairman, Florida Building Commission
2601 Blair Stone Road
Tallahassee, Florida 32399

Re: Comments on Proposed Code Modification 7218, Florida Building Code

Gentlemen:

Our law firm represents Heary Bros. Lightning Protection Co., Inc. ("Heary Bros.") and its division, Lightning Preventor of America®. Heary Bros. offers both NFPA 780 compliant systems as well as its Preventor® system which is an early streamer emission system ("ESE system") that is installed in compliance with its manufacturer's standard, HBP 21. This letter is submitted to comment on proposed Modification 7218 to require that all Florida Education Facilities install lightning protection systems in accordance with National Fire Protection Association ("NFPA") 780. The modification should not be accepted and instead there should continue to be the ability for the owner, architect and engineer on such projects for ALFs to select the type of lightning protection system that best fits the needs of the project.

Under the rules governing modification of the Florida Building Code, a prerequisite to accepting a proposed modification such as E6460 is that it "DOES NOT DISCRIMINATE AGAINST MATERIALS, PRODUCTS, METHODS, OR SYSTEMS OF CONSTRUCTION OF DEMONSTRATED CAPABILITIES." (553.73 (9) (a) 3 F.S.). It is respectfully submitted, for the reasons discussed in detail below, that Modification 7218 cannot be accepted because it will violate this fundamental prerequisite under Florida State law (553.73 (9) (a) 3 F.S.) by discriminating against manufacturers and installers of Early Streamer Emission ("ESE") lightning protection systems which constitute a competing alternative of "demonstrated

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capabilities." Indeed, there is no reasonable justification for favoring Faraday lightning protection systems installed under NFPA 780 over ESE lightning protection systems installed under HBP 21 or other equivalent standards which have been approved, specified by architects and engineers and successfully used for many decades throughout the United States and the world.

THE NEED TO REJECT THE PROPOSED MODIFICATION

While most if not all companies in the lightning protection industry either exclusively provide either Faraday Systems or ESE Systems, Heary Bros. manufactures both types of lightning protection systems available in the marketplace today: (1) the traditional Faraday lightning protection systems governed by NFPA 780; and (2) its ESE lightning protection systems which have been successfully installed under HBP 21 for over 30 years under its $11 Million Guaranty backed by Travelers Insurance Company without a single documented lost. Proposed Code Modification 7218—as proposed--would eliminate for Florida Building owners the ESE option.

Importantly, Heary Bros. does not seek to exclude other ESE manufacturers or installers by offering its proven standard known as HBP 21, a copy of which is attached as Exhibit A, as one proven alternative standard. **Instead, the Florida Building Commission should accept other alternative equivalent standards and not limit the standard to NFPA 780.** The point is that architects, engineers and owners should be free to make a choice and should not be limited to one option, particularly since modification 7218 was propounded by a representative of the Faraday Industry which stands to obtain an exclusive monopoly under the proposal. Notably, these types of restrictive changes to the Florida Building Code to require that lightning protection systems comply with NFPA 780 have been proposed by the Florida Industry previously and rejected by the Florida Building Commission for sound reasons in 2017. *See, e.g.*, Modification E6460 rejected by the Florida Building Commission in 2017.

There is no reason to adopt Proposed Modification 7218 and limit the lightning protection systems for Florida Education Facilities to compliance with NFPA 780. Not only does Heary Bros.' HBP 21 have a proven track record, but it also has the support of Traveler's insurance which provides $11 million in coverage to support Heary Bros.' guaranty of its ESE system. This support is documented by Exhibit B. The reason that Heary Bros. offers both options to its customers is because its ESE system offers a much less expensive option while its NFPA 780 Faraday alternative is more expensive with no technical or scientific basis of superior performance to justify the added cost. Heary Bros. believes the consumer should have the option to decide. Modification 7218—which Heary Bros. learned about for the first time in this week—should be rejected or modified so as not to eliminate that choice for Florida owners, architects and engineers.

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As explained below, not only has it been established in the lightning protection industry that there is no scientific basis for preferring the method of installation of the Faraday system whose installations are governed by NFPA 780 over ESE lightning protection systems, but also the installation approach of the Faraday systems (which uses more cable and more terminals) renders the Faraday System more costly with no added benefit to owners and consumers.

Heary Bros. readily concedes that its profit margins with respect to the sale of the components of Faraday systems exceeds the profit margins on ESE systems because the installation design for Faraday systems requires more cables, more down runs and more terminals and connections despite the lack of any scientific basis for claiming a difference in performance of the two systems. It should come as no surprise that the proponent of this change in the Florida Code is the Faraday Industry and those companies that exclusively install only Faraday Systems under the NFPA 780 standards. These entities consistently promote codes based on NFPA 780 and dominate the NFPA 780 committee.

There is no difference between the quality of the components of ESE systems and Faraday systems. Notably, the components of both the Faraday System and the ESE systems have been listed by Underwriters' Laboratories, Inc. pursuant to UL 96 which provides the "quality control" for component parts of lightning protection systems. In contrast, NFPA 780 ONLY governs the method of installation and requires more cabling, terminals, connectors and more grounding because of differences in the terminals used by each of these two competing systems.

Other factors to consider are that NFPA itself discloses that NFPA 780 has no scientific basis and has never recommended that this standard be adopted as "code." Further, the author of this letter made presentations to New York State when it considered adopting a similar code change more than two decades ago and New York State ultimately rejected the very code change now being considered— a change virtually identical to that being proposed here—and ruled that there was "no technical justification" for its adoption. Again, the proposed change in law simply imposes more costs on building owners with no scientific or practical justification.

If there is an argument being made regarding "insurance savings" by the proponents of this change in law, their evidence merely confirms that lightning protection—may in some few instances—results in insurance rebates, but the documentation does not show that only NFPA 780 systems are eligible for such rebates or whether these rebates are applicable solely to surge protection which is a separate and distinct product.. Moreover, what is indisputable is that the Faraday systems governed by NFPA 780 systems are NOT eligible for Heary Bros. $11 million guaranty backed by Travelers Insurance Company which Travelers offers only for ESE systems installed in compliance with Heary Bros.' manufacturer's standard—coverage which is provided based on Heary Bros.' decades of field experience with this type of system that exceeds thirty

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years. Copies of documentation demonstrating this insurance coverage are attached hereto as Exhibit B.

Perhaps the best illustration of burden that Proposed Modification 7218 would impose on building owners is the fact that so many building owners have in the past chosen the ESE system in preference to the Faraday system governed by NFPA 780. I have attached as Exhibit C a list of just a small sampling of Florida projects now enjoying the benefits of Heary Bros.' ESE system and $11 Million Guaranty which include numerous government and municipal buildings, resort and recreational centers, churches and corporate buildings. This constitutes a small sampling of Heary Bros.' ESE installations throughout the State of Florida—all of which have been installed in compliance with Heary Bros.' manufacturer's standard and have NOT been the subject of a single documented failure. Similarly, Federal and State governments have preferred the option of Heary Bros. ESE system with its $11 million guaranty over Faraday systems governed by NFPA 780. A list of a sampling of these projects is attached as Exhibit D which included, by way of illustration, such buildings as the Huntsville Alabama Public Safety Complex, the Los Angeles Federal Building, San Diego V. A. Medical Center, the Cape Canaveral Air Force Station, the Council Building for City of Coconut Creek, Florida, the Tampa Gateway Post Office Building, the Holmes Beach Florida Baseball Field and the U.S. Naval Air Station in Milton Florida. Again, these are just a very few examples of government installations in various States from all over the United States.

NFPA ITSELF MAKES CLEAR THAT NFPA 780 IS NOT SCIENTIFICALLY BASED

The proponents of the Faraday systems governed by NFPA 780 often argue that the existence of "national standards" for Faraday Systems (such as NFPA 780 and its parallel standard UL96A) somehow demonstrates that Faraday Systems are "scientific" and "proven." These types of statements are inconsistent with the very nature of national standards in the United States. NFPA 780 itself makes it very clear in its disclosures that NFPA 780 is NOT based on science, research, records of testing or even field experience. Instead, the NFPA specifically includes in the preamble to NFPA 780 (and in all NFPA consensus standards) the following disclaimers as to the efficacy of such standards:

> "While **the NFPA** administers the process and establishes rules to promote fairness in the development of consensus, it **does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgments contained in its codes and standards. The NFPA disclaims liability for any personal injury, property or other damages** of any nature whatsoever....directly or indirectly resulting from the ...use of, or reliance on this document. **The NFPA also makes no guaranty or warranty as to the accuracy or completeness of any information published herein**."

This excerpt from the preface to NFPA 780 is enclosed as Exhibit E. (Emphasis added.)

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THE LEADING INDUSTRY LITERATURE REJECTS ANY SUPERIORTY OF FARADAY SYSTEMS OVER ESE LIGHTNING PROTECTION SYSTEMS

We have attached the most recognized studies comparing ESE systems to Faraday Systems governed by NFPA 780, including a report generated by the NFPA itself in 1999. Specifically, attached as Exhibits F and G, respectively, are pertinent excerpts from the Report of the National Institute of Standards and Technology, entitled "Literature Review and Technical Analysis of Early Streamer Emission Systems of Lightning Protection" (1995) (hereinafter "NIST Report") and the Report of the NFPA's Third-Party Independent Evaluation Panel entitled "Early Streamer Emission Lightning Protection Technology" (1999) (hereafter "Bryan Report").

Both the NIST and the Bryan Report concluded that ESE systems have both an adequate theoretical basis and laboratory testing. NIST Report at page 25; Bryan Report at page 26. However, the authors of both reports found that there is insufficient field testing of either ESE systems or traditional (also known as "Faraday") systems of lightning protection under natural thunderstorm conditions. NIST Report at page. 16. Bryan Report at page 26. These findings of inadequate field testing of both traditional Faraday systems and ESE systems of lightning protection were based in part on the fact that there have been reported failures of both types of systems, and there was virtually no documentation to determine the cause of the failure.[1] As a result, both reports concluded that no meaningful conclusions regarding the performance of either type of system could be drawn based on either reported failures or lack of failures of either type of system under natural thunderstorm conditions. NIST Report at page 25; Bryan Report pages.23-24.

Based on this lack of field testing---or even laboratory testing—for traditional (Faraday) systems of lightning protection, the NIST Report concluded that "insufficient quantitative data see to exist about the performance of traditional rods…." NIST at page 24. Dr. Bryan, a former member of the NFPA Standards Council, went so far as to conclude that because of a lack of field or laboratory testing, NFPA 780 systems had insufficient scientific validation to warrant an NFPA standard and recommended that NFPA 780 be "downgraded" to a recommended practice. Bryan Report at pages 27-28.

It also is worth noting that both the NIST and Bryan Reports were highly critical of studies, funded by the Faraday industry, conducted by Professor Moore and Dr. Rison of the

[1] Both Faraday and ESE Systems—like other products—sometimes experience failures due to failure to maintain the systems properly or due to installation errors. Faraday Systems rely on their "track record" in field to support their efficacy. ESE Systems, like Faraday System, also have similar field experience. For example, in over twenty years and with thousands of systems installed in the United States, Heary Bros. have had no documented failures and their insurance carriers have paid no claims. Of course, Heary Bros.' ESE systems are installed in compliance with its manufacturer's standard to ensure adequate installation.

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New Mexico Institute of Mining and Technology. The NIST Report questioned whether any meaningful conclusions could be drawn based on tests conducted at elevations of 3000 m, and that the testing at this altitude "raise questions about the interpretation of such observations" NIST Report at 21.

Similarly, the Bryan Report identified several significant problems with the methodology employed by Professor Moore and Dr. Rison. The Bryan Report noted that despite reporting a "failure" of an ESE system, the ESE terminal had been damaged and--as a result--the study failed to document that the ESE terminal was even working at the time of the alleged strike within the zone of protection. Bryan Report at 17. The Bryan Report also noted that Dr. Rison's and Professor Moore's research questioned the efficacy of terminals used in NFPA 780 systems (Faraday Systems), noting that in four years not a single sharp pointed Franklin rod was struck. *Id.* at 18.

The lack of a scientific basis for NFPA 780 and UL 96A also has been confirmed in an article by written by Professor Martin Uman (a leading lightning protection expert who is often quoted by Faraday manufacturers) and published in the December 2002 issue of *American Meteorological Society*. The article states "[t]he theoretical justification of the traditional [Faraday] approach is fairly crude, in part due to our incomplete understanding of lightning's attachment to ground-based objects. Hence, the fact that traditional [Faraday lightning protection] systems have a history of success in preventing or minimizing damage to structures is the primary justification for their use." December 2002 Edition of *American Meteorological Society* at page 1809. Of course, as noted above, Heary Bros.' ESE systems have the same history of success based on field experience now exceeding thirty years—success which has been acknowledged by Heary Bros.' insurance carriers who provide insurance coverage for its ESE systems through Travelers Insurance Company.

CONCLUSION

For all the foregoing reasons, we respectfully request that you reject Proposed Code Modification 7218. Importantly, as explained above, Proposed Code Modification 7218 clearly cannot be adopted under Florida law because it discriminates against manufacturers and installers of ESE lightning protection systems which constitute a competing alternative of "demonstrated capabilities." Florida State law (553.73 (9) (a) 3 F.S.). Moreover, the Proposed Code Modification 7218 should be accepted since it simply is the right thing to do to preserve an option that architects, engineers and owners have chosen for decades with success and—to do otherwise—would provide the Faraday industry with an unfair and unlawful monopoly. Thus, the action proposed by this letter is in the interests of retaining the owners' ability to choose and will avoid the creation of state law that conflicts with federal antitrust laws and imposes

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anticompetitive restraints on the marketplace.

Sincerely,

SCHRODER, JOSEPH & ASSOCIATES, LLP

Linda H. Joseph

EXHIBIT A

Manufacturer's Installation Standard For Lightning Protection Systems Using Early Streamer Emission Air Terminals

HBP-21

CONTENTS

INTRODUCTION

1. Scope

1.1 The requirements of this standard cover the design of systems using Early Streamer Emission ("ESE") air terminals for strikes. The Standard is divided into Three Levels of Protection. Electrical transmission lines and equipment are not within the scope of this standard.

1.2 These requirements apply to lightning protection systems that are complete and cover all parts of a structure. Partial systems are not covered by this standard.

1.3 Where fittings, devices or other components required by this standard are available as listed or labeled, such components shall be used. Otherwise the components shall be approved by the authority having jurisdiction (i.e. Engineer of Record, Architect, Owner, Applied Research Laboratories or Underwriter's Laboratories).

1.4 This Manufacturer's standard is based upon Heary Bros.' 30 years experience in designing lightning protection systems. Because of the lack of a complete understanding of the interaction between lightning and ground based objects and the lightning attachment process, the number and placement of air terminals set forth in this Manufacturer's Standard is based solely on Heary Bros.' experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection, NFPA 780, states that the NFPA "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgments contained in its codes and standards."

2. Glossary

2.1 For the purpose of this standard the following definitions apply:

Lightning Protection System is complete system of air terminals(s), conductors, ground terminals, bonding conductors, transient voltage surge suppression devices and other components required to complete a system.

2.2 AIR TERMINAL:

Is the component of the system that is intended to intercept the lightning strokes.

2.3 APPROVED:

Acceptable to the "authority having jurisdiction".

2.4 AUTHORITY HAVING JURISTICTION:

Is the organization, office or individual responsible for "approving" the equipment, and installation or a procedure.

2.5 BONDING:

An electrical connection between an electrically conductive object and a component of a lightning protection system that is intended to significantly reduce potential differences created by lightning currents.

2.6 CABLE: A conductor formed of a number of wires stranded together.

2.7 CHIMNEY:

A smoke or vent stack having a flue with cross sectional area less than 500 sq in (.3 sq m) and a total height of less than 75 feet (23m).

2.8 CONDUCTOR:

The portion of a lightning protection system that is intended to carry the lightning discharge to the ground.

2.8.1 MAIN CONDUCTOR:

A conductor that interconnects air terminals and serves as a down lead to ground.

2.8.2 BONDING CONDUCTOR:

A conductor intended to be used for potential equalization between metal bodies and the lightning protection system. Bonding conductors are not designed or intended to carry main lightning current.

2.9 FASTENER:

An attachment to secure the conductor to the structure.

2.10 GROUNDED:

Connected to earth or to some conducting body that is connected to earth.

2.10.1 GROUND GRID:

A system of grounding electrodes consisting of interconnected bare cables buried in the earth.

2.10.2 GROUND TERMINAL (ELECTRODE):

The portion of a lightning protection system that is installed for the purpose of providing electrical contact with earth.

2.11 LIGHTNING STRIKE:

The entire lightning event that can consist of one or more lightning strokes.

2.12 LOOP CONDUCTOR:

A conductor that encircles a structure that is used to interconnect ground terminals, main conductors or other grounded bodies.

2.13 METAL FRAME STRUCTURE:

A structure with electrically continuous structure members of sufficient size to provide electrical path equivalent to that of the lightning conductors in this standard.

2.14 SHALL:

Indicates a mandatory requirement of this Standard.

2.15 SHOULD:

Indicates a recommendation or that which is advised but not required.

2.16 SURGE ARRESTORS:

Are devices designed to limit damaging surge voltages by discharging or bypassing the current while maintaining the ability of repeating these functions. Heary Brothers Lightning Protection Co., Inc. and its Division Lightning Preventor of America do not manufacture Surge Arrestors nor do they warranty the equipment.

3. GENERAL REQUIREMENTS

3.1 GENERAL DESIGN REQUIREMENTS:

A lightning protection system using an Early Streamer Emission Air Terminal (s) shall be designed with provisions for inspection and maintenance.

3.2 Every installation shall be reviewed by a prior study to determine the level of protection required (See Figure 3.5.1).

3.3 The position of the E.S.E. air terminal, including height of above structure shall be determined in accordance with the level of protection required. (See Figure 3.5.1)

3.4 The number of terminals will depend on the system design under the Manufacturer's Standard based upon the dimensions of the area to be protected. (See Figure 3.5.1)

3.5 There are multiple styles of E.S.E. air terminals and systems available. For purposes of this standard they have been divided into separate levels of protection, with each level having its own installation requirements. A chart is provided (See Figure 3.5.1) as a general guideline in determining which level of protection best fits the requirements of the project.

3.6 All bolts on bolt pressure connectors require to be torqued at 150 pound-inches (17N-m).

3.7 This Manufacturer's standard is based upon Heary Bros.' 30 years experience in designing lightning protection systems. Because of the lack of a complete understanding of the interaction between lightning and ground based objects and the lightning attachment process, the number and placement of air terminals set forth in this Manufacturer's Standard is based solely on Heary Bros.' experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection, NFPA 780, states that the NFPA "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgments contained in its codes and standards."

Figure 3.5.1 **Levels of Protection for ESE Lightning Protection Systems**

FEATURES	LEVEL 1	LEVEL 2	LEVEL 3
Number of ESE Terminals Required Pursuant to System Design	1 Air Terminal (See Note: A)	1 Air Terminal (See Note: A)	1 Air Terminal (See Note: B)
Grounding Resistance Requirements	10Ω (ohms) or less	10 Ω (ohms) or less	25Ω (ohms) or less
Warranty	15 year material workmanship	15 year material workmanship	5 year material workmanship
Air Terminal height above all roof top projections	20' (6.1m)	20' (6.1 m)	7' (2 m)
Transient Voltage Surge Suppression	Shall be installed on all service entrances of electric, telephone, cable, and antenna lead-in.	Shall be installed on all service entrances of electric, telephone, cable, antenna lead-in.	Shall be installed on all service entrances of electric, telephone, cable, antenna lead-in.
ARL Listing and UL Listing mark on applicable components	Required	Required	Required
Building Height	Unlimited	Unlimited	Under 75' (23m)
Building Types	All	All	Residential, Farm, Agricultural, Small commercial.

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(Note: A)

Manufacturer's Installation Standard HBP-21Level 1 and Level 2 require one (1) ESE Air Terminal to be installed on the roof for every circular area of 337,810 feet. Structures may be on any height and the ESE lightning protection system must comply with all other requirements within this Manufacturer's Installation Standard HBP-21. This Manufacturer's standard is based upon Heary Bros.' 30 years experience in designing lightning protection systems. Because of the lack of a complete understanding of the interaction between lightning and ground based objects and the lightning attachment process, the number and placement of air terminals set forth in this Manufacturer's standard is based solely on Heary Bros.' experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lightning protection NFPA 780, states that the NFPA, "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

(Note: B)

Manufacturer's Installation Standard HBP-21 Level 3 requires one (1) ESE Air Terminal to be installed on the roof for every circular area of 70,650 feet. Structures may be of any height and the ESE lightning protection system must comply with all other requirements within this Manufacturer's Installation Standard HBP-21. The recommended number and placement of air terminals is based solely on Heary Bros.' 30 years of experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lighting protection, NFPA 780, states that the NFPA, "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

LEVEL 1

MANUFACTURER'S INSTALLATION STANDARD

FOR

EARLY STREAMER EMISSION LIGHTNING PROTECTION SYSTEMS

4. Level 1 General Installation and Component Requirements

4.1 An ESE lightning protection system installation consists of the following interconnected parts

(a) One or more ESE air terminals
(b) Mast and mounting systems - as required based on level of protection desired.
(c) Bonding conductors - as required based on level of protection.
(d) Ground system – Single grid to loop conductor system.
(e) Equipotential Bonding.
(f) Transient Voltage Surge Suppression.

4.1.1 The number of ESE air terminals will depend on the system design under the Manufacturer's Standard based upon the area indicated in Figure 3.5.1 for Level 1 type systems. The recommended number and placement of air terminals is based solely on Heary Bros.' 30 years of experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lightning protection, NFPA 780, states that the NFPA, "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

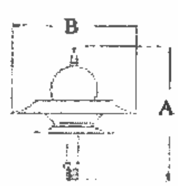
4.1.2 Components Tables 4.1.1.1 and Figure 4.1.1.2 provides minimum sizes and weights for use in ESE lightning protection system installation.

Figure 4.1.1.1

Type of conductor	Minimum Diameter	Copper Standard/ Metric	Aluminum Standard/ Metric
ESE Air Terminal	½" /12.7mm	½"/ 12.7 mm	½"/ 12.7 mm
Main Conductor Cable	Min Size each strand Weight Per Length Cross Sectional area	14AWG 375lbs /1000/ or 558 g/m 115,000 CM / 58 mm ^{2}	13AWG 190lbs/1000/ 283 g/m 192000 CM/ 97 mm ^{2}
Ground Terminals	Ground Rod / Ground Plate	¾" x 10' (20mm x 3000mm)/ 24" x 24"x 20 gauge (600mm x 600mm) pure Copper plate minimum of 2 contact points each 8 sq inch contact to plate	NA

Figure 4.1.1.2 Early Streamer Emission Air Terminal

A= 12"
B= 9"



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4.2 ESE Air terminals shall be sufficiently rigid to withstand mechanical damage. They shall be constructed of copper, copper alloy, aluminum or stainless steel. The main conductive parts of the ESE air terminal shall have the minimum dimensions in accordance with table 4.1.1.1 and Figure 4.1.1.2 for minimum dimensions of ESE Air Terminal.

4.2.1 Installation: Air terminals and their supports shall be mounted in such a way as to withstand the lightning currents, electromotive force, corrosion and effects of weather, heat, humidity, snow and wind.

NOTE: Wind design requirements should be consistent with local building code requirements.

4.2.2 Where an air terminal or mast is supported by conductive guys, the guys shall be connected from their points of anchorage to the closest down conductor(s) by a conductor equivalent in size to that of the down conductor(s).

4.2.3 The tip of any ESE air terminal or mast shall not be less than 20' (6.1m) above the protected structures, including antennas, cooling towers, tanks, roofs and masts.

4.2.4 The ESE air terminal shall be mounted on structures such as flagpoles, the top of pylons, light standards or on dedicated supports for structures at certain facilities, such as, sports facilities and stadiums, golf courses, public parks, camping sites and racetracks. The ESE unit shall be mounted at an elevation indicated in Section 4.2.3.

4.3 Storage areas for Flammable and Combustible Liquids or Flammable Gases. Structures containing these materials shall be grounded, but grounding alone does not constitute sufficient protection against atmospheric discharges.

4.4 Surge Suppression devices shall be installed on electric and telephone service entrances, antenna lead-ins, and electrical and electronic cables/ conductors entering or exiting the building.

4.4.1 Electrical Surge Suppression device shall be internally redundant and modular, in both surge suppression elements and fusing in construction for ease of field reparability. Manufacturers shall warranty the modules and fuse for the lifetime of the unit, with a minimum 10-year full unit warranty. Units shall be mounted as to minimize inductance installation. (i.e. As close to equipment to be protected or by use of documented low inductance cabling).

4.5 General, In determining the necessity of bonding a metal body to a lightning protection system, the following factors shall be considered:

A. Bonding is required only if there is a likely to be a side flash between the lightning protection system and other grounded medium.

B. The influence of a non-grounded metal body, such as metal window frame in a non-conductive medium, is limited to its effectiveness as a short circuit conductor if a side flash occurs therefore, does not necessarily require bonding to the lightning protection system.

C. Bonding distance requirements depend on the technical evaluation of the number of down conductors and their location, the interconnection of other grounded systems, the proximity of grounded metal bodies to the down conductors and the flashover medium (Air or solid materials).

D. Metal bodies located in a steel frame structure shall be permitted to be inherently bonded through construction and further bonding shall not be required.

E. Metal antenna masts or supports located on a protected structure shall be bonded to the lightning protection system using main size conductors and listed fittings. The height of the air terminal shall maintain the minimum protection above these objects as specified in Section 4.2.3

NOTE: For additional bonding requirements see Section 5.2 and 5.3.

4.6 Components

4.6.1 A lightning protection system shall be made of components that are resistant to corrosion or shall be acceptably protected against corrosion. The following materials are acceptable:

A. Copper of the grade required for commercial electrical work. Or a copper alloy with similar characteristics. Usually of 98 percent conductivity when annealed.

B. Aluminum conductors as acceptable as electrical grade aluminum.

4.6.2 Components shall be protected against deterioration due to local conditions. Any part of a copper system that is exposed to direct action of chimney gasses or other similar corrosive gases shall be protected. Aluminum components are not required to be protected.

4.6.3 Metals shall be used in combinations that are galvanically compatible.

A. Copper components shall not be installed directly on aluminum roofing, siding or other aluminum surfaces.

B. Aluminum lightning protection components shall not be installed directly on copper roofing material or other copper surfaces or below the run off of a copper surface.

C. Aluminum conductors and components shall not be:

a. Embedded in concrete or masonry.

b. In direct contact with a surface coated with alkaline base paint, or

c. Installed in wet locations, for example eave troughs or downspouts.

d. Installed in direct contact with earth.

D. Components used for connection of aluminum down conductors to copper or copper-clad grounding equipment shall provide separation between aluminum and copper materials. These fittings may be a Stainless steel sleeve with internal separation or other connector that provides proper separation of aluminum and copper components.

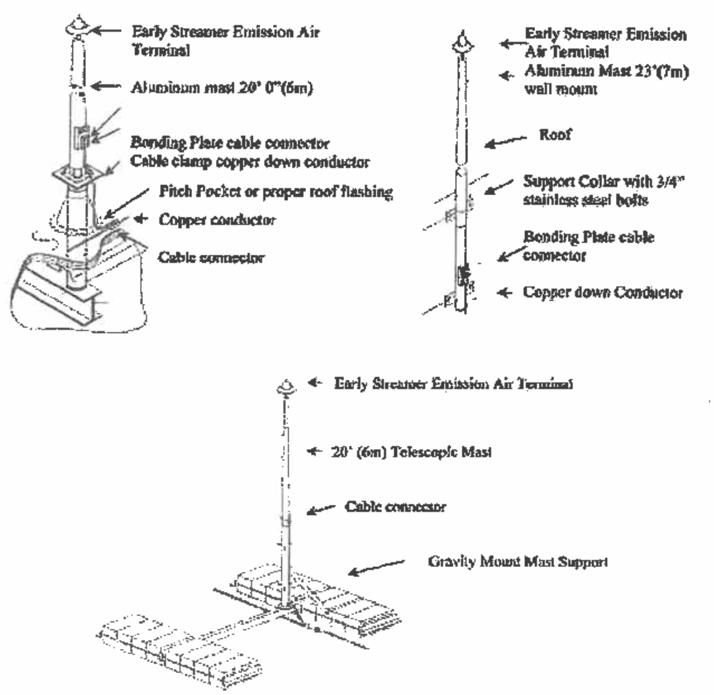
4.6.4 Unless otherwise indicated in this standard, an air terminal shall be provided for each part of a structure that is likely to be damaged by lightning. Based on the individual design requirements of the level of protection required.

5. Level 1 Air Terminal Installation Requirements

5.1 Early Streamer Emission Air Terminals

A. ESE Air Terminals shall be mounted at a height consistent with the requirements of Section 4.2.3 or a minimum of 20' above all projections on the roof.
See Figure 5.1.1 for sample mast mounting details.

Figure 5.1.1



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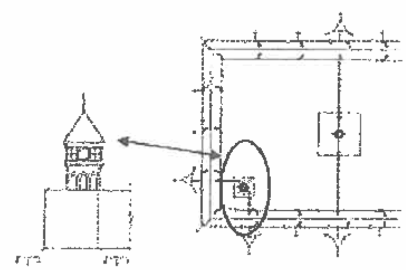
B. ESE Air Terminals shall be provided in proper quantity and location based on the system design under Manufacturer's Standard. See Figure 3.5.1 Level 1 requirements. The recommended number and placement of air terminals is based on Heary Bros.' experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lightning protection, NFPA 780, states that the NFPA "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

C. Additional ESE air terminals shall be provided in situations where steeples, cupolas, crosses, stacks, chimneys, etc. project above the protected roof area. This requirement applies to all projections which could provide a potential upward streamer release. The addition air terminals shall be provided regardless of whether or not the projection is within or outside the area covered by the system design under the Manufacturer's Standard. See Figure 5.1.2. The recommended number and placement of air terminals is based on Heary Bros.' experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lightning protection, NFPA 780, states that the NFPA "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

Figure 5.1.2

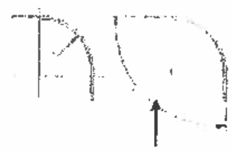


D. Conductors shall be securely fastened to roof or structure at intervals not exceeding 3'0" on center.

E. ESE Air Terminals shall be provided with a minimum of two paths to ground. Cables shall maintain a horizontal or downward path to ground to avoid "U" and "V" (down and up) pockets. See Figure 5.1.4

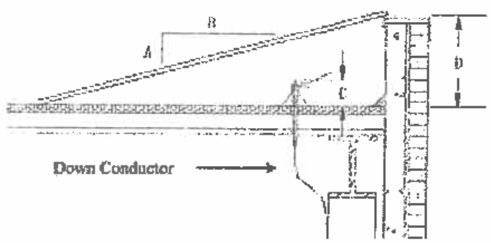
F. No Bend of a conductor shall form an included angle of less than 90 degrees or have a radius of bend less than 8 inches nor shall a conductor rise greater than 8". However conductors may raise a rate of 3" per 12" of run. See Figure 5.1.3 and Figure 5.1.4

Figure 5.1.3



NOTE: Through roof, through wall and tee type connectors do not need to comply with this requirement

Figure 5.1.4

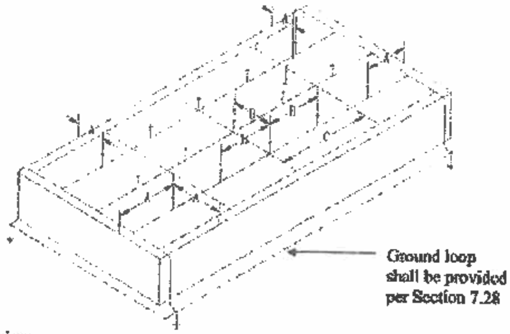


Note: Ramp may be constructed of wood, metal, fiberglass, plastic, PVC etc, provided the construction is such that it will be resistant to corrosion and rot. The conductor shall be attached or support on ramp as required in Section 5.1.D

5.1.1 In situations where multiple air terminals are required, the perimeter air terminals shall be positioned so that they are not more than 230' (70m) for the outside edge of the building nor shall the ESE Air Terminals be spaced more than 460' (140m) apart at any time. A cross run cable shall be provided at intervals of 1000' (305m) when building exceeds 2000' (610m) in length in any direction. See Fig 5.1.1.1. The recommended number and placement of air terminals is based solely on Heary Bros.' 30 years of experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed ho have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lightning protection, NFPA 780, states that the NFPA, "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

5.1.2 Down Conductors in situations where multiple ESE Air Terminals are required shall be spaced at intervals no more than 500' (152m) apart around the perimeter of the structure. The recommended number and placement of air terminals is based solely on Heary Bros.' 30 years of experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lightning protection, NFPA 780, states that the NFPA, "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

Figure 5.1.1.1



6. Level 1 Bonding Requirements

6.1 Roof top Interconnection loop

A. An interconnection loop around the perimeter of the roof structure shall be provided to which ESE Ground Conductors shall be bonded.

B. Loops shall be provided at all intermediate and lower roof levels and connected at a minimum of two (2) locations to the down conductors.

a. Bonding connections shall be made with main size conductor to all rebar, reinforcing rod, structural steel, interior wall wire mesh, nylon mesh in stucco walls, etc. whether exposed or not at all inside and outside corners of structure as a minimum. Additional bonding connections shall be made at intervals not exceeding 60' (18m) around the perimeter of the structure. Care shall be taken to assure that all rebar, reinforcing rod, structural steel, interior wall wire mesh, nylon mesh in stucco walls, et. Whether exposed or not is electrically continuous or made so. (See Fig. 6.2.4 and Fig 6.25).

b. Down Conductors shall be bonded to the structural steel, reinforcing rod or other structural support at the top and bottom of conductor run.

Figure 6.2.4

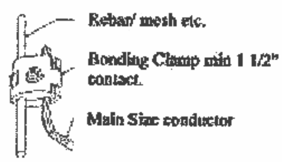


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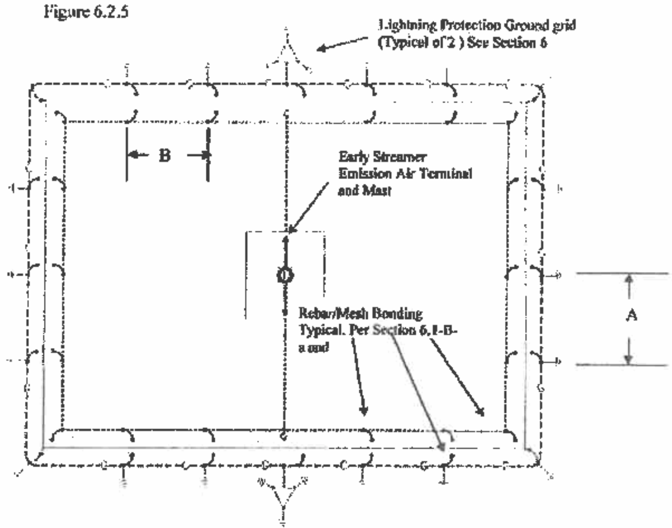
Figure 6.2.5



A= 60' (18m) Maximum Spacing
B= 60' (18m) Maximum Spacing

Note: For Base Grounding requirements see Section 7

6.2 Bonding Requirements

A. Roof top air handling units, equipment, or other roof top equipment shall be bonded to the system where the equipment is within 6' (1.8m) of a lightning protection conductor unless;

B. Inherently bonded to the lightning protection system.

C. Sanitary vents, roof drains, flashings, copings, etc. located within 6' (1.8m) of a lightning protection conductor, shall be bonded via secondary sized conductor to the lightning protection system.

7. Level 1 Grounding System Requirements

7.1 Down Conductors"

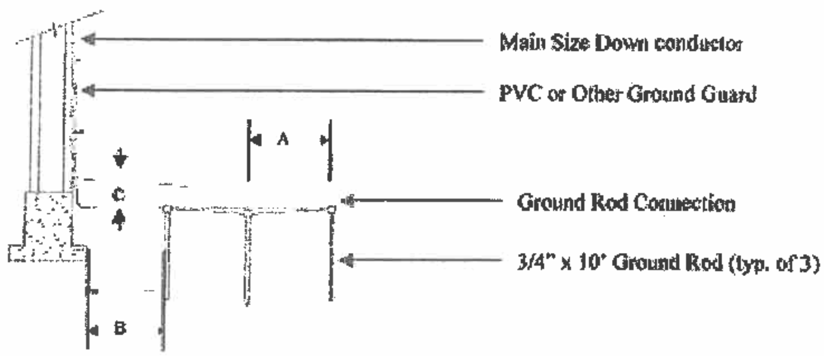
7.1.1 A minimum of Two (2) Down Conductors Shall be provided for each ESE Lightning Protection System. In cases where multiple ESE Air Terminals are used then additional down conductors shall be provided in accordance with Section 5.1.2

7.1.2 Down Conductors shall be spaced at least 10' (3m) apart.

7.1.3 Down conductors and other conductor where exposed to potential mechanical damage shall be protected against such damage by means of PVC, Fiberglass conduit sleeve, or metal conduit. (Metal conduit may be used provided the upper and lower portions are bonded to the down conductor). At ground level the bottom 8' (2.4m) of exposed down conductor shall be protected. See figure 7.2.1.1

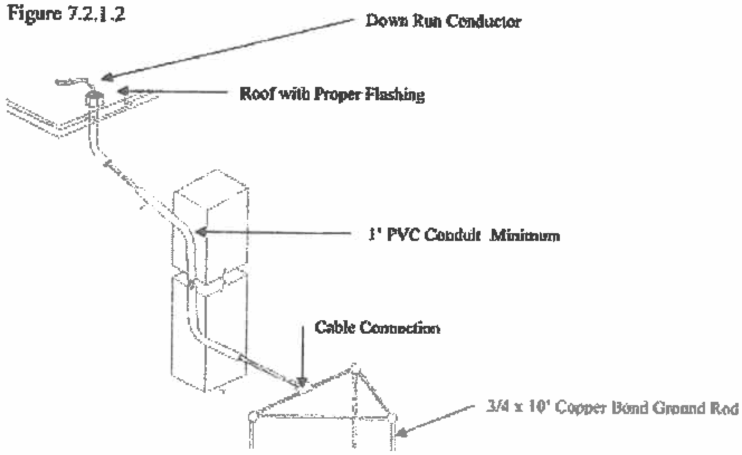
7.1.4 Down Conductors may be coursed within the construction of the building provided they are properly protected. See Figure 7.2.1.2

Figure 7.2.1.1



A= 10' (3 m) Minimum
B= 2' (0.6m) Minimum
C= 3' (0.3m) Minimum

Figure 7.2.1.2



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7.1.5 For masts that are electrically conductive then the mast shall be permitted to be used as a down conductor.

A. If electrically continuous, structural steel shall be permitted to be used as the down conductor.

B. Test joints shall be provided for each down conductor. They shall be accessible and located as near as practicable to the ground termination.

7.1.6 Masonry Anchors used to secure the lightning protection materials shall have a minimum outside diameter of ¼ in. (6.4mm) and shall be set with care. Holes made to receive the body of the anchor shall be of correct size, made with the proper tools and made in brick, stone or other masonry unit. Fasteners shall not be installed in mortar joints. When anchors are installed, the fit shall be tight against moisture, thus reducing the possibility of damage due to freezing.

7.1.7 Connector Fittings shall be used at all "end to end, "tee" or "Y" splices of lightning conductors. They shall be attached so as to withstand a pull test of 200 lbs. Fittings used for required connections shall be of bolted, welded or high compression type and bear the ARL Listing and UL Listing.

7.1.8 Conductors shall be fastened securely to the structure upon which they are placed at intervals not exceeding 3 ft (1m). The fasteners, attached by nails, screws, bolts or adhesives as necessary, shall not be subject to breakage and shall be of the same material as the conductor or of a material as resistant to corrosion as that of the conductor. No combination of materials shall be used that forms an electrolytic couple of such nature that, in the presence of moisture, corrosion is accelerated.

7.2 Grounding

7.2.1 Ground Terminations: A study shall be conducted to engineer a grounding system to a maximum of 10 ohms resistance in accordance with IEEE fall of potential ANSI/IEEE 141, *Recommended Practice for Electric Power Distribution for Industrial Power Plants,* method. The components for the grounding system shall be selected to be suitable for the soil conditions and the other side factors such as cathodic protection.

7.2.2 Ground electrodes shall be of copper-bond steel in sufficient number as to achieve a 10-ohm maximum resistance to ground. Ground electrodes shall be installed so that the top of the electrode is a minimum 3' (1m) below finished grade minimum and 2' (0.6m) away from the foundation wall. See Figure 7.2.1.1

7.2.3 Ground rod terminations. The down conductor shall be attached to the ground rod by mechanical clamp, exothermic welding or brazing. Clamps shall be suitable for direct burial.

7.2.4 Each down conductor shall terminate at a ground terminal system. A minimum of 3 ground terminals shall be provided per down conductor location. Configured either in a straight line or in delta formation. Where the ground terminals are spaced a minimum of 10' (3m) apart. See Figures 7.2.3.1 and 7.2.3.2

Figure 7.2.3.1

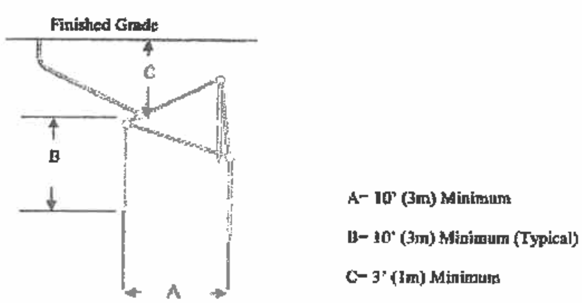

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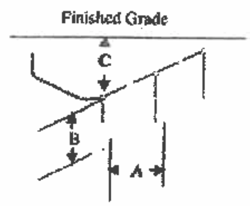
Figure 7.2.3.2



A– 10' (3m) Minimum

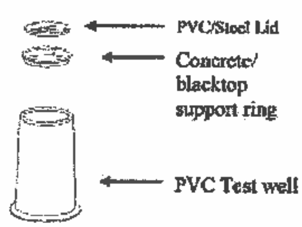
B– 10' (3m) Minimum (Typical)

C– 3' (1m) Minimum

7.2.5 Ground terminals located under slabs or in crawl spaces shall be installed as near as practicable to the outside perimeter of the structure.

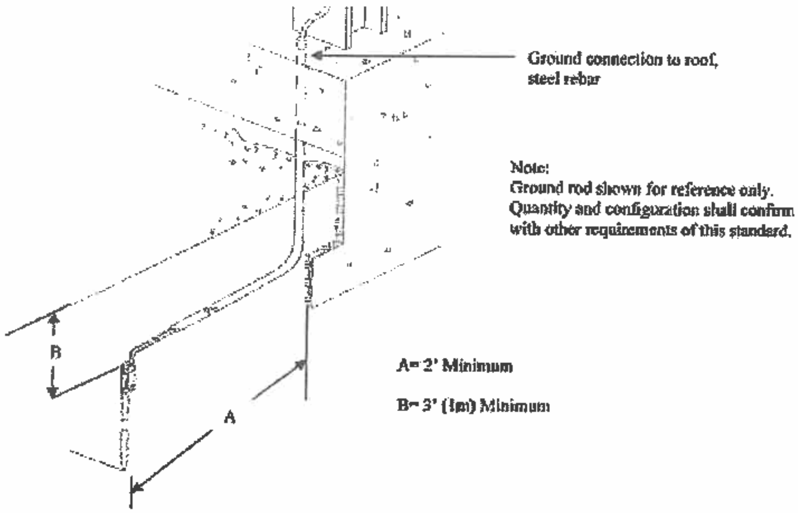
7.2.6 Electrical system grounding electrodes shall not be used in lieu of lightning ground rods. This provision shall not prohibit the required bonding together of grounding electrodes of different systems.
NOTE 1: For Further information, see NFPA 70 National Electric Code, which contains detailed information on the grounding of electrical systems.
NOTE 2: Ground rod or ground ring/loop electrodes should be installed below the frost line where practicable and in accordance with Section 7.2.8

Figure 7.2.6.1



7.2.7 Grounding ring/loop Electrode encircling the structure shall be provided and in direct contact with the earth at a depth of not less than 2ft. The ground ring conductor shall be sized at a minimum of that of the main sized conductor. See Figure 7.2.8.1

Figure 7.2.8.1



7.2.8 Common Grounding. All grounding media in or on a structure shall be interconnected to provide a common ground potential. This shall include, but not be limited to lightning protection, electrical services, telephone and antenna system grounds as well as underground metallic piping systems. Such piping systems include water service, well casings located within 25ft (7.6m) of the structure, underground conduits (not already bonded) etc. Main size lightning conductors shall be used for interconnecting these grounding systems to the lightning protection system.

7.2.9 Common Ground Bonding. If electric telephone or other systems are bonded to metallic water pipe, only one connection from the lightning protection system to the water pipe system is necessary, provided that the water pipe is electrically continuous between all systems. In situations where there are separate services for domestic and fire water entering the building both systems shall be bonded to the lightning protection grounding system. This may be accomplished via direct connection or through the ground loop system.

8. Level 1 Structural Steel Systems

8.1 General. The steel framework of a structure shall be permitted to be utilized as the main conductor of a lightning protection system if it is electrically continuous or is made electrically continuous.

8.2 Steel Structure Terminals. Ground terminals shall be connected to approximately every other steel column around the perimeter of the structure at intervals averaging not more than 60ft (18m). Ground terminals shall be connected together via a main size conductor as indicated in sec 7.2. Connections shall be made near the base of the column, with a surface contact area not less than 8 sq inches (5200mm^2) or by exothermic welding. Bonding plates shall have bolt pressure cable connectors and shall be bolted securely to the structural steel framework so as to maintain electrical continuity.

8.3 Connections to Framework. Conductors shall be connected to cleaned areas of the structural steel framework by the bonding of plates having a surface contact area of not less than 8 sq in (5200mm^2). The area of attachment shall be free of paint, grease oil and debris. (See Figure 8.3.1)

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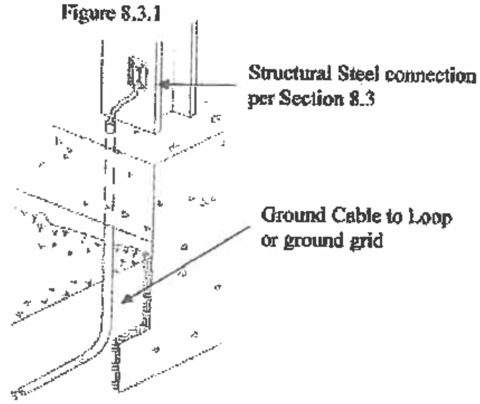
Figure 8.3.1



8.4 Early Streamer Emission Air terminals shall be permitted to be bonded directly to structural, by means of direct attachment through mast or by use of two interconnection wires routed through roof and bonded at the top of the structural steel in the manner described in Section 8.3

8.5 Metal Bodies. Certain Metal bodies located outside or inside the structure contribute to lightning hazards because they are grounded or assist in providing a path to ground for lightning currents. Such metal bodies shall be bonded to the lightning protection system in accordance with Section 4.5.

8.6 Concealment in Steel Reinforced Concrete. Conductors or other components of the lightning protection system concealed in steel reinforced concrete units shall be connected to the reinforcing steel. Concealed down conductors shall be connected to vertical reinforcing steel. Roof conductors or other concealed horizontal conductors runs shall be connected to reinforcing steel/structural steel at intervals not exceeding 60ft (18m) and at all corners. See Section 6.

8.7 Down Conductors coursed on or in reinforced concrete columns or on structural steel columns shall be connected to the reinforcing steel and/or structural steel member at its upper and lower extremities. In the case of long vertical members an additional connection shall be made at intervals not exceeding 200ft (60m). Such connections shall be made using listed clamps or listed bonding plates or by exothermic welding. The use of PVC conduit or other non-metallic chase does not negate the need for these interconnections.

LEVEL 2

MANUFACTURER'S INSTALLATION STANDARD

FOR

EARLY STREAMER EMISSION LIGHTNING PROTECTION SYSTEMS

9. Level 2 General Installations and Component Requirements

9.1 An ESE lightning protection system installation consists of the following interconnected parts

(a) One or more ESE air terminals
(b) Mast and mounting systems – as required based on level of protection desired
(c) Bonding conductors – as required based on level of protection.
(d) Ground system – Single grid to loop conductor system
(e) Equipotential Bonding
(f) Transient Voltage Surge Suppression

9.2 The number of ESE air terminals will depend on the system design under the manufacturer's Standard based on the area as indicated in Figure 3.5.1 for Level 2 Systems. The recommended number and placement of air terminals is based solely on Heary Bros.' 30 years of experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumer should be aware that the NFPA, in issuing its standard for lightning protection, NFPA 780, states that the NFPA, "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

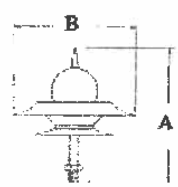
9.3 Components Tables Figure 9.3.1 and Figure 9.3.2 provide minimum sizes and weights for use in ESE lightning protection system installation.

Figure 9.3.1

Type of conductor	Minimum Diameter	Copper Standard/ Metric	Aluminum Standard/ Metric
ESE Air Terminal	1/2 "/ 12.7mm	1/2" / 12.7 mm	1/2" / 12.7 mm
Main Conductor Cable	Min Size each strand Weight Per Length Cross Sectional area	14AWG 375lbs /1000/ or 558 g/m 115,000 CM / 58 mm ^{2}	13AWG 190lbs/1000/ 283 g/m 192000 CM/ 97 mm ^{2}
Ground Terminals	Ground Rod / Ground Plate	¾" x 10' (20mm x 3000mm)/ 24" x 24" x 20 gauge (600mm x 600mm) pure Copper plate minimum of 2 contact points each 8 sq inch contact to plate	NA

Figure 9.3.2 Early Streamer Emission Air Terminal

A= 12"
B= 9"



9.4 ESE Air Terminals shall be sufficiently rigid to withstand mechanical damage. They shall be constructed of copper, copper alloy, aluminum or stainless steel. The main conductive parts of the ESE air terminals shall have the minimum dimensions in accordance with Figures 9.3.1 and Figure 9.3.2 for minimum dimensions of ESE Air Terminals Installation: Air terminals and their supports shall be mounted in such a way as to withstand the lightning currents, electromotive force, corrosion and effects of weather, heat, humidity, snow and wind

NOTE: Wind design requirements should be consistent with local building code requirements.

9.4.1 Where an air terminal or mast is supported by conductive guys, the guys shall be connected from their points of anchorage to the closest down conductor(s) by a conductor equivalent in size to that of the down conductor(s).

9.4.2 The tip of any ESE air terminal shall not be less than 20' (6.1m) above the protected structures, including antennas, cooling towers, tanks, roof and masts.

9.4.3 The ESE air terminals shall be mounted on structures such as flagpole, the top of pylons, light standards or on dedicated supports for structures at certain facilities, such as, sports facilities and stadiums, golf courses, public parks, camping sites and racetracks. The ESE unit shall be mounted at an elevation as indicated in Section 9.4.2.

9.5 Storage Areas for flammable and combustible liquids or flammable gases. Structures containing these materials shall be grounded, but grounding alone does not constitute sufficient protection against atmospheric discharges.

9.5.1 Electrical Surge Suppression device shall be internally redundant and modular, in both surge suppression elements and fusing in construction for ease of field reparability. Manufacturers shall warranty the modules and fuse for the lifetime of the unit, with a minimum 10-year full unit warranty. Units shall be mounted as to minimize inductance installation. (I.e. As close to equipment to be protected or by use of documented low inductance cabling.)

Note 1: Electrical systems and utilization equipment within the structure may require further surge suppression. Such protection is not part of this standard. NFPA 70, National Electric Code and ANSI/IEEE C62.41-1991 2nd Edition, shall be consulted for further information and installation requirements.

Note 2: Illustrations shown in this are those of Heary Brothers Lightning Protection Co., Inc. (HBLP) and its division Lightning Preventor of America (LPA). HBLP and LPA do not manufacture or warranty surge protection devices. Warranties required of this standard shall be the responsibility or the surge protection device manufacturer.

9.6 General. In determining the necessity of bonding a metal body to a lightning protection system, the following factors shall be considered:

A. Bonding is required only if there is a likely to be a side flash between the lightning protection system and other grounded medium.

B. The influence of a non-grounded metal body, such as a metal window frame in a non-conductive medium, is limited to its effectiveness as a short circuit conductor if a side flash occurs therefore, does not necessarily require bonding to the lightning protection system.

C. Bonding distance requirements depend on the technical evaluation of the number of down conductors and their location, the interconnection of other grounded systems, the proximity of grounded metal bodies to the down conductors and the flashover medium (air or solid materials).

(a) Metal bodies located in a steel frame structure shall be permitted to be inherently bonded through construction and further bonding shall not be required.

(b) Metal antenna masts or supports located on a protected structure shall be bonded to the lightning protection system using main size conductors and listed fittings. The height of the air terminal shall still maintain the minimum protection above these objects as specified in Section 9.4.2.

9.7 Components

9.7.1 A lightning protection system shall be made of components that are resistant to corrosion or shall be acceptably protected against corrosion. The following materials are acceptable:

A. Copper of the grade required for commercial electrical work. Or a copper alloy with similar characteristics. Usually of 98 percent conductivity when annealed.

B. Aluminum conductors as acceptable as electrical grade aluminum.

9.7.2 Components shall be protected against deterioration due to local conditions. Any part of a copper system that is exposed to direct action of chimney gases or other similar corrosive gases shall be protected. Aluminum components are not required to be protected.

9.7.3 Metals shall be used in combinations that are galvanically compatible.

A. Copper components shall not be installed directly on aluminum roofing, siding, or other aluminum surfaces.

B. Aluminum lightning protection components shall not be installed directly on copper roofing material or other copper surfaces or below the run off of a copper surface.

C. Aluminum Conductors and components shall not be:

a) Embedded in concrete or masonry;

b) In direct contact with a surface coated with alkaline base paint; or

c) Installed in wet locations, for example eave troughs or downspouts.

d) Installed in direct contact with earth

D. Components used for connection of aluminum down conductors to copper or copper-clad grounding equipment shall provide separation between aluminum and copper materials. These fittings may be a stainless steel sleeve with internal separation or other connector that provides proper separation of aluminum and copper materials.

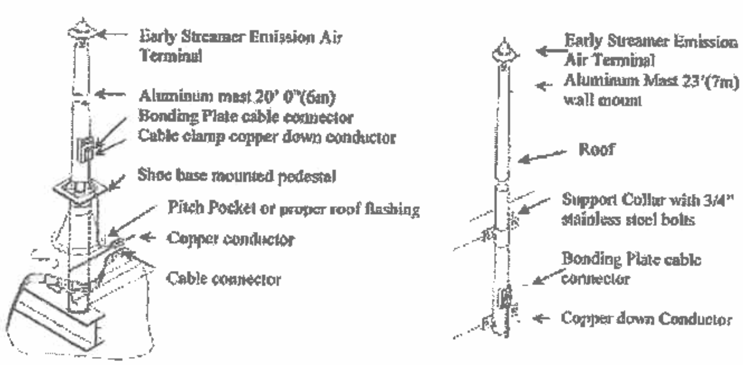
9.7.4 Unless otherwise indicated in this standard, an air terminal shall be provided for each part of a structure that is likely to be damaged by lightning. Based on the individual design requirements of the level of protection required.

10. Level 2 Air Terminals Installation Requirements

10.1 Early Streamer Emission Air Terminals

A. ESE Air Terminals shall be mounted at a height consist with the requirements of Section 9.4.2 or a minimum of 20' above all projections on the roof. See Figure 10.1.1 for sample mast mounting details.

Figure 10.1.1



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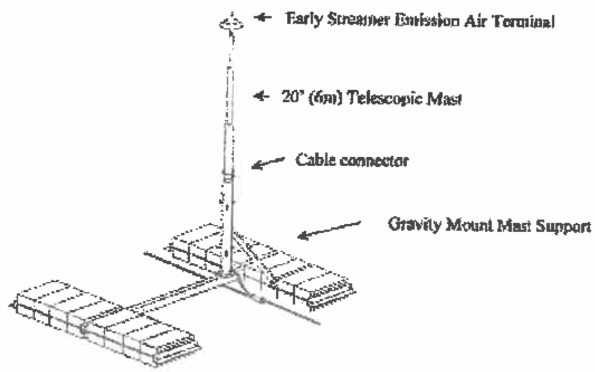
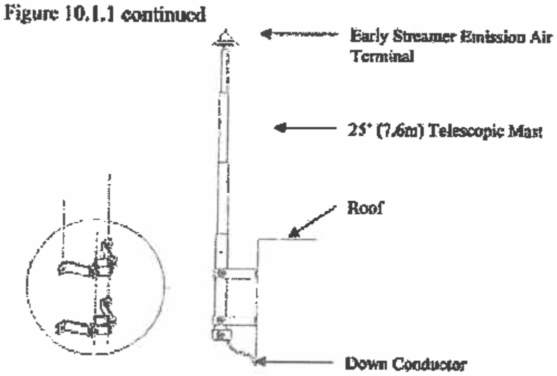


Figure 10.1.1 continued



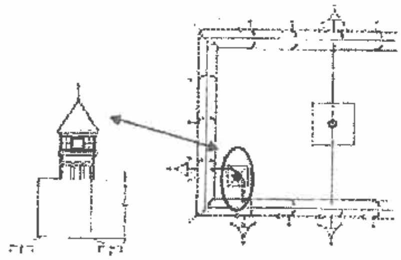
10.2 ESE Air Terminals shall be provided in proper quantity and location based on the system design under the Manufacturer's Standard. See Figure 3.5.1 for Level 2. The recommended number and placement of air terminals is based on Heary Bros.' experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lightning protection, NFPA 780, states that the NFPA "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

10.3 Conductors shall be securely fastened to roof or structure at intervals not exceeding 3'0" on center.

10.4 Additional ESE air terminals shall be provided in situations where steeples, cupolas, crosses, stacks, chimneys, etc project above a protected roof area. This requirement applies to all projections which could provide a potential upward streamer release. The addition air terminals shall be provided regardless of whether or not the projection is within or outside the area covered by the system design under the Manufacturer's Standard. See Figure 10.2.1. The recommended number and placement of air terminals is based on Heary Bros.' experience and its air terminals and the configuration of those

terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lightning protection, NFPA 780, states that the NFPA "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

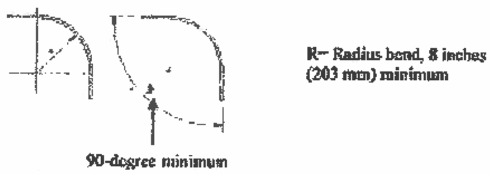
Figure 10.2.1



10.5 ESE Air Terminals shall be provided with a minimum of two paths to ground. Cables shall maintain a horizontal or downward path to ground to avoid "U" and "V" (down and up) pockets.

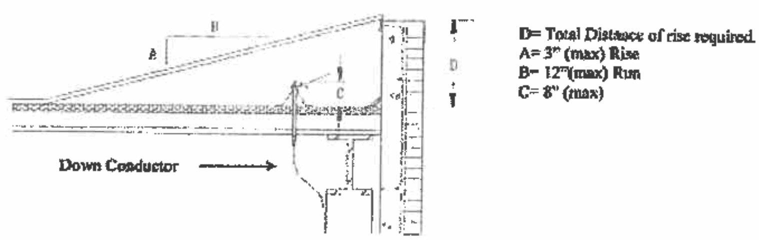
10.6 No Bend of a conductor shall form an included angle of less than 90 degrees or have a radius of bend less than 8 inches nor shall a conductor rise greater than 8". However Conductors may rise at a rate of 3" per 12" of run. See Figure 10.5.1 and Figure 10.6.1

Figure 10.5.1



NOTE: Through roof, through wall and tee type connectors do not need to comply with this requirement.

Figure 10.6.1



Note: Ramp may be constructed of wood, metal, fiberglass, plastic, PVC etc, provided the construction is such that it will be resistant to corrosion and rot. The conductor shall be attached or support on ramp as required in

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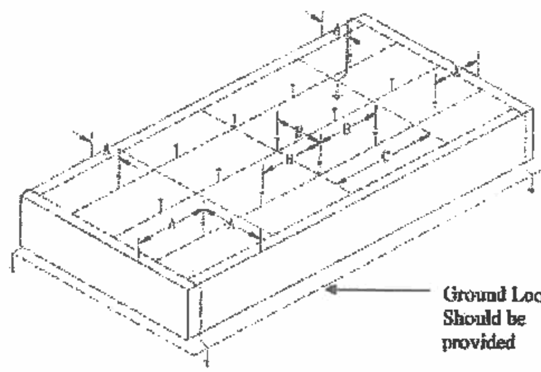
10.7 In situations where multiple air terminals are required, the perimeter air terminals shall be positioned so that they are no more than 230' (70m) from the outside edge of the building nor shall be ESE Air Terminals be spaced more than 460' (140m) apart at any time. A cross run cable shall be provided at intervals of 1000' (305m) When building exceed 200' (610m) in length in any direction. See Figure 10.8.1. The recommended number and placement of air terminals is based solely on Heary Bros.' 30 years of experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lightning protection, NFPA 780, states that the NFPA, "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

10.8 Down Conductors in situations where multiple ESE Air Terminals are required shall be spaced at intervals no more than 500' (152m) apart around the perimeter of the structure.

Figure 10.8.1



A- 230' (70m) maximum
B- 460' (140 m) maximum
C- 1000' (305m)

10.9 Bonding connections shall be made with main size conductor to all rebar, reinforcing rod, structural steel, interior wall wire mesh, nylon mesh in stucco walls, etc., whether exposed or not, at the upper and lower extremities of each down conductor. Care shall be taken to assure that all rebar, reinforcing rod, structural steel, interior wall mesh, nylon mesh in stucco walls etc, whether exposed or not is electrically continuous or made so. (See Fig. 10.9.1 and Fig 10.9.2).

Figure 10.9.1

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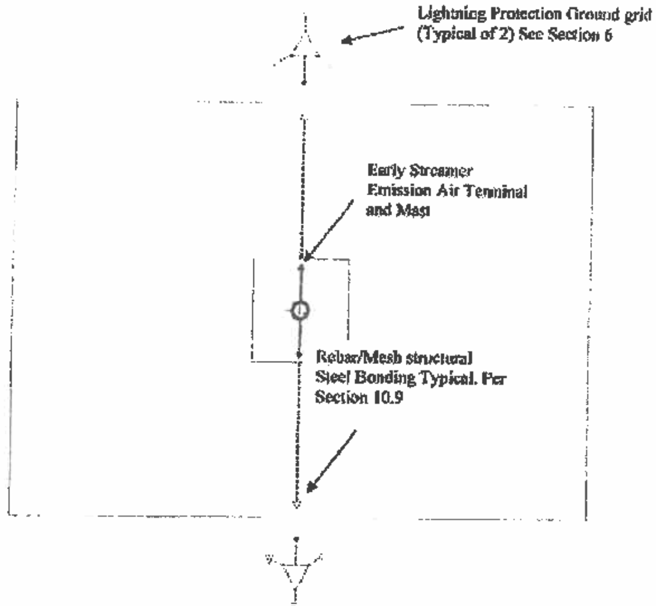
Figure 10.9.2



11. Level 2 Bonding Requirements

11.1 Roof top air handling units, equipment, or other roof top equipment shall be bonded to the system where the equipment is within 6' (1.8m) of a lightning protection conductor unless.

A. Inherently bonded to the lightning protection system.

11.2 Sanitary vents, roof drains, flashings, copings, etc located within 6' (1.8m) of a lightning protection conductor, shall be bonded via secondary sized conductor to the lightning protection system.

12. Level 2 Grounding System Requirements

12.1 Down Conductors and Grounding

12.2 A minimum of two (1) down conductors shall be provided for each ESE Lightning Protection System. In cases where multiple ESE Air Terminals are used then additional down conductors shall be provided in accordance with Section 10.8.

12.3 A single down conductor shall be permitted to be used where the length of run does not exceed 65ft (19m).

12.4 If the horizontal length is greater than the vertical length, two (2) down conductors shall be required and separated a minimum of 10' (3m).

12.4.1 For lengths greater than 65' (19m) two conductors shall be required.

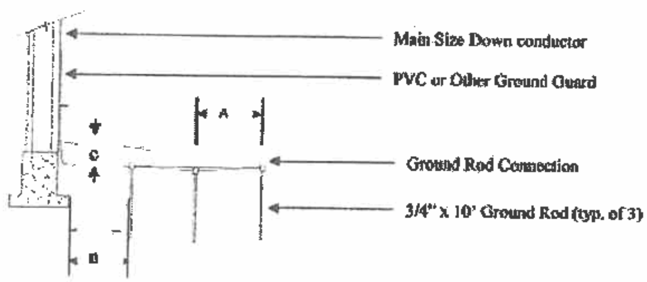
12.4.2 For masts, a single down conductor only shall be required.

12.4.3 If electrically conductive, the mast shall be permitted to be used as the down conductor.

12.5 Down Conductors and other conductor where exposed to potential mechanical damage shall be protected against such damage by means of PVC, Fiberglass conduit sleeve, or metal conduit. (Metal conduit may be used provided the upper and lower portions are bonded to the down conductor). At ground level the bottom 8' (2.4m) of exposed down conductor shall be protected. See figure 12.4.1.

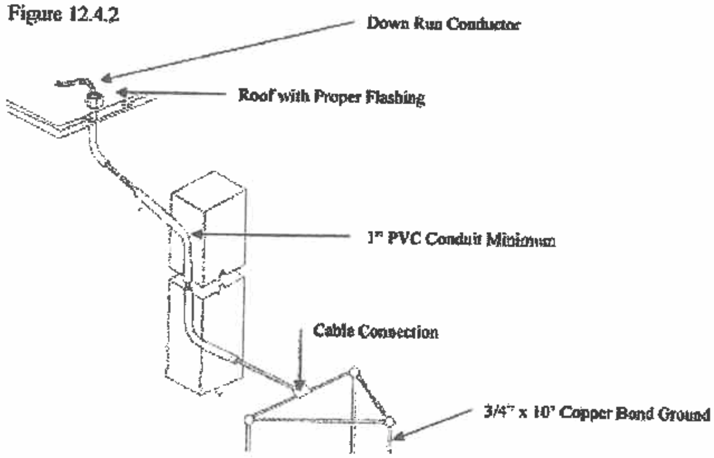
12.6 Down Conductors may be coursed within the construction of the building provided they are properly protected. See Figure 12.4.2.

Figure 12.4.1



A= 10' (3 m) Minimum
B= 2' (0.6m) Minimum
C= 1' (0.3m) Minimum

Figure 12.4.2



12.7 For masts that are electrically conductive then the mast shall be permitted to be used as a down conductor.

12.7.1 If electrically continuous, structural steel shall be permitted to be used as the down conductor.

12.8 Masonry Anchors used to secure the lightning protection components shall have a minimum outside diameter of ¼" (6.4mm) and shall be set with care. Holes made to receive the body of the anchor shall be of correct size, made with the proper tools and made in brick, stone or other masonry unit. Fasteners shall not be installed in mortar joints. When anchors are installed the fit shall be tight against moisture, thus reducing the possibility of damage due to freezing.

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12.9 Connector Fittings shall be used at all "end to end", "tee" or "y" splices of lightning conductors. They shall be attached so as to withstand a pull test of 200 lbs. Fittings used for required connections shall be of bolted, welded, or high compression type and bear the ARL Listing and UL Listing.

12.10 Conductors shall be fastened securely to the structure upon which they are placed at intervals not exceeding 3 ft (1m). The fasteners, attached by nails, screws, bolts or adhesives as necessary, shall not be subject to breakage and shall be of the same material as the conductor or of a material as resistant to corrosion as that of the conductor. No combination of materials shall be used that forms an electrolytic couple of such nature that, in the presence of moisture, corrosion is accelerated.

12.11 Ground Terminations: A study shall be conducted to engineer a grounding system to a maximum of 10 ohms resistance in accordance with IEEE fall of potential ANSI/IEEE 141, *Recommended Practice for Electric Power Distribution for Industrial Power Plants,* method. The components for the grounding system shall be selected to be suitable for the soil conditions and the other side factors such as cathodic protection.

12.12 Ground electrodes shall be of copper-bond steel in sufficient number as to achieve a 10-ohm maximum resistance to ground. Ground electrodes shall be installed so that the top of the electrode is a minimum 1' (0.3m) below finished grade minimum and 2' (0.6m) away from the foundation wall. See Figure 12.4.1

12.13 Ground Rod terminations. The down conductor shall be attached to the ground rod by mechanical clamp, exothermic welding or brazing. Clamps shall be suitable for direct burial.

12.14 Each down conductor shall terminate at a ground terminal system. A minimum of 3 ground terminals shall be provided per down conductor location. Configured either in a straight line or in delta formation. Where the ground terminals are spaced a minimum of 10' (3m) apart. See Figures 12.4.1 and 12.4.2.

12.15 Ground terminals located under slabs or in crawl spaces shall be installed as near as practicable to the outside perimeter of the structure.

12.16 Electrical system grounding electrodes shall not be used in lieu of lightning ground rods. This provision shall not prohibit the required bonding together of grounding electrodes of different systems.

NOTE 1: For further information, see NFPA 70 National Electric Code, which contains detailed information on the grounding of electrical systems.

12.17 Ground ring/loop electrode encircling the structure should be provided and in direct contact with the earth at a depth of not less than 2 ft. The ground ring conductor shall be sized at a minimum of that of the main sized conductor.

12.18 Common Grounding. All grounding media in or on a structure shall be interconnected to provide a common ground potential. This shall include lightning protection, electric service, telephone and antenna system grounds as well as underground metallic piping systems. Such piping systems include water service, well casings located within 25ft (7.6m) of the structure, underground conduits (not already bonded) etc. Main size lightning conductors shall be used for interconnecting these grounding systems to the lightning protection system.

12.19 Common Ground Bonding. If electric, telephone or other systems are bonded to metallic water pipe; only on connection from the lightning protection system to the water pipe system is necessary, provided that the water pipe is electrically continuous between all systems. In situations where there are separate services for domestic and fire water entering the building both systems shall be bonded to the lightning protection grounding system. This may be accomplished via direct connection or through the ground loop system.

12.20 If the horizontal length is greater than the vertical length, two down conductors shall be required and separated a minimum of 10' (3m).

(a) For lengths greater than 65' (19m) two conductors shall be required.

(b) For masts, a single down conductor only shall be required.

(c) If electrically conductive, the mast shall be permitted to be used as the down conductor.

13. Level 2 Structural Steel Systems

13.1 General. The steel framework of a structure shall be permitted to be utilized as the main conductor of a lightning protection system if it is electrically continuous or is made electrically continuous.

13.2 Steel Structure Terminals. Ground terminals shall be connected to approximately every other steel column around the perimeter of the structure at intervals averaging not more than 60 ft (18m). Connections shall be made near the base of the column, with a surface contact area not less than 8 sq inches ($5200mm^2$) or by exothermic welding. Bonding plates shall have bolt pressure cable connectors and shall be bolted securely to the structural steel framework so as to maintain electrical continuity.

13.3 Connections to Framework. Conductors shall be connected to cleaned areas of the structural steel framework by the bonding of plates having a surface contact area of not less than 8 sq inches ($5200mm^2$). The area of attachment shall be free of paint, grease oil and debris.

13.4 Early Streamer Emission Air Terminals shall be permitted to be bonded directly to structural, by means of direct attachment through mast or by use of two interconnection wires routed through roof and bonded at the top of the structural steel in the manner described in Section 13.3.

13.5 Metal Bodies. Certain metal bodies located outside or inside the structure contribute to lightning hazards because they are grounded or assist in providing a path to ground for lightning currents. Such metal bodies shall be bonded to the lightning protection system in accordance with Section 11.

13.6 Concealment in Steel Reinforced Concrete. Conductors or other components of the lightning protection system concealed in steel reinforced concrete units shall be connected to the reinforcing steel. Concealed down conductors shall be connected to vertical reinforcing steel. Roof conductors or other concealed horizontal conductor runs shall be connected to reinforcing steel and structural steel at intervals not exceeding 60ft (18m) and at all corners. See Section 10.9.

13.7 Down Conductors coursed on or in reinforced concrete columns or on structural steel columns shall be connected to the reinforcing steel and/or structural steel member at its upper and lower extremities. In the case of long vertical members an additional connection shall be made at intervals not exceeding 200 ft (60m). Such connections shall be made using listed clamps or listed bonding plates or by exothermic welding. The use of PVC conduit or other non-metallic chase does not negate the need for the interconnections.

LEVEL 3

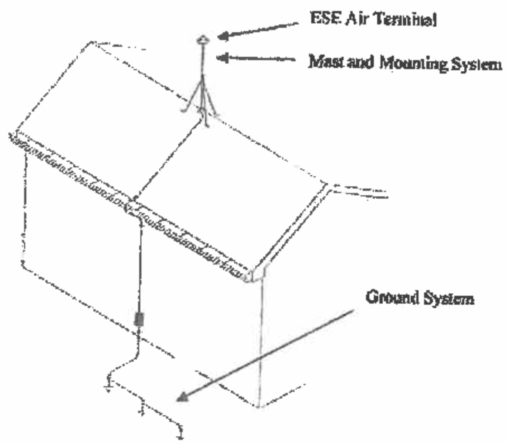
MANUFACTURER'S INSTALLATION STANDARD FOR EARLY STREAMER EMISSION LIGHTNING PROTECTION SYSTEMS

14. Level 3 General Installation Requirements

14.1 An ESE lightning protection system installation consists of the following interconnected parts see figure 14.1.1.

a. One or more ESE air terminals.
b. Mast and mounting systems – as required based on level of protection.
c. Ground system – Single grid to loop conductor system.
d. Equipotential Bonding.
e. Transient Voltage Surge Suppression.

Figure 14.1.1



14.2 The number of ESE air terminals will depend on the system design under the Manufacturer's Standard based on the area as indicated in Figure 3.5.1 for Level 3 Systems. The recommended number and placement of air terminals is based solely on Heary Bros.' 30 years of experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lightning protection, NFPA 780, states that the NFPA, "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

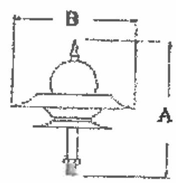
14.3 Components Tables Figure 14.3.1 and Figure 14.3.2 provide minimum sizes and weights for use in ESE lightning protection system installation.

Figure 14.3.1

Type of conductor	Minimum Diameter	Copper Standard/ Metric	Aluminum Standard/ Metric
ESE Air Terminal	1/2 "/ 12.7mm	1/2" / 12.7 mm	1/2" / 12.7 mm
Main Conductor Cable	Min Size each strand Weight Per Length Cross Sectional area	16AWG 190lbs /1000' or 278 g/m 61900 CM / 35 mm ^{2}	14AWG 110lbs/1000' 164 g/m 98600 CM/ 50 mm ^{2}
Ground Terminals	Ground Rod / Ground Plate	5/8" x 8' (16 mm x 2400mm)/ 18" x 18"x 20 gauge (460mm x 460mm) pure Copper plate minimum of 2 contact points each 8 sq inch contact to plate	NA

Figure 14.3.2 Early Streamer Emission Air Terminal

A= 12" (300mm)
B= 9" (230mm)



14.4 ESE Air Terminals shall be sufficiently rigid to withstand mechanical damage. They shall be constructed of aluminum, copper, copper alloy, or stainless steel. The main conductive parts of the ESE air terminal shall have the minimum dimensions in accordance with Figures 14.3.1 and Figure 14.3.2.

14.5 ESE Air Terminals Installation: Air terminals and their supports shall be mounted in such a way as to withstand the lightning currents, electromotive force, corrosion and effects of weather, heat, humidity, snow and wind.

14.5.1 Where an air terminals or mast is supported by conductive guys, the guys shall be connected from their points of anchorage to the closest down conductor(s) by a conductor equivalent in size to that of the down conductor(s).

14.5.2 The tip of any ESE air terminal shall not be less than 7' (2.1m) above the protected structures, including antennas, cooling towers, tanks, roof and masts.

14.5.3 The ESE air terminals shall be mounted on structures such as flagpole, the top of pylons, light standards or on dedicated supports for structures at certain facilities, such as sports facilities and stadium, golf courses, public parks, camping sites and racetracks. The ESE unit shall still be mounted at an elevation as indicated in Section 14.5.2

14.5.4 Storage areas for flammable and combustible liquids or flammable gases. Structures containing these materials shall be grounded, but grounding alone does not constitute sufficient protection against atmospheric discharges.

14.5.5 Electrical Surge Suppression devices shall be internally redundant and modular, in both surge suppression elements and fusing in construction for ease of field reparability. Manufacturers shall warranty the modules and fuse for the lifetime of the unit, with a minimum 10-year full unit warranty.

Units shall be mounted as to minimize inductance installation. (I.e. As close to equipment to be protected or by use of documented low inductance cabling).

NOTE 1: Electrical systems and utilization equipment within the structure may require further surge suppression. Such protection is not part of this standard. NFPA 70, National Electric Code and ANSI/IEEE C62.41-1991 2nd Edition, shall consulted for further information and installation requirements.

NOTE 2: Illustrations shown in this standard are those of Heary Brothers Lightning Protection Co., Inc. (HBLP) and its division Lightning Preventor of America (LPA). HBLP and LPA do not manufacture or warranty surge protection devices. Warranties required of this standard shall be the responsibility of the surge protection device manufacturer.

14.6 General. In determining the necessity of bonding a metal body to a lightning protection system, the following factors shall be considered:

A. Bonding is required only if there is a likely to be a side flash between the lightning protection system and other grounding medium.

B. The influence of a non-grounded metal body, such as metal window frame in a non-conductive medium, is limited to its effectiveness as a short circuit conductor if a side flash occurs therefore, does not necessarily require bonding to the lightning protection system.

C. Bonding distance requirements depend on the technical evaluation of the number of down conductors and their location, the interconnection of other grounded systems, the proximity of grounded metal bodies to the down conductors and the flashover medium, (Air or solid materials).

D. Metal bodies located in a steel frame structure shall be permitted to be inherently bonded through construction and further bonding shall not be required.

E. Metal antenna masts or supports located on a protected structure shall be bonded to the lightning protection system using main size conductors and listed fittings. The height of the air terminal shall still maintain the minimum projection above these objects as specified in section 14.5.2 and the object shall be bonded to the lightning protection system by means of main sized conductor.

15. Level 3 Components

15.1 A lightning protection system shall be made of components that are resistant to corrosion or shall be acceptably protected against corrosion. The following materials are acceptable:

A. Copper of the grade required for commercial electrical work. Or a copper alloy with similar characteristics. Usually of 98 percent conductivity when annealed.

B. Aluminum conductors as acceptable as electrical grade aluminum.

15.1.1 Components shall be protected against deterioration due to local conditions. Any part of a copper system that is exposed to direct action of chimney gases or other similar corrosive gases shall be protected. Aluminum components are not required to be protected.

15.2 Metals shall be used in combinations that are galvanically compatible.

A. Copper components shall not be installed directly on aluminum roofing, siding, or other aluminum.

B. Aluminum lightning protection components shall not be installed directly on copper roofing material or other copper surfaces or below the run off of a copper surface.

C. Aluminum conductors and components shall not be embedded in concrete or masonry;

a) In direct contact with a surface coated with alkaline base paint; or installed in wet locations, for example eave troughs or downspouts.

b) Installed in direct contact with earth.

c) Components used for connection of aluminum down conductors to copper or copper-bond grounding equipment shall provide separation between aluminum and copper materials. These fitting may be a stainless steel sleeve with internal separation or other connector that provides proper separation of aluminum and copper materials.

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15.2.1 Unless otherwise indicated in this standard, an air terminals shall be provided for each part of a structure that is likely to be damaged by lightning. Based on the individual design requirements of the level of protection required.

16. Level 3 Air Terminal Installation Requirements

16.1 Early Streamer Emission Air Terminals

16.1.1 ESE Air Terminals shall be mounted at a height consistent with the requirements of Section 14.5.2 or a minimum of 7' (2.1m) above all projections on the roof. See Figure 16.1.1 for sample mast mounting details and figure 16.1.2 for installation diagram.

Figure 16.1.1

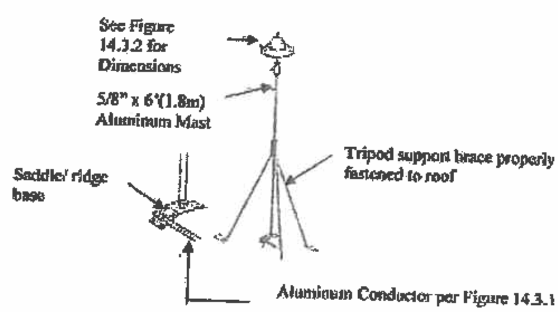


Figure 16.1.1 (Continued)

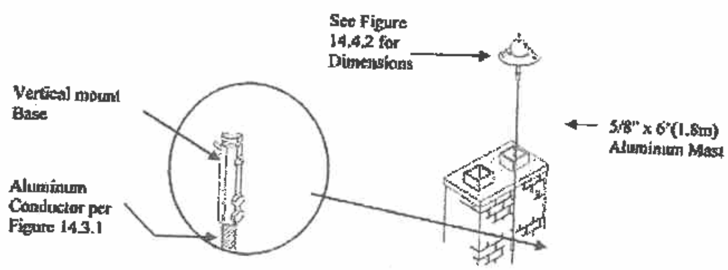
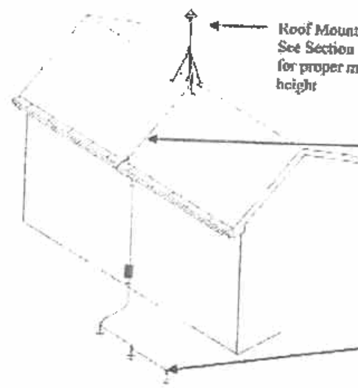


Figure 16.1.2



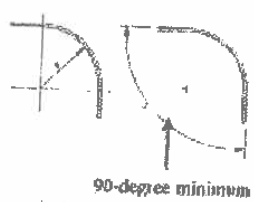
16.1.2 ESE Air Terminals shall be provided in proper quantity and location based on the system design under the Manufacturer's Standard. See Figure 3.5.1 and for Level 3 Systems. The recommended number and placement of air terminals is based on Heary Bros.' experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lightning protection, NFPA 780, states that the NFPA "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

16.1.3 Conductors shall be securely fastened to roof or structure at intervals not exceeding 3' (1m) on center.

16.1.4 The ESE Air Terminals shall be provided with a minimum of one path to ground. (See Section 17 for additional requirements) Cables shall maintain a horizontal or downward path to ground to avoid "U" and "V" (down and up) pockets. See Figure 16.1.4

16.1.5 No bend of a conductor shall form an included angle of less than 90 degrees or have a radius of bend less than 8 inches nor shall a conductor rise greater than 8". However Conductors may raise a rate of 3" per 12" of run. See Figure 16.1.3 and Figure 16.1.4

Figure 16.1.3



NOTE: Through roof, through wall and tee type connectors do not need to comply with this requirement.

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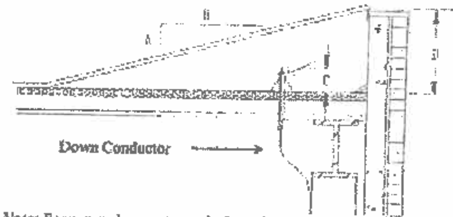
Figure 16.1.4



Note: Ramp may be constructed of wood, metal, fiberglass, plastic, PVC etc, provided the construction is such that it will be resistant to corrosion and rot. The conductor shall be attached or support on ramp as required in Section 16.1.3.

16.1.6 In situations where multiple air terminals are required, air terminals shall be positioned so that they are no more than 150' (45m) from the outside edge of the building nor shall they be more than 300' (90m) apart. The recommended number and placement of air terminals is based on Heary Bros.' experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lightning protection, NFPA 780, states that the NFPA "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

16.1.7 Down Conductors in situations where multiple ESE Air Terminals are required shall be installed in accordance with Section 17.

16.1.8 Bonding connections shall be made to all rebar, reinforcing rod, structural steel etc. at the upper on lower extremities of the down conductor. See Figure 16.18.

Figure 16.18

16.2 Roof Top Bonding Requirements;

16.2.1 Roof top air handling units, equipment, or other roof top equipment shall be bonded to the system where the equipment is within 6' (1.8m) of a lightning protection conductor unless the equipment is inherently connected to the ground system through direct bond or common bond.

16.2.2 Sanitary vents, roof drains, flashings, gutters, copings etc. Located within 6' (1.8m) of the lightning protection system, shall be bonded via a secondary sized conductor to the system unless the equipment is inherently bonded to the lightning protection system.

17. Level 3 Grounding System Requirements

17.1 A minimum of two (2) down conductors shall be provided for each ESE Lightning Protection System. In cases where multiple ESE Air Terminals are used then additional down conductors shall be provided in accordance with Section 16.1.7.

17.2 A single down conductor shall be permitted to be used where the length of run does not exceed 65ft (19m).

17.3 If the horizontal length is greater than the vertical length, two down conductors shall be required and separated a minimum of 10' (3m).

17.4 For lengths greater than 65' (19m) two conductors shall be required.

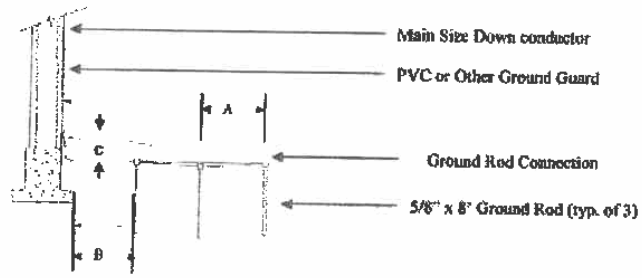
17.5 For masts, a single down conductor only shall be required.

17.6 If electrically conductive, the mast shall be permitted to be used as the down conductor.

17.7 Down Conductors and other conductor where exposed to potential mechanical damage shall be protected against such damage by means of PVC, fiberglass conduit sleeve, or metal conduit. (Metal conduit may be used provided the upper and lower portions are bonded to the down conductor). At ground level the bottom 8' (2.4m) of exposed down conductor shall be protected. See Figure 17.8.1

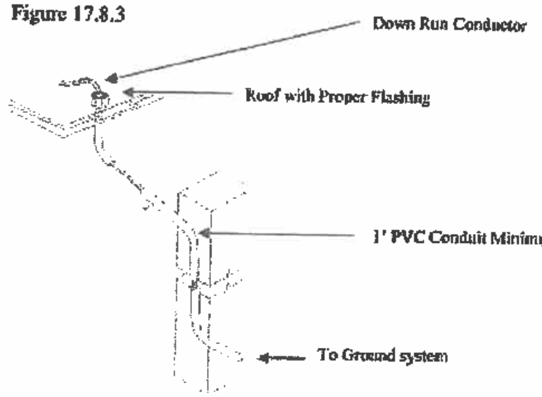
17.8 Down Conductors may be coursed within the construction of the building provided they are properly protected. See Figure 17.8.3.

Figure 17.8.1



A= 8' (3 m) Minimum
B= 2' (0.6m) Minimum
C= 1' (0.3m) Minimum

Figure 17.8.3



17.9 For masts that are electrically conductive then the mast shall be permitted to be used as a down conductor.

17.10 If electrically continuous, structural steel shall be permitted to be used as the down conductor.

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17.11 Masonry Anchors used to secure the lightning protection components shall have a minimum outside diameter of ¼ in. (6.4mm) and shall be set with care. Holes made to receive the body of the anchor shall be of correct size, made with the proper tools and made in brick, stone or other masonry unit. Fasteners shall not be installed in mortar joints. When anchors are installed, the fit shall be tight against moisture, thus reducing the possibility of damage due to freezing.

17.12 Connector Fittings shall be used at all "end to end", "tee", or "y" splices of lightning conductors. They shall be attached so as to withstand a pull test of 200 lb. Fittings used for required connections shall be of bolted, welded or high compression type and bear the ARL Listing and UL Listing.

17.13 Conductors shall be fastened securely to the structure upon which they are placed at intervals not exceeding 3 ft (1m). The fasteners, attached by nails, screws, bolts or adhesives as necessary, shall not be subject to breakage and shall be of the same material as the conductor or of a material as resistant to corrosion as that of the conductor. No combination of components shall be used that forms an electrolytic couple of such nature that in the presence of moisture, corrosion is accelerated.

17.14 Ground Terminations: A study shall be conducted to engineer a grounding system to a maximum of 25 ohms resistance in accordance with IEEE fall of potential ANSI/IEEE 141, *Recommended Practice for Electric Power Distribution for Industrial Power Plants,* method. The components for the grounding system shall be selected to be suitable for the soil conditions and the other side factors such as cathodic protection.

17.15 Ground electrodes shall be of copper-bond steel or copper plate in sufficient number as to achieve a 25 ohm maximum resistance to ground. Ground electrodes shall be installed so that the top of the electrode is a minimum 1' (0.3m) below finished grade minimum and 2' (0.6m) away from the foundation wall. See Figure 17.8.1.

17.16 Ground Rod Terminations. The down conductor shall be attached to the ground rod by mechanical clamp, exothermic welding or brazing. Clamps shall be suitable for direct burial.

17.17 Each down conductor shall terminate at a ground terminal system. A minimum of 3 ground terminals shall be provided per down conductor location. Configures in a straight line. Where the ground terminals are spaced a minimum of 8' (3m) apart. See Figure 17.8.1.

17.18 Ground terminals located under slabs or in crawl spaces shall be installed as near as practicable to the outside perimeter of the structure.

17.19 Electrical system grounding electrodes shall not be used in lieu of lightning ground rods. This provision shall not prohibit the required bonding together of grounding electrodes of different systems. *NOTE 1: For further information, see NFPA 70National Electric Code, which contains detailed information on the grounding of electrical systems.*

17.20 Common Grounding. All grounding media in or on a structure shall be interconnected to provide a common ground potential. This shall include lightning protection, electric service, telephone and antenna system grounds as well as underground metallic piping systems. Such piping systems include water service, well casings located within 25 ft (7.6m) of the structure, underground conduits (not already bonded) etc. Main size lightning conductors shall be used for interconnecting these grounding systems to the lightning protection system.

17.21 Common Ground Bonding. If electric, telephone or other systems are bonded to metallic water pipe; only one connection from the lightning protection system to the water pipe system is necessary, provided that the water pipe is electrically continuous between all systems. In situations where there are separate services for domestic and fire water entering the building both systems shall be bonded to the lightning protection grounding system. This may be accomplished via direct connection or through the ground loop system.

18. Level 3 Structural Steel Systems

18.1 General. The steel framework of a structure shall be permitted to be utilized as the main conductor of a lightning protection system if it is electrically continuous or is made electrically continuous.

18.2 Steel Structure Terminals. Ground terminals shall be connected to approximately every other steel column around the perimeter of the structure at intervals averaging not more than 60ft (18m). Connections shall be made near the base of the column, with a surface contact area not less than 8 sq inches (5200mm²) or by exothermic welding. Bonding plates shall have bolt pressure cable connectors and shall be bolted securely to the structural steel framework so as to maintain electrical continuity.

18.3 Connections to Framework. Conductors shall be connected to cleaned areas of the structural steel framework by the bonding of plates having a surface contact area of not less than 8 sq inches (5200mm²). The area of attachment shall be free of paint, grease, oil, and debris.

18.4 Early Streamer Emission Air Terminals shall be permitted to be bonded directly to structural, by means of direct attachment through mast or by use of two interconnection wires routed through roof and bonded at the top of the structural steel in the manner described in Section 18.3.

EXHIBIT B

USI

April 29th, 2019

Heary Bros Lightning Protection Co Inc
11291 Moore Rd
Springville, NY 14141

To Whom It May Concern:

During the many years we have done business with Heary Brothers Lightning Protection Co. Inc., we have found your commitment to developing quality products for your customers as paramount. Included in that commitment would be the successful line of the Early Streamer Lightning Protection Equipment.

Your dedication has allowed us to establish a comprehensive and cost-effective insurance program for your companies. Because of your dedication, we have been able to secure 11 million dollars of Liability limits. This includes coverage for damage from direct lightning strikes to the structure of any buildings. Please see enclosed America Certificate of Guarantee as additional evidence.

In addition, claims activity has been negligible and we, as your broker, the The Travelers Insurance Company, as your carrier, appreciate your attention to workplace safety and products liability quality control efforts. In today's highly competitive world, this is critical.

Without a doubt, your company was built around a commitment to give customers the products they need and confidence in our ability to meet or exceed expectations. We encourage your efforts and with you continued success.

Sincerely,

Timothy M. Wroblewski

Timothy M. Wroblewski
Vice President

TW/lam

Property & Casualty • Employee Benefits • Personal Risk • Retirement Consulting
The USI ONE Advantage®

FIRST NIAGARA

April 24, 2015

Heary Bros Lightning Protection Co Inc
11291 Moore Rd
Springville, NY 14141

To Whom It May Concern:

During the many years we have done business with Heary Brothers Lightning Protection Co. Inc., we have found your commitment to developing quality products for your customers as paramount. Included in that commitment would be the successful line of the Early Streamer Lightning Protection Equipment.

Your dedication has allowed us to establish a comprehensive and cost-effective insurance program for your companies. Because of your dedication, we have been able to secure 11 million dollars of Liability limits. This includes coverage for damage from direct lightning strikes to the structure of any buildings. Please see enclosed America Certificate of Guarantee as additional evidence.

In addition, claims activity has been negligible and we, as your broker, the The Travelers Insurance Company, as your carrier, appreciate your attention to workplace safety and products liability quality control efforts. In today's highly competitive world, this is critical.

Without a doubt, your company was built around a commitment to give customers the products they need and confidence in our ability to meet or exceed expectations. We encourage your efforts and with you continued success.

Sincerely,

Timothy M. Wroblewski

Timothy M. Wroblewski
Vice President

TW/lam

First Niagara Risk Management, Inc.
726 Exchange Street, Suite 900 • Buffalo, NY 14210
Phone: 716-819-5500 • Toll Free: 800-854-9121 • Fax: 716-819-5140

EXHIBIT C

Preventor System Installations In Florida

ProjectName	Address	City	State
7000 Williams Island Building		Adventura	FL
Florida Hospital Altamonte Office		Altamonte Springs	FL
Turner Agriculture Center and Extension Office		Arcadia	FL
Marriott - Aventura Hotel		Aventura	FL
Alliant Food Service		Boca Raton	FL
Boca Museum		Boca Raton	FL
Boca Raton Condos		Boca Raton	FL
Caterpillar C-2 Expansion		Boca Raton	FL
Sears Store	Glades Road	Boca Raton	FL
TAG (The Answer Group) Main Building		Boca Raton	FL
TAG Main Building East Emissions Building		Boca Raton	FL
The Polo Club of Boca Raton		Boca Raton	FL
Bealls Corp Headquarters		Bradenton	FL
Paul Azinger Residence		Bradenton	FL
St. Stephens School		Bradenton	FL
Tara Preserve Golf Clubhouse		Bradenton	FL

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ProjectName	Address	City	State
Suntree Elementary and Chiller Building		Brevard Co	FL
Florida Welcome Center		Campbelton	FL
Advanced Elastomers		Cantonement	FL
Cape Canaveral AF Station Patrick AFB Cape Arrays		Cape Canaveral	FL
Cape Canaveral Station	Patrick Air Force Ba	Cape Canaveral	FL
Satellite Assembly Bldg Cape Canaveral		Cape Canaveral	FL
Kreiseder Residence		Casey Key	FL
Silverstein Residence		Casey Key	FL
Florida Hospital		Celebration	FL
Clyde Dyal Water Treatment Plant		Christmas	FL
Citrus Springs Utilities	1360 N. Citrus Spri	Citrus Springs	FL
Baystreet Plaza @ International Mall		Clearwater	FL
Capitol One Phase IV		Clearwater	FL
Catile Tower		Clearwater	FL
Church of Scientology Sandcastle Addition		Clearwater	FL
Crescent Beach Club		Clearwater	FL
Crescent Beach Club		Clearwater	FL
General Services Bldg		Clearwater	FL

ProjectName	Address	City	State
Pinellas County Utilities		Clearwater	FL
Ruth Eckerd Hall		Clearwater	FL
Ruth Eckerd Hall - CEP Addition		Clearwater	FL
St. Cecelia Intraparochial School		Clearwater	FL
The Sirata Beach Resort		Clearwater	FL
The Tides@ Feather Sound		Clearwater	FL
Worthington Square Apartments		Clearwater	FL
City of Coconut Creek - Council Building		Coconut Creek	FL
City of Coconut Creek - Motor Pool Building		Coconut Creek	FL
Coconut Creek Public Safety		Coconut Creek	FL
Sabal Pines - Ball Field #2		Coconut Creek	FL
Sabal Pines - Elementary School		Coconut Creek	FL
Sabal Pines - Hockey Rink		Coconut Creek	FL
Sabal Pines - Maintenance Facility		Coconut Creek	FL
Sabal Pines - Pines Pavilion		Coconut Creek	FL
Sabal Pines - Soccer Field #1		Coconut Creek	FL
Body of Christ Family Life Center		College	FL
Stone/Bag Paper Container Facility	Hwy 29 & Becks La	Contonement	FL

ProjectName	Address	City	State
Alahamra Tower		Coral Gables	FL
The Alhambra Hotel/Office	50 Alhambra Circle	Coral Gables	FL
University of Miami Intra Mural Fields		Coral Gables	FL
Sheik Island Horse Farm		Dade City	FL
BCC Building 27/ New Child Develop. CTR		Davie	FL
BCC Student Services Building		Davie	FL
Nova Southeastern College Parking Garage		Davie	FL
Phil Smith Toyota		Davie	FL
Rolling Hills Golf and Country Club		Davie	FL
Daytona Auto Dealers Exchange		Daytona Beach	FL
Daytona Marriott Hotel	100 N Atlantic Ave	Daytona Beach	FL
Deerfield Beach Grand Hilton	100 Fairway Drive	Deerfield Beach	FL
Granada Royale Hotel	902 S. E. 20th Ave.	Deerfield Beach	FL
Deltona Lake Track "A"	Diamond Street	Deltona	FL
Deltona WWTP	Saxton & Agatha	Deltona	FL
Deltona WWTP	Lombardy Ctr	Deltona	FL
Deltona WWTP	Cortland Blvd	Deltona	FL
Deltona WWTP	Fisher Drive	Deltona	FL

ProjectName	Address	City	State
Well # 2 & High Service Pump	Unit 21 Sagmore Dr	Deltona	FL
Silver Beach Condominium		Destin Beach	FL
Guardian Angel School		Dunedin	FL
Our Lady of Lourdes		Dunedin	FL
Burdines Dept. Store		Fort Lauderdale	FL
Marriott - Ft Pierce Travel Plaza	Florida Turnpike Mi	Ft Pierce	FL
Granada Royale Hotel	1101 S.E. 17th Stree	Ft. Lauderdale	FL
Riverside Hotel		Ft. Lauderdale	FL
McGregor Point Hotel		Ft. Myers	FL
Raymond Building Products		Ft. Myers	FL
Raymond Building Supply Rack Storage		FT. Myers	FL
Raymond Building Supply Warehouse Building		FT. Myers	FL
Palm Court Yacht Club		Ft. Walton Beach	FL
Holy Faith Church	700 N.W. 39th Roa	Gainesville	FL
Main Library	on SR-26 Across fro	Gainesville	FL
Nordstrom Distribution Center		Gainesville	FL
UF Hotel and Conference Center		Gainesville	FL
Union Street Station		Gainesville	FL

ProjectName	Address	City	State
Jack Sawyer	608 Fairpoint Drive	Gulf Breeze	FL
Palmento General Hospital	W. 20th & W. 68th	Hialeah	FL
Aqua Penn Water Co.		High Springs	FL
City of Holmes Beach Baseball Field	5901 Marina Drive	Holmes Beach	FL
North Lake Elementary		Indian River	FL
Sebastian Highlands WTP	1001 Prineville Roa	Indian River City	FL
Richard Herrmann II Residence	405 15th Ave	Indian Rocks Beach	FL
Florida Power/Light Co Martin Combined Cycle # 3,4	State Road 710	Indiantown	FL
Martin Plant Combined Cycle 3 & 4		Indiantown	FL
Allbritton Communications	7025 AC Skinner Pk	Jacksonville	FL
Berkman Plaza		Jacksonville	FL
Cathedral Terrace		Jacksonville	FL
Cathedral Towers		Jacksonville	FL
Cathedral Townhouses		Jacksonville	FL
Cypress Village Apartments	4600 Middleton Par	Jacksonville	FL
Sears Logistics Center		Jacksonville	FL
The Pointe		Jupiter	FL
The Phoenix @ Peachtree		Kennesaw	FL

ProjectName	Address	City	State
Dolphin Hotel - Epcot Center	1500 Epcot Resort	Lake Buena Vista	FL
Dolphin/Swan Hotel Causeway & Grotto	1500 Epcot Resort	Lake Buena Vista	FL
Royal Plaza Hotel	1905 Preview Blvd	Lake Buena Vista	FL
Swan Hotel - Epcot Center	1500 Epcot Resort	Lake Buena Vista	FL
Westgate Lakes Sales Center		Lake Buena Vista	FL
Columbia Correctional Institution		Lake City	FL
Marriott - Lake Worth Travel Plaza	Florida Turnpike Mi	Lake Worth	FL
Publix Deli Plant	PO Box 407	Lakeland	FL
RMC Ewell Corp		Lakeland	FL
FCCI Insurance Group		Lakewood Ranch	FL
US Post Office - Land O Lakes		Land O Lakes	FL
Central Catholic High School		Lecanto	FL
Citrus Co. Landfill		Lecanto	FL
St. Stalastic Church		Lecanto	FL
FDOT District 5		Leesburg	FL
Lehigh Post Office		Lehigh	FL
Ben Price Residence	Gulf of Mexico Driv	Longboat Key	FL
James Gradner Residence		Longboat Key	FL

ProjectName	Address	City	State
Sea Place Condominium Complex M1 & M2	1945 Gulf of Mexic	Longboat Key	FL
Wagner Residence	5940 Gulf of Mexic	Longboat Key	FL
Albert Whitted Expansion		Longwood	FL
Lowell Correctional Institution		Lowells	FL
St. Timothy's Catholic Church		Lutz	FL
Marco Island Pump Station	RTE 951	Marco Island	FL
South Fork High School		Martin Co.,	FL
Brevard Educational Facility		Melborne	FL
Eau Gallie High School Gymnasium & Auditorium		Melborne	FL
Brickell Station Towers	30 S.W. 8th Street	Miami	FL
Doral Concourse		Miami	FL
La Tour Condo		Miami	FL
Lincoln Financial Center	701 Brickell Ave.	Miami	FL
Marriott - Snapper Creek Travel Plaza	Florida Turnpike Mi	Miami	FL
Metropolitan Sun Bank	777 Brickell Ave	Miami	FL
Porta Vita		Miami	FL
Pro-Player Stadium		Miami	FL
Sienna		Miami	FL

ProjectName	Address	City	State
Softel Hotel	5800 Blue Lagoon	Miami	Fl
Telemundo Networf		Miami	FL
Tequesta Condominium	808 Bricknell Key D	Miami	FL
Three Tequesta Point		Miami	FL
University of Miami Hecht Athletic Center		Miami	FL
University of Miami Knight Baseball Stadium & Foot		Miami	FL
University of Miami Schiff Tennis Ctr & Hecht Ath		Miami	FL
Loews Hotel & Convention Center		Miami Beach	FL
Portofino Tower		Miami Beach	FL
Sandy Park Health Care Center		Miami Beach	FL
US Naval Air Station Bldg 1406 & 1424	Whiting Field South	Milton	FL
Mulberry Post Office		Mulberry	FL
North Port St. Lucie WTP	Gulf Port Terrace	N. Port St. Lucie	FL
Collier Residence		Naples	FL
Gerry Residence	3400 Gordon Drive	Naples	FL
HorseCreek Properties Collier Equestrian Facility		Naples	FL
Horsecreek Properties Collier Equestrian Facility	Daniels Road	Naples	FL
Naples Cay Seapointe Condo	10 Seagate Drive	Naples	FL

ProjectName	Address	City	State
Royal Poinciana Country Club	Goodlette Rd	Naples	FL
The Savoy Condo	4041 Gulf Shore Blv	Naples	FL
Blazer Residence		Navarre	FL
Caribbean Resort Condo		Navarre Beach	FL
The Fountaians Condominium		New Smyrna Beach	FL
Implant Innovations Inc.		North Palm Beach	FL
King Plastics Inc.		North Port	FL
Bishop Larkin Pastoral Center	9th Avenue	North St. Petersburg	FL
Lowell Correctional Facility Water Tower		Ocala	FL
Marion Oaks Water TRT Plant	14170 S.W. 39th Av	Ocala	FL
Marriott - Turkey Travel Plaza	Florida Turnpike Mi	Ocee	FL
Marriott - Ft Drum Travel Plaza	Florida Turnpike Mi	Okeechobee	FL
BIC Manufacturing Plant(III) Myerlake		Oldsmar	FL
Florida Hospital East Orlando		Orlando	FL
Florida Hospital Orlando		Orlando	FL
Martin Marietta Conflow Area Site	Kirtland Road	Orlando	FL
Orlando Utilities Commission Power Plant		Orlando	FL
St. Johns Rive Water Management		Palatka	FL

ProjectName	Address	City	State
St. Johns River Waste Management District Office		Palatka	FL
SWA Tipping Floor Building		Palm Beach	FL
The Diplomat Hotel - Main Building		Palm Beach	FL
SWA West Central Tipping Floor		Palm Beach Co	FL
George Young United Methodist Church		Palm Harbor	FL
St. Mark Village	Rte 19	Palm Harbor	FL
William E. Dunn Water Reclamation Facility		Palm Harbor	FL
Riviera Dunes Marina		Palmetto	FL
St. Andrews Condo		Panama City	FL
Hidden Dunes Condominium		Panama City Beach	FL
Landmark Holiday Beach Resort		Panama City Beach	FL
The Summit Resort	Thomas Drive	Panama City Beach	FL
Camp-O-Pines Pensacola Christian College		Pensacola	FL
Ellyson Industrial Park	Ellyson Field Proj	Pensacola	FL
Gelman Sciences	8780 Fly Road	Pensacola	FL
George Estes Residence		Pensacola	FL
Girls Parking Garage -Pensacola Christian College		Pensacola	FL
H-6 Academic Building		Pensacola	FL

ProjectName	Address	City	State
McKenzie Building- Pensacola Christian College		Pensacola	FL
Phoenix 10 Condominium		Pensacola	FL
University of West FL Admin. Building		Pensacola	FL
University of West FL Classroom Building		Pensacola	FL
Sabine Yacht & Racquet Club	330 Fort Pickens Rd	Pensacola Beach	FL
Eden Condominium		Peridido Key	FL
St. Clements Catholic Church		Plant City	FL
American Heritage Fine Arts Building		Plantation	FL
Crossroads 4		Plantation	FL
Motorola		Plantation	FL
Motorola Inc.		Plantation	FL
Spa Atlantis		Pompano	FL
Ligi Tool		Pompano Beach	FL
Marriott - Pompano Travel Plaza	Florida Turnpike Mi	Pompano Beach	FL
Charlotte County Public Works		Port Charlotte	FL
Dr. Eugene Gregosh Residence		Port Charlotte	FL
East Port Environmental Services		Port Charlotte	FL
Peace River WTP	Kings Hwy	Port Charlotte	FL

ProjectName	Address	City	State
Peace River WTP	Intake Structure	Port Charlotte	FL
Port Malabar WTP		Port Malbar	FL
Bishop Larkin School		Port Richey	FL
Charlotte County Sheriff's Administration	Metro Pkwy	Punta Gorda	FL
Chateau Towers	Gulfport Blvd	S. Pasadena	FL
Espirtu Santo Catholic School		Safety Harbor	FL
The Shipley Residence		Sannibel Island	FL
Baker Electronics		Sarasota	FL
C'A' D' Zan John't Mable Rigling Home		Sarasota	FL
Davis Residence		Sarasota	FL
Ed Windemuller Residence	Saddle Oaks Estates	Sarasota	FL
Ken Miller Barn		Sarasota	FL
Lincoln Properties/ NBD Bank Building	240 N Washington	Sarasota	FL
Marina Towers Condominium		Sarasota	FL
Meridian @ The Oaks Building III		Sarasota	FL
Sarasota Herald Tribune		Sarasota	FL
Scott Sign Systems		Sarasota	FL
Scott Signs Phase II		Sarasota	FL

ProjectName	Address	City	State
Sun Hydraulics Inc.		Sarasota	FL
The Phoenix Condo	Golden Gate Point	Sarasota	FL
The Radisson Hotel Lido Beach	Ben Franklin Drive	Sarasota	FL
The Renaissance		Sarasota	FL
Sebastian WTP	Filbert Street	Sebastian	FL
Lake Jackson Post Office		Sebring	FL
St. Cloud High School		St Cloud	FL
Casa Monica Hotel		St. Augustine	FL
St. Augustine Shores	771 Alahambra	St. Augustine	FL
Marriott - Canoe Creek Travel Plaza	Florida Turnpike Mi	St. Cloud	FL
School "C" Osceola Co. School District		St. Cloud	FL
Incarnation Church		St. Petersburg	FL
Jabil Circuit Inc.	10800 Roosevelt Blv	St. Petersburg	FL
Midcore Parking Garage		St. Petersburg	FL
San Seair Condominiums		St. Petersburg	FL
St. Marks Family Life Center	PO Box 43022	St. Petersburg	FL
Wheelbrator Corp		St. Petersburg	FL
SECO Office Building		Sumterville	FL

ProjectName	Address	City	State
Capital One Building One	8745 Henderson Ro	Tampa	FL
Capital One Phase II Building 2 Renaissance	8745 Henderson Ro	Tampa	FL
Capital One Phase II Parking Garage	8745 Henderson Ro	Tampa	FL
Capital One Phase III Parking Garage	8745 Henderson Ro	Tampa	FL
Capital One Phase IV Flagpole	8745 Henderson Ro	Tampa	FL
Capital One Softball Field	8745 Henderson Ro	Tampa	FL
Capital One Tai Chi Building	8745 Henderson Ro	Tampa	FL
Florida Aquarium		Tampa	FL
Gateway Post Office		Tampa	FL
Group Tech		Tampa	FL
Lee Moffit Cancer Center Parking Garage		Tampa	FL
Marriott -Tampa		Tampa	FL
Muvico	18002 Richmond Pa	Tampa	FL
Myrtle Oaks		Tampa	FL
Notre Dame High School		Tampa	FL
Seaboard Waste Water TRT Plant	8234 Causeway Blv	Tampa	FL
St. Mary's Episcopal Day School		Tampa	FL
St. Pete Catholic High School		Tampa	FL

ProjectName	Address	City	State
Tampa Bay Water Groundwater Clear Well Tank		Tampa	FL
Tampa Bay Water Surface		Tampa	FL
Tampa Juvenile Detention Center		Tampa	FL
The Garrison Condo		Tampa	FL
The Sorelle Residence		Tampa	FL
Westshore Plaza Phase III Expansion		Tampa	FL
City of Titusville Blue Heron WRF		Titusville	FL
City of Titusville Blue Heron WRF		Titusville	FL
Reliant Energy Corp. Maintenance Instrumentation B		Titusville	FL
Reliant Energy Corporation Intake Structure	Highway US 1	Titusville	FL
Sipprelle Residence		Ussepa Island	FL
Meridian @ The Oaks		Venice	FL
Woodmere Clubhouse		Venice	FL
Our Lady of the Rosary-Ballfield	21010 S.R. 54	West Land O'Lakes	FL
Our Lady of the Rosary-Flagpole	21010 S.R. 54	West Land O'Lakes	FL
SWA (CMRF)		West Palm Beach	FL
Marriott - Okahumpka Travel Plaza	Florida Turnpike Mi	Wildwood	FL
Florida Hospital		Winter Park	FL

ProjectName	Address	City	State
Florida Brewing Company		Ybor City	FL

EXHIBIT D

Preventor 2005 Installations (Government)

Project Name	Address	City	State
Kodiak Building (SCAT) Mobile Structure on Rails		Kodiak	AK
Huntsville Public Safety Complex		Huntsville	AL
New Phoenix City Hall	Package Street	Phoenix	AZ
Phoenix Central Library		Phoenix	AZ
Los Angeles Federal Bldg. GSA	255 E. Temple Street	Los Angeles	CA
GSA Oakland Federal Building		Oakland	CA
California Federal Service Center	1515 Walnut Grove Avenue	Rosemead	CA
V.A. Medical Center		San Diego	CA
FBI Center New 9 Story Office Bldg		Washington	DC
Florida Welcome Center		Campbelton	FL
Cape Canaveral AF Station Patrick AFB Cape Arrays		Cape Canaveral	FL
Cape Canaveral Station	Patrick Air Force Base	Cape Canaveral	FL
Satellite Assembly Bldg Cape Canaveral		Cape Canaveral	FL
General Services Bldg		Clearwater	FL
City of Coconut Creek - Council Building		Coconut Creek	FL
City of Coconut Creek - Motor Pool Building		Coconut Creek	FL

Project Name	Address	City	State
Coconut Creek Public Safety		Coconut Creek	FL
Marriott - Ft Pierce Travel Plaza	Florida Turnpike Mile Mkr 144	Ft Pierce	FL
City of Holmes Beach Baseball Field	5901 Marina Drive	Holmes Beach	FL
Marriott - Lake Worth Travel Plaza	Florida Turnpike Mile Mrk. 94	Lake Worth	FL
US Post Office - Land O Lakes		Land O Lakes	FL
FDOT District 5		Leesburg	FL
Marriott - Snapper Creek Travel Plaza	Florida Turnpike Mile Mkr 19	Miami	FL
US Naval Air Station Bldg 1406 & 1424	Whiting Field South & North Tower	Milton	FL
Mulberry Post Office		Mulberry	FL
Marriott - Turkey Travel Plaza	Florida Turnpike Mile Mkr 263	Ocee	FL
Marriott - Ft Drum Travel Plaza	Florida Turnpike Mile Mkr 184	Okeechobee	FL
St. Johns Rive Water Management		Palatka	FL
Marriott - Pompano Travel Plaza	Florida Turnpike Mile Mrk 65	Pompano Beach	FL
East Port Environmental Services		Port Charlotte	FL
Charlotte County Sheriff's Administration	Metro Pkwy	Punta Gorda	FL
Marriott - Canoe Creek Travel Plaza	Florida Turnpike Mile Mrk 229	St. Cloud	FL
Gateway Post Office		Tampa	FL
Marriott - Okahumpka Travel Plaza	Florida Turnpike Mile Mrk 299	Wildwood	FL

Project Name	Address	City	State
Cherokee County Public Safety Complex		Canton	GA
Montgomery County Courthouse		Chula	GA
Paulding County Courthouse	Courthouse Square	Dallas	GA
Handcock Co. Courthouse		Greenfield	IN
Courthouse		Tipton	IN
Campbell County Courthouse	4th Street	Newport	KY
Westover AFB Hangar		Chicopee	MA
Westover AFB Upgrade Hangar B-700		Chicopee Falls	MA
Melrose City Hall	Essex& Main St	Melrose	MA
Natick Municipal Complex		Natick	MA
Mt. Holyoke Summit Lodge	Holyoke State Park	S. Hadley	MA
Wellesley Town Hall	525 Washington St	Wellesley	MA
Bethesda Metro Center	7450 Wisconsin Ave	Bethesda	MD
National Park		Landover	MD
Van Buren County Courthouse		Paw Paw	MI
Public Service of New Hampshire Corporate Hdqrts.		Mancester	NH
Veterans Memorial Home	132 Evergreen Rd	Edison	NJ
Oyster Creek Emergency Bldg	Route 9	Forked River	NJ

Project Name	Address	City	State
Municipal Complex		Hanover Twp.	NJ
Manchester Town Hall	1 Colonial Drive @ Rte 37	Lakehurst	NJ
Morris County Hall of Records	Ann Street	Morristown	NJ
NJIT Library Bldg	Central Ave	Newark	NJ
South Brunswick Maintenance Storage Complex		S. Brunswick	NJ
City Hall and Police Dept	Morris & Springfield Aves	Summit	NJ
GTE Government Systems White Sands Missile Range		WSMR	NM
State Legislature Building			NV
Yuca Mountain Test Site			NV
Regional Justice Center		Las Vegas	NV
New Reno Federal Building		Reno	NV
Galena Maintenance Station		Washoe	NV
Broadway Office Complex	625 Broadway	Albany	NY
Transitional Housing	Jackson & Cypress	Bronx	NY
Transitional Housing	141st	Bronx	NY
Transitional Housing for the Homeless	50 W. Mt Eden & Inwood	Bronx	NY
Transitional Housing	Linden Blvd	Brooklyn	NY
Transitional Housing for the Homeless	St. Johns Place & E. NY Ave.	Brooklyn	NY

Project Name	Address	City	State
Family Court Building		Buffalo	NY
The Rath County Office Building		Buffalo	NY
Tompkins County DOT Admin Facility. Bus Garage	Willow Ave	Ithaca	NY
Police & Hwy Dept Bldg	525 Pavement Road	Lancaster	NY
Niagara Falls Housing Authority-Wrobel Towers	Main Street	Niagara Falls	NY
Orchard Park Municipal Center	S-4295 South Buffalo Street	Orchard Park	NY
Criminal Courts Building		Riverhead	NY
Roosevelt Island Phase II	Building I	Roosevelt	NY
Manhasset Fire House	Prospect Rd	Thomaston	NY
West Valley Nuclear Services		West Valley	NY
Logan County Court House		Bellefontaine	OH
Wood County Court House		Bowling Green	OH
Gurnet County Courthouse		Cambridge	OH
Pickway County Courthouse		Circleville	OH
Fayette County Courthouse		Fayette	OH
Trumbull County Courthouse		Trumbull	OH
Owasso City Hall		Owasso	OK
Coudersport Court House		Coudersport	PA

Project Name	Address	City	State
Potter County Courthouse	1 East Second Street	Coudersport	PA
Cameron County Courthouse	20 East Fifth St	Emporium	PA
Emporium Court House		Emporium	PA
Valley Forge Plaza	First & Moore rd	King of Prussia	PA
Berks County Courthouse	6th & Court St,	Reading	PA
Berks County Services Center	Reed & Court Sts	Reading	PA
Elk County Court House		Ridgeway	PA
Warren County Courthouse		Warren	PA
City Hall Ave Parking Facility		Norfolk	VA
FBI Firearms Range Renov. [26m Range & Stress Obst		Quantico	VA
National Parks Service bldg	North Cascades Visitor Ctr	New Halem	WA

EXHIBIT E

Preface from NFPA 780

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See inside back cover for additional important notices and information.

3/02

EXHIBIT F

REPORT OF THE THIRD-PARTY INDEPENDENT EVALUATION PANEL ON THE EARLY STREAMER EMISSION LIGHTNING PROTECTION TECHNOLOGY

BY

John L. Bryan

Richard G. Biermann

Glenn A. Erickson

Submitted to the National Fire Protection Association Standards Council on September 1, 1999

Rison (336) reported in 1991 on studies conducted at the Langmuir Laboratory from July 15 to August 23, 1991 to evaluate whether a radioactive ESE air terminal provided protection within a 100 meter radius as reported by the Manufacturer. The ESE device was installed on a twenty foot mast 4 meters below South Baldy Peak. Video cameras were used to record the occurrence of lightning strikes. There were two recorded lightning strikes within the 100 meter radius area during the approximate five week study, one 85 meters from the ESE device and one approximately 78 meters from the device. However, the following statement should be noted from the report:

> Near the end of the test period, it was noticed that the radioactive Preventor had been damaged --the weld had broken between the spherical ball on the Preventor and the nut to which it attached. It is not certain when or how this happened. There was no evidence of tampering or vandalism. Examination of the tip of the Preventor under a microscope showed evidence of melting, such as would occur if lightning were to have struck it. Most likely, the Preventor was struck by lightning at a time when the camcorders were not turned on (when the peak was in a cloud, or a storm occurred in the early morning hours), and the lightning broke the weld.[13]

Thus, it might appear that the ESE device was active in a lightning strike not recorded by the video cameras utilized during the study, since there were periods during the study when the cameras were inactive.

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[13]Rison, William, A Study of Lightning Strikes in The Vicinity of a Radioactive Preventor, Langmuir Laboratory, New Mexico Tech., Socorro, NM, 11-8-91, p. 4.

Moore *et al.* (248) reported in 1998 a summary of all the field tests of the radioactive "Preventor" ESE device during the summers of 1990, 1991, 1993, 1994, 1995, 1996, and 1997. Moore's analysis is as follows:

> In the six summers during which the "preventor" was exposed to thunderstorms overhead, lightning struck six different sites within 100 meters of the device yet the "preventor" itself was never struck.
>
> Digitized measurements with quarter-microsecond time resolution, of the currents that flowed from the "Preventor" during two nearby lightning strikes in September 1997 showed no indication that the "Preventor" emitted any effective "early streamers". In fact, during one of these discharges, lightning struck a blunt rod located 20 meters distant yet no streamers were emitted from the "Preventor" to connect with this close strike.[14]

It should be noted these seven-year tests involved a single ESE device of a radioactive type. It should also be noted that Moore's (243) field studies under natural lightning conditions have questioned the validity of the effectiveness of the sharp-pointed Franklin air terminal as follows:

> The failure of radioactive-ionizing and of sharply pointed air terminals to participate in lightning discharges by being pre-eminent connectors of lightning to earth is no surprise to scientists studying thunderstorms and lightning. For the past 40 years, I have been measuring the electric currents flowing into the air from both radioactive electrodes and from sharply pointed ones under the influence of the strong electric fields beneath thunderstorms but not one of my well-exposed electrodes has ever been struck by lightning.[15]

[14] Moore, C. B., William Rison, and G. D. Aulich, An Assessment of The Radioactive "Preventor" as an Early Streamer Emitting Lightning Protector, New Mexico Tech., Langmuir Laboratory for Atmospheric Research, Socorro,NM, 12-29-98, pp. 24-25.

[15] 243. Moore, Charles B., New Mexico Tech., "Personal Communication to Subcommittee of NFPA Board of Directors", 9-4-95, p. 1.

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2. Consideration of System Performance

It would appear the ultimate evaluation of any complete lightning protection system would be the performance of the systems as installed on buildings. The submitted materials included one reference to the failure of a conventional system with Franklin rods (328) and there was one newspaper account of a Franklin rod system failure resulting in personnel injuries. (252) There were several studies of failures of ESE lightning protection systems. (146) (220).

The failure of the Franklin rod system resulting in the eleven personnel injuries occurred at the Robert F. Kennedy stadium in Washington, D.C. on June 13, 1998. (252) Richardson reported on the failure of a Franklin rod air terminal located approximately four feet from an externally mounted camera on the building which was damaged by a lightning strike. (328)

Makerras *et al.*, (220) have reported on four cases of lightning striking buildings in Singapore from the late 1960's until the 1980's. Hartono and Robiah (146) have reported on ten cases of failures on buildings protected with ESE lightning protection systems. This study utilized photographs of the building conditions both before and after the reported lightning strikes on the damaged areas of the buildings. It was found from this photographic study the damage appeared to be dependent on the number of strokes received, the strength of the lightning stroke and

the shape of the structure at the point of the stroke. Although not specified in the study Hartono and Robiah have indicated lightning strike damage was found on buildings protected with Franklin air terminals as indicated in the following statement:

> Studies conducted on the buildings equipped with the standard lightning air terminals (Franklin rod type) also exhibited similar lightning damage locations on or near the rooftop. Based on this comparison, we conclude that no advantage can be obtained by using the ESE device in protecting the building against direct lightning strikes.[21]

It should be noted that all of the incidents of system failure submitted to the panel lacked the necessary detailed documentation to enable a valid analysis as to the effectiveness of the system. Even the most detailed photo study lacked the necessary documentation consisting of the following: The manufacture and model of the air terminal. The date the installation was completed, thus establishing the age of the system when the lightning strike occurred. The maintenance and condition of the system when the strike occurred, including the condition of the down conductors and the grounding system. It would appear that detailed documentation of lightning protection system operations or failures is a needed component for the evaluation of the effectiveness of lightning protection systems of all types on various buildings of differing heights and configurations.

[21] Hartono, Zainal Abidin and Ibrahim Robiah, A Long Term Study on The Performance of Early Streamer Emission Air Terminals in a highly Isokeraunic Region. 2-19-99, p. 2.

Van Brunt *et al.*, (369) has referenced this problem of adequate data on lightning protection system performance in the following manner:

> There are reports of incidents where ESE devices failed to provide the protection specified by the manufacturer [156,158,165,215]. Statistics on the failure of conventional systems have also been documented [109]. When examining reports of "failures", one can always raise questions about their cause, e.g., whether they are primarily a consequence of exaggerated claims made by the manufacturer or a consequence of misuse (faulty installation) of the device. Reports of isolated failures raise legitimate concerns, but are seldom accompanied by enough supporting data about the event to enable a determination of why the failure occurred. Generally it is difficult to draw significant conclusions from single events that can be used to improve system design or evaluate system performance.[22]

Thus, given the present situation of lightning protection system performance not being a priority of the proponents of the systems, the manufacturers, the insurance companies or public officials it would appear little valid information or data relative to a validation of the theoretical basis of the systems will be obtained.

III. RECOMMENDATIONS TO STANDARDS COUNCIL

Based on a thorough and complete evaluation of the 377 items submitted to the third-party independent panel the members of the panel have agreed in a complete consensus on the following recommendations to the National Fire Protection Association Standards Council. It should be

[22]Van Brunt, Richard J., Thomas L. Nelson, Samar L. Firebaugh, Early Streamer Emission Air Terminals Lightning Protection Systems: Literature Review and Technical Analysis. Quincy, MA. National Fire protection Research Foundation, 1-31-95, p. 25.

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recognized the Standards Council is the official designated authority on any action to be taken relative to the NFPA lightning protection documents.

A. **Scientific and Technical Basis of ESE**

The initial question posed to the third-party independent evaluation panel was stated as: "whether the ESE lightning protection technology is scientifically and technically sound." The panel's review of the submitted materials resulted in the following determinations:

1. The ESE air terminals appear to be technically sound since they are generally equivalent to the conventional Franklin air terminal in laboratory experiments.

2. However, neither the ESE air terminals nor the conventional Franklin rod appear to be scientifically or technically sound when evaluated in field tests under natural lightning conditions.

3. The ESE lightning protection technology as currently developed in the installation of complete systems does not appear to be scientifically and technically sound in relation to the claimed areas of protection or the essentials of the grounding system.

B. **Adequacy of Theoretical Basis and Lab Tests**

The second specific question posed to the third-party independent review panel was stated as: "whether the ESE lightning protection technology is supported by adequate scientific-theoretical basis and

laboratory testing." The panel's review of the submitted materials resulted in the following determinations:

1. There does appear to be an adequate theoretical basis for the early streamer emission lightning protection air terminal concept and design from a physical viewpoint.

2. There does not appear to be an adequate theoretical basis for the claimed enhanced areas of protection with limited down conductors and grounding system.

3. The high voltage laboratory tests of the ESE air terminals appear to be adequate in scope and quantity, but they are limited in that they are not equivalent to an evaluation of the complete ESE lightning protection system under natural thunderstorm conditions.

C. NFPA Lightning Protection Documents

The third-party independent evaluation panel was also directed in the Settlement Agreement as follows: "This panel, in issuing its report, shall address the following issues, and any other issues it deems relevant:" The panel considered the issues of the existing NFPA 780 document titled: Standard for The Installation of Lightning Protection Systems 1997 edition. (294) and the proposed NFPA 781 document titled: Standard for Lightning Protection Systems Using Early Streamer Emission Air Terminals. (277) The panel considered the need for each document and each committee's membership and balance in accordance with NFPA

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procedures. The panel's review of the submitted materials resulted in the following determinations:

1. The current NFPA 780 Committee should be discharged and the Committee should be completely restructured. The committee needs new and additional memberships in the membership categories of enforcer, consumer, user, insurance, labor, special expert and research/testing..

2. The Council should solicit memberships from prominent users such as: FAA, DOE, DOD, NASA, IBM, Reedy Creek Improvement District, phone, radio, television organizations and electric power utilities.

3. The NFPA 780 document should be reformulated as a Guide or Recommended Practice. It appears to the panel the NFPA 780 document does not meet the NFPA criteria for a standard since the recommended lightning protection system has never been scientifically or technically validated and the Franklin rod air terminals have not been validated in field tests under thunderstorm conditions. The NFPA criteria for a standard as stated in the NFPA 99 Directory (298) is as follows:

> Standard —A document, the main text of which contains only mandatory provisions using the word "shall" to indicate requirements and which is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions shall be located in an appendix, footnote, or fineprintnote and are not to be consider as part of the requirements of a standard.[21]

[21]NFPA, National Fire Protection Association 1999 Directory, Quincy, MA, 11-98, p. 52.

EXHIBIT G

EARLY STREAMER EMISSION AIR TERMINALS LIGHTNING PROTECTION SYSTEMS

LITERATURE REVIEW AND TECHNICAL ANALYSIS

Prepared by

Dr. Richard J. Van Brunt
Thomas L. Nelson
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development has been established from laboratory investigations [113], considerably less is known about the dynamics and interactions of these species in a discharge compared to what is known about ions. In particular, very little is known about how they contribute to lightning discharge initiation or propagation under relevant atmospheric conditions. As with negative ions, the metastable content of the air around a lightning terminal will be affected by relative humidity and general air contamination. The influence of metastable species should not extend significantly beyond the end of a lightning rod. Their role, if anything, will be to enhance initial development of a streamer at the rod tip.

In summary, it would appear that enhancement of upward streamer initiation from an ESE terminal (compared to a conventional terminal) has a plausible physical basis. However, it would also appear that a complete and universally accepted understanding of how all ESE devices work has not yet been achieved, and it can be argued that a better understanding is needed to make meaningful quantitative comparisons between the performances of ESE and conventional devices. To reach such an understanding it will undoubtedly be necessary to address numerous basic questions such as:

1. What are the predominant streamer initiation mechanisms under different conditions of polarity, atmospheric humidity, air contamination, and terminal geometry?

2. What are the relative roles of ions, electrons, and metastable species on the development and propagation of a streamer discharge from a terminal for different conditions?

3. What is the likelihood of corona formation around a terminal and how will the presence of corona affect the ability of the terminal to launch a streamer upon approach of a lightning stroke?

4. In the case of radioactive terminals, what is the dependence of the streamer initiation probability on the intensity and type of radiation source?

5. In the case of electrically triggered devices, how does the streamer initiation probability depend on the timing and magnitude of the electrically triggered spark?

6. Also for electrically triggered devices, how reliable is the field sensor that controls the triggering, and can its performance be affected by local space charge?

Attempts to find answers to questions like these are the focus of much ongoing experimental and theoretical research, not only on lightning, but on electrical discharge phenomena in general.

D. Validation of ESE System Performance

Three general methods have been used to evaluate and test the performance of lightning protection systems, namely: 1) small-scale laboratory or outdoor tests in which lightning, or the effects of lightning are simulated by applying high-voltage impulses

lightning seldom hits a terminal regardless of whether or not it is equipped with an ESE device [182,183,215]. Although a few isolated strikes to the mountain were reported to have occurred within the supposed zones of protection of ESE terminals [183,215], it would appear that the overwelming majority of strikes to the mountain were at considerable distance from any terminal. In any case, the failure of air terminals to attract lightning on mountain tops at elevations of 3000 m (9843 feet) or more is obviously disturbing and raises questions about the interpretation of such observations. Before any serious conclusions are drawn about the performance of lightning attractors from tests performed on mountain tops; it may be necessary to consider the perturbing effect of the mountain itself on such parameters as the surface charge distribution and electric-field profile under a thundercloud, as well as the extent that lightning strokes at such high elevations differ from those that normally occur in lower, flatter locations. It would appear that the answers to some of these questions might already be found in the literature.

It is noted in some papers that lightning that occurs at high elevations generally differs on average from that which occurs at sea level, if in no other respect than that it has less distance to cover in going from the cloud to ground [36]. At an elevation of 3000 m, the ground can be quite close to or even engulfed by the base of a storm cloud. Certainly the results from high mountain tests cannot be dismissed, and such tests should continue, as should similar tests underway at other locations [107]. The problem is how to interpret the results of these tests and infer what they might imply about air terminal performance at lower elevations, and what they indicate about the influence of mountainous or rocky terrain on the effective zone of protection of an air terminal.

The unfavorable statistical odds associated with natural lightning can be partially overcome by using artificially triggered lightning. Tests have shown that lightning can be triggered with reasonably high probability by a rocket launched into a thundercloud [124,160,190,193]. A long trailing wire is usually attached to the rocket which provides a low resistance path to guide the initial discharge and define its direction of propagation [45,120,193]. Transportable facilities have been developed for rocket triggering of lightning that can be used for testing at nearly any location [231]. Although tests of air terminals are being made using triggered lightning, there are questions that can be raised about the meaning of such tests. There is evidence that triggered lightning is unlike natural lightning both in its intensity and propagation characteristics. In particular, it has been noted that triggered lightning is of lower current than natural lightning and exhibits characteristics more like those of return strokes observed in natural lightning [78,161]. It has also been argued that triggered lightning does not satisfactorily mimic the primary stroke and is therefore unsuited for investigation of the attachment to a grounded lightning conductors, i.e. its use in evaluating air terminals would appear to be questionable [78]. The extent to which rocket-triggered lightning behaves like natural lightning seems to depend on the length of the trailing wire and the distance of the bottom end of the wire above

3. Radiation hazards

In the case of ESE devices that employ radioactive materials, issues have been raised in the literature about the possible radiation hazards to humans that the use of these devices present [24,25,39,81,180,196,278]. As noted above, radioactive air terminals are banned in some countries, presumably because of perceived health hazards. It has been noted that ^{241}Am sources used in lightning protection devices are not any more hazardous than similar sources approved for use in smoke detectors or static eliminators [109,167,180]. Nevertheless, there are those who argue that the public may be placed at risk from a proliferation of radioactive materials in devices that can enter the environment without adequate controls [25,81,180]. An evaluation of the health and safety aspects of radioactive sources used in air terminals lies outside the scope of this report. However, we have identified this as a serious issue that the manufacturers and users of radioactive terminals must be prepared to address.

4. Damage and maintenance

Given that ESE devices likely have a structure and associated instrumentation that are more complex than conventional air terminals, questions can be raised about their susceptibility to damage during a lightning strike. The electric current and energy deposited by a lightning stroke can be sufficiently high to actually melt metallic structures and destroy electronic components. There are numerous reports of damage inflicted by the primary lightning stroke to metal parts on aircraft, etc. [70,79,138,209,237,269]. The possibility of damage means that a lightning protection device may require periodic inspection and/or maintenance that is generally not required for conventional terminals. Although this problem is pointed out [155], there seems to be very little discussion about it in the open literature.

IV. CONCLUSIONS

The possible conclusions that can be drawn from an examination of the literature included in the bibliography are discussed in this section. The main conclusions of this report are briefly summarized in Section VI.

Because of the sparsity of information that can be found in the peer-reviewed literature from tests of early streamer emission air terminals, either in the laboratory or in the natural environment, it is nearly impossible to make quantitatively meaningful statements or judgements about the performance of ESE devices in comparison to conventional Franklin rods. In fact, insufficient reliable quantitative data seem to exist about the performance of conventional rods, and there seems to be an ongoing debate about the best geometrical design for conventional terminals required to achieve optimum lightning attraction efficiency.

Nearly all of the information or data that could found on ESE device performance resulted either from tests performed by manufacturers of lightning protection sys-

tems or by those directly or indirectly employed by such manufacturers. Although abundant criticism is published by non-manufacturers about the performance of ESE devices, especially radioactive air terminals, it is seldom based on actual test data. Those on both sides of the issue invoke lack of evidence in making their case about the performance of ESE terminals. Proponents of these devices claim that a lack of credible statistical data on failure of ESE terminals proves their effectiveness; while critics of these terminals argue that a lack of evidence about the improved performance of ESE terminals over conventional terminals proves their ineffectiveness. In either case, one must beware of faulty logic, in as much as a lack of evidence never proves the lack of something.

There are reports of incidents where ESE devices failed to provide the protection specified by the manufacturer [156,158,165,215]. Statistics on the failure of conventional systems have also been documented [109]. When examining reports of "failures", one can always raise questions about their cause, e.g., whether they are primarily a consequence of exaggerated claims made by the manufacturer or a consequence of misuse (faulty installation) of the device. Reports of isolated failures raise legitimate concerns, but are seldom accompanied by enough supporting data about the event to enable a determination of why the failure occurred. Generally it is difficult to draw significant conclusions from single events that can be used to improve system design or evaluate system performance. There is no reason to believe that an air terminal is 100% efficient in attracting lightning, regardless of what kind of ESE device it uses, if any. Considering the wide range of possible atmospheric conditions and types of lightning behavior that have been recorded, it is not surprising that air terminals of all types will sometimes fail [37,201,271]. Tall structures are reported to be struck occasionally by lightning at points far below the top, i.e., outside of the "protection zone" [173,185,186]. Any claims of 100% efficiency in the performance of a lightning attractor should be viewed with skepticism. In any case, the meaning of the term "efficiency", when specified for an air terminal, should be clearly defined and understood.

A reasonable physical basis for the operation of an ESE device appears to exist in the sense that there is good evidence from laboratory investigations that the probability of initiating a streamer discharge from an electrode can be increased significantly by irradiation or electrical triggering. However, the precise amount by which this enhancement in streamer initiation improves the lightning attraction efficiency of an air terminal remains questionable. There is reason to doubt that it significantly extends the maximum range of protection. A lightning stroke that would not hit a conventional terminal because of the fact that it does not enhance the field at the terminal tip enough to allow streamer formation will also not likely hit a terminal equipped with an ESE device. (The exception would be an ESE device that significantly increases the terminal potential during the approach of a lightning stroke.) In our view, the possible advantage offered by an ESE device, if operated properly, is that it helps to insure that a streamer will be initiated if the field produced by the

SP7255

Date Submitted	12/20/2018	**Section**	450.3.19	**Proponent**	Bryan Holland
Chapter	4	**Affects HVHZ**	No	**Attachments**	No
TAC Recommendation	Approved as Submitted				
Commission Action	Pending Review				

Comments

General Comments **Yes** **Alternate Language** **No**

Related Modifications

7209, 7211, and 7212

Summary of Modification

This proposed modification revises the requirements for lightning and surge protection for added clarity and effective enforcement.

Rationale

This proposed modification simply revises the language to clarify the rules. The change to .1 corrects the proper name for the NFPA 780 Standard. The changes to .2, .3, and .4 are minor editorial revisions for clarity. The change to .5 corrects the product name from "suppressors" to "protectors" as indicated by the UL 497 and UL 497A Standards.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposed modification does not add any new criteria so impacts to the local entity are minimal.

Impact to building and property owners relative to cost of compliance with code

This proposed modification will not change the cost of compliance to building or property owners.

Impact to industry relative to the cost of compliance with code

This proposed modification will not impact the industry relative to the cost of compliance with code.

Impact to small business relative to the cost of compliance with code

This proposed modification will not impact businesses relative to the cost of compliance with code.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed change clarifies the rules for lightning and surge protection which directly impacts the health, safety, and welfare of the general public.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposed modification improves the code by adding clarity and correcting used terms.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This proposed modification enhances the effectiveness of the code.

2nd Comment Period

SP7255-G2

Proponent Michael Riley **Submitted** 5/23/2019 **Attachments** Yes

Comment:

Proposed code modification 7255 does not meet the statutory standards of Chapter 553. See attached comments.

2nd Comment Period

SP7255-G3

Proponent Bryan Holland **Submitted** 5/26/2019 **Attachments** No

Comment:

Please disregard general comment SP7255-G2. The comment is not valid as it attempts to address the existing requirements of the code and not the proposed modification that is currently open for comment. The editorial revisions made to this section by the modification did not add to or take away from any of the current requirements. Therefore, none of the statements made in the general comment are relevant.

2nd Comment Period

SP7255-G4

Proponent	Joe Bigelow	**Submitted**	5/28/2019	**Attachments**	Yes

Comment:

Submitted by Shroder Joseph & Associates via FedEX

1st Comment Period History

SP7255-G1

Proponent	Vincent Della Croce	**Submitted**	1/8/2019	**Attachments**	No

Comment:

I support the proposed modification as it will ensure the Code includes the most current requirements for electrical installations that provide for the health, safety and general welfare of the public.

450.3.19 Lightning protection.

450.3.19.1

A lightning protection system shall be provided for all new buildings and additions in accordance with NFPA 780, Standard for the Installation of Lightning Protection Systems.

450.3.19.2

Where additions are constructed to existing buildings, the existing building's lightning protection system, if present, shall be interconnected to the new lightning protection system.~~connected to the new lightning protection system, shall be inspected and brought into compliance with current standards.~~

450.3.19.3

~~There shall be sure protection~~ Surge protective devices (SPDs) shall be installed in accordance with NFPA 70, National Electrical Code, as required by NFPA 780, Standard for the Installation of Lightning Protection Systems for all normal and emergency electrical services.

450.3.19.4

Additional surge protection shall be required for all low voltage and power connections to all electronic equipment in critical care areas and life safety systems and equipment such as fire alarm, nurse call and other critical systems. Protection shall be in accordance with NFPA 70, National Electrical Code and the appropriate IEEE Standards for the type of equipment protected.

450.3.19.5

All ~~low-voltage~~ communication systems ~~main or branch circuits~~ entering or exiting the structure shall have surge ~~suppressors~~ protectors installed for each pair of conductors and shall have visual indication for protector failure to the maximum extent feasible.

The controlling statutory standards for approving an amendment or modification to the Florida Building Code are as follows. Proposed code modification 7255 does not meet the statutory standards:

1. *Is needed in order to accommodate the specific needs of this state.*
2. *Has a reasonable and substantial connection with the health, safety, and welfare of the general public.*

It is undisputed that structural fire incidents are declining – not increasing – in the United States from 1977 to 2015 so there is no reason for FBC to impose this new tax for LPS and SPD on Florida's economy. Haynes, *Fire Loss in the United States 2015*, NFPA, September 2016, Figure 1 at p. 11. Haynes concludes that "[t]he total number of fires continues to be on a downward trend, as does the number of outside fires, structure fires and vehicle fires." P. 35. Direct property damage from lightning fires has declined as well from 1977 to 2015 in 2015 dollars. More specifically, the amount of direct property damage to non-home structures caused by lightning fires dropped over 70% annually from 1980 to 2014 ($249 million to $65 million). Ahrens, *Structure Fires Started by Lightning*, NFPA, April 2017, at Table 2, p. 4. http://www.nfpa.org/news-and-research/fire-statistics-and-reports/fire-statistics/fire-causes/lightning-fires-and-lightning-strikes

In 2011 Fire Departments reported 27,100 total lightning fires in the United States. Of these reported fires 20,400, or 75% of the total, were outside fires or non-structure fires. Only 7% of lightning fires from 2007-2011 were "non-home structure fires." Ahrens, *Lightning Fires and Lightning Strikes*, NFPA, Fire Analysis and Research Div., June 2013, p. 1. Exhibit C. There were only 1,800 "non-home structure" fires. *Lightning Fires and Lightning Strikes* at Table 4, p. 14. By 2014, the number of "non-home structure fires" was even lower (1,400). *Structure Fires Started by Lightning*, at Table 2, p. 4.

Therefore, the Proposed Code Modification is not needed and does not have a reasonable and substantial connection with the health, safety and welfare of Floridians. The Proposed Code Modification overstates the risk and costs of lightning damage to structures in Florida and given the overstated threat of damage caused by lightning strikes, the costs of complying with the proposed LPS and SPD requirements exceed the benefits of their installation in Florida.

3. *Strengthens or improves the Florida Building Code, or in the case of innovation or new technology, will provide equivalent or better products or methods or systems of construction.*
4. *Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.*

The restriction of approved LPS to only NFPA 780-compliant systems provides no equivalent products, methods, or systems of construction and is entirely discriminatory as to all other products, methods and systems. The Proposed Code Modification would wholly exclude from Florida construction projects UL Certified Lightning Protection Systems and specific Components and Systems such as UL96A Master Labeled LPSs and UL Letter of Findings LPS.

Further the modification excludes LPS such as IEC 62305, DOD DDESB 6055.9, DOE M440.1-1, FAA Std – 019e, FAA 6950.19A, NASA E-0012F, API – 2003, and any new LPS technology that may be developed and otherwise certified.

5. *Does not degrade the effectiveness of the Florida Building Code.*

An inherent conflict exists in the Proposed Code Modification. While LPS must be NFPA 780-compliant, SPD must be installed in accordance with NFPA 70, National Electric Code. These codes conflict as to installation of SPDs and where they are required to be installed in a structure.

§553.73 (9) (a)

Further, a proposed amendment must include a fiscal impact statement that documents the costs and benefits of the proposed amendment:

The proposed modification would needlessly – but substantially – unfairly tax the Florida economy. The narrative for Proposed Code Modification 6460 in 2017 providing for new LPS building requirements admitted that "[t]he average cost of a complete LPS is approximately 1% to 5% of total construction cost of the building." Dr. Issa's draft report presented to the Technical Advisory Committee at that time directly acknowledges these additional costs:

> "[t]he largest cost impact for the 2015 Florida specific changes came from proposed code change E6460, the installation of Lightning Protection Systems (LPS). The anticipated cost of the LPS was estimated to add 5% to the buildings total cost. Up to 80% of that cost reportedly could be offset through insurance reductions, **however such insurance reductions are not guaranteed and were therefore omitted from this cost estimate.**" (emphasis supplied) Issa, *Evaluation of the Cost Impact of Florida's specific changes to 2015 I-Codes "Prescriptive Code Changes"*, Draft Final Report, April 17, 2017, at Executive Summary p. 1.

§553.73 (9) (b)

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May 23, 2019

Via Federal Express

Florida Building Commission
Special Occupancy Technical Advisory Committee
2601 Blair Stone Road
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Via Email (rsbrowdy@aol.com)

Richard S. Browdy
Chairman, Florida Building Commission
2601 Blair Stone Road
Tallahassee, Florida 32399

Re: Comments on Proposed Code Modification 7255, Florida Building Code

Gentlemen:

Our law firm represents Heary Bros. Lightning Protection Co., Inc. ("Heary Bros.") and its division, Lightning Preventor of America®. Heary Bros. offers both NFPA 780 compliant systems as well as its Preventor® system which is an early streamer emission system ("ESE system") that is installed in compliance with its manufacturer's standard, HBP 21. This letter is submitted to comment on proposed Modification 7255 to require that all Florida nursing homes install lightning protection systems in accordance with National Fire Protection Association ("NFPA") 780. The modification should not be accepted and instead there should continue to be the ability for the owner, architect and engineer on such projects for ALFs to select the type of lightning protection system that best fits the needs of the project.

Under the rules governing modification of the Florida Building Code, a prerequisite to accepting a proposed modification such as E6460 is that it "DOES NOT DISCRIMINATE AGAINST MATERIALS, PRODUCTS, METHODS, OR SYSTEMS OF CONSTRUCTION OF DEMONSTRATED CAPABILITIES." (553.73 (9) (a) 3 F.S.). It is respectfully submitted, for the reasons discussed in detail below, that Modification 7255 cannot be accepted because it will violate this fundamental prerequisite under Florida State law (553.73 (9) (a) 3 F.S.) by discriminating against manufacturers and installers of Early Streamer Emission ("ESE") lightning protection systems which constitute a competing alternative of "demonstrated

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capabilities." Indeed, there is no reasonable justification for favoring Faraday lightning protection systems installed under NFPA 780 over ESE lightning protection systems installed under HBP 21 or other equivalent standards which have been approved, specified by architects and engineers and successfully used for many decades throughout the United States and the world.

THE NEED TO REJECT THE PROPOSED MODIFICATION

While most if not all companies in the lightning protection industry either exclusively provide either Faraday Systems or ESE Systems, Heary Bros. manufactures both types of lightning protection systems available in the marketplace today: (1) the traditional Faraday lightning protection systems governed by NFPA 780; and (2) its ESE lightning protection systems which have been successfully installed under HBP 21 for over 30 years under its $11 Million Guaranty backed by Travelers Insurance Company without a single documented lost. Proposed Code Modification 7255—as proposed--would eliminate for Florida Building owners the ESE option.

Importantly, Heary Bros. does not seek to exclude other ESE manufacturers or installers by offering its proven standard known as HBP 21, a copy of which is attached as Exhibit A, as one proven alternative standard. **Instead, the Florida Building Commission should accept other alternative equivalent standards and not limit the standard to NFPA 780.** The point is that architects, engineers and owners should be free to make a choice and should not be limited to one option, particularly since modification 7255 was propounded by a representative of the Faraday Industry which stands to obtain an exclusive monopoly under the proposal. Notably, these types of restrictive changes to the Florida Building Code to require that lightning protection systems comply with NFPA 780 have been proposed by the Florida Industry previously and rejected by the Florida Building Commission for sound reasons in 2017. *See, e.g.*, Modification E6460 rejected by the Florida Building Commission in 2017.

There is no reason to adopt Proposed Modification 7255 and limit the lightning protection systems for Florida nursing homes to compliance with NFPA 780. Not only does Heary Bros.' HBP 21 have a proven track record, but it also has the support of Traveler's insurance which provides $11 million in coverage to support Heary Bros.' guaranty of its ESE system. This support is documented by Exhibit B. The reason that Heary Bros. offers both options to its customers is because its ESE system offers a much less expensive option while its NFPA 780 Faraday alternative is more expensive with no technical or scientific basis of superior performance to justify the added cost. Heary Bros. believes the consumer should have the option to decide. Modification 7255—which Heary Bros. learned about for the first time in this week—should be rejected or modified so as not to eliminate that choice for Florida owners, architects and engineers.

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As explained below, not only has it been established in the lightning protection industry that there is no scientific basis for preferring the method of installation of the Faraday system whose installations are governed by NFPA 780 over ESE lightning protection systems, but also the installation approach of the Faraday systems (which uses more cable and more terminals) renders the Faraday System more costly with no added benefit to owners and consumers.

Heary Bros. readily concedes that its profit margins with respect to the sale of the components of Faraday systems exceeds the profit margins on ESE systems because the installation design for Faraday systems requires more cables, more down runs and more terminals and connections despite the lack of any scientific basis for claiming a difference in performance of the two systems. It should come as no surprise that the proponent of this change in the Florida Code is the Faraday Industry and those companies that exclusively install only Faraday Systems under the NFPA 780 standards. These entities consistently promote codes based on NFPA 780 and dominate the NFPA 780 committee.

There is no difference between the quality of the components of ESE systems and Faraday systems. Notably, the components of both the Faraday System and the ESE systems have been listed by Underwriters' Laboratories, Inc. pursuant to UL 96 which provides the "quality control" for component parts of lightning protection systems. In contrast, NFPA 780 ONLY governs the method of installation and requires more cabling, terminals, connectors and more grounding because of differences in the terminals used by each of these two competing systems.

Other factors to consider are that NFPA itself discloses that NFPA 780 has no scientific basis and has never recommended that this standard be adopted as "code." Further, the author of this letter made presentations to New York State when it considered adopting a similar code change more than two decades ago and New York State ultimately rejected the very code change now being considered— a change virtually identical to that being proposed here—and ruled that there was "no technical justification" for its adoption. Again, the proposed change in law simply imposes more costs on building owners with no scientific or practical justification.

If there is an argument being made regarding "insurance savings" by the proponents of this change in law, their evidence merely confirms that lightning protection—may in some few instances—results in insurance rebates, but the documentation does not show that only NFPA 780 systems are eligible for such rebates or whether these rebates are applicable solely to surge protection which is a separate and distinct product.. Moreover, what is indisputable is that the Faraday systems governed by NFPA 780 systems are NOT eligible for Heary Bros. $11 million guaranty backed by Travelers Insurance Company which Travelers offers only for ESE systems installed in compliance with Heary Bros.' manufacturer's standard—coverage which is provided based on Heary Bros.' decades of field experience with this type of system that exceeds thirty

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years. Copies of documentation demonstrating this insurance coverage are attached hereto as Exhibit B.

Perhaps the best illustration of burden that Proposed Modification 7255 would impose on building owners is the fact that so many building owners have in the past chosen the ESE system in preference to the Faraday system governed by NFPA 780. I have attached as Exhibit C a list of just a small sampling of Florida projects now enjoying the benefits of Heary Bros.' ESE system and $11 Million Guaranty which include numerous government and municipal buildings, resort and recreational centers, churches and corporate buildings. This constitutes a small sampling of Heary Bros.' ESE installations throughout the State of Florida—all of which have been installed in compliance with Heary Bros.' manufacturer's standard and have NOT been the subject of a single documented failure. Similarly, Federal and State governments have preferred the option of Heary Bros. ESE system with its $11 million guaranty over Faraday systems governed by NFPA 780. A list of a sampling of these projects is attached as Exhibit D which included, by way of illustration, such buildings as the Huntsville Alabama Public Safety Complex, the Los Angeles Federal Building, San Diego V. A. Medical Center, the Cape Canaveral Air Force Station, the Council Building for City of Coconut Creek, Florida, the Tampa Gateway Post Office Building, the Holmes Beach Florida Baseball Field and the U.S. Naval Air Station in Milton Florida. Again, these are just a very few examples of government installations in various States from all over the United States.

NFPA ITSELF MAKES CLEAR THAT NFPA 780 IS NOT SCIENTIFICALLY BASED

The proponents of the Faraday systems governed by NFPA 780 often argue that the existence of "national standards" for Faraday Systems (such as NFPA 780 and its parallel standard UL96A) somehow demonstrates that Faraday Systems are "scientific" and "proven." These types of statements are inconsistent with the very nature of national standards in the United States. NFPA 780 itself makes it very clear in its disclosures that NFPA 780 is NOT based on science, research, records of testing or even field experience. Instead, the NFPA specifically includes in the preamble to NFPA 780 (and in all NFPA consensus standards) the following disclaimers as to the efficacy of such standards:

> "While **the NFPA** administers the process and establishes rules to promote fairness in the development of consensus, it **does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgments contained in its codes and standards. The NFPA disclaims liability for any personal injury, property or other damages** of any nature whatsoever....directly or indirectly resulting from the ...use of, or reliance on this document. **The NFPA also makes no guaranty or warranty as to the accuracy or completeness of any information published herein.**"

This excerpt from the preface to NFPA 780 is enclosed as Exhibit E. (Emphasis added.)

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THE LEADING INDUSTRY LITERATURE REJECTS ANY SUPERIORTY OF FARADAY SYSTEMS OVER ESE LIGHTNING PROTECTION SYSTEMS

We have attached the most recognized studies comparing ESE systems to Faraday Systems governed by NFPA 780, including a report generated by the NFPA itself in 1999. Specifically, attached as Exhibits F and G, respectively, are pertinent excerpts from the Report of the National Institute of Standards and Technology, entitled "Literature Review and Technical Analysis of Early Streamer Emission Systems of Lightning Protection" (1995) (hereinafter "NIST Report") and the Report of the NFPA's Third-Party Independent Evaluation Panel entitled "Early Streamer Emission Lightning Protection Technology" (1999) (hereafter "Bryan Report").

Both the NIST and the Bryan Report concluded that ESE systems have both an adequate theoretical basis and laboratory testing. NIST Report at page 25; Bryan Report at page 26. However, the authors of both reports found that there is insufficient field testing of either ESE systems or traditional (also known as "Faraday") systems of lightning protection under natural thunderstorm conditions. NIST Report at page. 16. Bryan Report at page 26. These findings of inadequate field testing of both traditional Faraday systems and ESE systems of lightning protection were based in part on the fact that there have been reported failures of both types of systems, and there was virtually no documentation to determine the cause of the failure.[1] As a result, both reports concluded that no meaningful conclusions regarding the performance of either type of system could be drawn based on either reported failures or lack of failures of either type of system under natural thunderstorm conditions. NIST Report at page 25; Bryan Report pages.23-24.

Based on this lack of field testing---or even laboratory testing—for traditional (Faraday) systems of lightning protection, the NIST Report concluded that "insufficient quantitative data see to exist about the performance of traditional rods…." NIST at page 24. Dr. Bryan, a former member of the NFPA Standards Council, went so far as to conclude that because of a lack of field or laboratory testing, NFPA 780 systems had insufficient scientific validation to warrant an NFPA standard and recommended that NFPA 780 be "downgraded" to a recommended practice. Bryan Report at pages 27-28.

It also is worth noting that both the NIST and Bryan Reports were highly critical of studies, funded by the Faraday industry, conducted by Professor Moore and Dr. Rison of the

[1] Both Faraday and ESE Systems—like other products—sometimes experience failures due to failure to maintain the systems properly or due to installation errors. Faraday Systems rely on their "track record" in field to support their efficacy. ESE Systems, like Faraday System, also have similar field experience. For example, in over twenty years and with thousands of systems installed in the United States, Heary Bros. have had no documented failures and their insurance carriers have paid no claims. Of course, Heary Bros.' ESE systems are installed in compliance with its manufacturer's standard to ensure adequate installation.

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New Mexico Institute of Mining and Technology. The NIST Report questioned whether any meaningful conclusions could be drawn based on tests conducted at elevations of 3000 m, and that the testing at this altitude "raise questions about the interpretation of such observations" NIST Report at 21.

Similarly, the Bryan Report identified several significant problems with the methodology employed by Professor Moore and Dr. Rison. The Bryan Report noted that despite reporting a "failure" of an ESE system, the ESE terminal had been damaged and--as a result--the study failed to document that the ESE terminal was even working at the time of the alleged strike within the zone of protection. Bryan Report at 17. The Bryan Report also noted that Dr. Rison's and Professor Moore's research questioned the efficacy of terminals used in NFPA 780 systems (Faraday Systems), noting that in four years not a single sharp pointed Franklin rod was struck. *Id.* at 18.

The lack of a scientific basis for NFPA 780 and UL 96A also has been confirmed in an article by written by Professor Martin Uman (a leading lightning protection expert who is often quoted by Faraday manufacturers) and published in the December 2002 issue of *American Meteorological Society*. The article states "[t]he theoretical justification of the traditional [Faraday] approach is fairly crude, in part due to our incomplete understanding of lightning's attachment to ground-based objects. Hence, the fact that traditional [Faraday lightning protection] systems have a history of success in preventing or minimizing damage to structures is the primary justification for their use." December 2002 Edition of *American Meteorological Society* at page 1809. Of course, as noted above, Heary Bros.' ESE systems have the same history of success based on field experience now exceeding thirty years—success which has been acknowledged by Heary Bros.' insurance carriers who provide insurance coverage for its ESE systems through Travelers Insurance Company.

CONCLUSION

For all the foregoing reasons, we respectfully request that you reject Proposed Code Modification 7255. Importantly, as explained above, Proposed Code Modification 7255 clearly cannot be adopted under Florida law because it discriminates against manufacturers and installers of ESE lightning protection systems which constitute a competing alternative of "demonstrated capabilities." Florida State law (553.73 (9) (a) 3 F.S.). Moreover, the Proposed Code Modification 7255 should be accepted since it simply is the right thing to do to preserve an option that architects, engineers and owners have chosen for decades with success and—to do otherwise—would provide the Faraday industry with an unfair and unlawful monopoly. Thus, the action proposed by this letter is in the interests of retaining the owners' ability to choose and will avoid the creation of state law that conflicts with federal antitrust laws and imposes

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anticompetitive restraints on the marketplace.

Sincerely,

SCHRODER, JOSEPH & ASSOCIATES, LLP

Linda H. Joseph

EXHIBIT A

Manufacturer's Installation Standard For Lightning Protection Systems Using Early Streamer Emission Air Terminals

HBP-21

CONTENTS

INTRODUCTION

1. Scope

1.1 The requirements of this standard cover the design of systems using Early Streamer Emission ("ESE") air terminals for strikes. The Standard is divided into Three Levels of Protection. Electrical transmission lines and equipment are not within the scope of this standard.

1.2 These requirements apply to lightning protection systems that are complete and cover all parts of a structure. Partial systems are not covered by this standard.

1.3 Where fittings, devices or other components required by this standard are available as listed or labeled, such components shall be used. Otherwise the components shall be approved by the authority having jurisdiction (i.e. Engineer of Record, Architect, Owner, Applied Research Laboratories or Underwriter's Laboratories).

1.4 This Manufacturer's standard is based upon Heary Bros.' 30 years experience in designing lightning protection systems. Because of the lack of a complete understanding of the interaction between lightning and ground based objects and the lightning attachment process, the number and placement of air terminals set forth in this Manufacturer's Standard is based solely on Heary Bros.' experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection, NFPA 780, states that the NFPA "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgments contained in its codes and standards."

2. Glossary

2.1 For the purpose of this standard the following definitions apply:

Lightning Protection System is complete system of air terminals(s), conductors, ground terminals, bonding conductors, transient voltage surge suppression devices and other components required to complete a system.

2.2 AIR TERMINAL:

Is the component of the system that is intended to intercept the lightning strokes.

2.3 APPROVED:

Acceptable to the "authority having jurisdiction".

2.4 AUTHORITY HAVING JURISTICTION:

Is the organization, office or individual responsible for "approving" the equipment, and installation or a procedure.

2.5 BONDING:

An electrical connection between an electrically conductive object and a component of a lightning protection system that is intended to significantly reduce potential differences created by lightning currents.

2.6 CABLE: A conductor formed of a number of wires stranded together.

2.7 CHIMNEY:

A smoke or vent stack having a flue with cross sectional area less than 500 sq in (.3 sq m) and a total height of less than 75 feet (23m).

2.8 CONDUCTOR:

The portion of a lightning protection system that is intended to carry the lightning discharge to the ground.

2.8.1 MAIN CONDUCTOR:

A conductor that interconnects air terminals and serves as a down lead to ground.

2.8.2 BONDING CONDUCTOR:

A conductor intended to be used for potential equalization between metal bodies and the lightning protection system. Bonding conductors are not designed or intended to carry main lightning current.

2.9 FASTENER:

An attachment to secure the conductor to the structure.

2.10 GROUNDED:

Connected to earth or to some conducting body that is connected to earth.

2.10.1 GROUND GRID:

A system of grounding electrodes consisting of interconnected bare cables buried in the earth.

2.10.2 GROUND TERMINAL (ELECTRODE):

The portion of a lightning protection system that is installed for the purpose of providing electrical contact with earth.

2.11 LIGHTNING STRIKE:

The entire lightning event that can consist of one or more lightning strokes.

2.12 LOOP CONDUCTOR:

A conductor that encircles a structure that is used to interconnect ground terminals, main conductors or other grounded bodies.

2.13 METAL FRAME STRUCTURE:

A structure with electrically continuous structure members of sufficient size to provide electrical path equivalent to that of the lightning conductors in this standard.

2.14 SHALL:

Indicates a mandatory requirement of this Standard.

2.15 SHOULD:

Indicates a recommendation or that which is advised but not required.

2.16 SURGE ARRESTORS:

Are devices designed to limit damaging surge voltages by discharging or bypassing the current while maintaining the ability of repeating these functions. Heary Brothers Lightning Protection Co., Inc. and its Division Lightning Preventor of America do not manufacture Surge Arrestors nor do they warranty the equipment.

3. GENERAL REQUIREMENTS

3.1 GENERAL DESIGN REQUIREMENTS:

A lightning protection system using an Early Streamer Emission Air Terminal (s) shall be designed with provisions for inspection and maintenance.

3.2 Every installation shall be reviewed by a prior study to determine the level of protection required (See Figure 3.5.1).

3.3 The position of the E.S.E. air terminal, including height of above structure shall be determined in accordance with the level of protection required. (See Figure 3.5.1)

3.4 The number of terminals will depend on the system design under the Manufacturer's Standard based upon the dimensions of the area to be protected. (See Figure 3.5.1)

3.5 There are multiple styles of E.S.E. air terminals and systems available. For purposes of this standard they have been divided into separate levels of protection, with each level having its own installation requirements. A chart is provided (See Figure 3.5.1) as a general guideline in determining which level of protection best fits the requirements of the project.

3.6 All bolts on bolt pressure connectors require to be torqued at 150 pound-inches (17N-m).

3.7 This Manufacturer's standard is based upon Heary Bros.' 30 years experience in designing lightning protection systems. Because of the lack of a complete understanding of the interaction between lightning and ground based objects and the lightning attachment process, the number and placement of air terminals set forth in this Manufacturer's Standard is based solely on Heary Bros.' experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection, NFPA 780, states that the NFPA "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgments contained in its codes and standards."

Figure 3.5.1 Levels of Protection for ESE Lightning Protection Systems

FEATURES	LEVEL 1	LEVEL 2	LEVEL 3
Number of ESE Terminals Required Pursuant to System Design	1 Air Terminal (See Note: A)	1 Air Terminal (See Note: A)	1 Air Terminal (See Note: B)
Grounding Resistance Requirements	10Ω (ohms) or less	10 Ω (ohms) or less	25Ω (ohms) or less
Warranty	15 year material workmanship	15 year material workmanship	5 year material workmanship
Air Terminal height above all roof top projections	20' (6.1m)	20' (6.1 m)	7' (2 m)
Transient Voltage Surge Suppression	Shall be installed on all service entrances of electric, telephone, cable, and antenna lead-in.	Shall be installed on all service entrances of electric, telephone, cable, antenna lead-in.	Shall be installed on all service entrances of electric, telephone, cable, antenna lead-in.
ARL Listing and UL Listing mark on applicable components	Required	Required	Required
Building Height	Unlimited	Unlimited	Under 75' (23m)
Building Types	All	All	Residential, Farm, Agricultural, Small commercial.

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(Note: A)

Manufacturer's Installation Standard HBP-21Level 1 and Level 2 require one (1) ESE Air Terminal to be installed on the roof for every circular area of 337,810 feet. Structures may be on any height and the ESE lightning protection system must comply with all other requirements within this Manufacturer's Installation Standard HBP-21. This Manufacturer's standard is based upon Heary Bros.' 30 years experience in designing lightning protection systems. Because of the lack of a complete understanding of the interaction between lightning and ground based objects and the lightning attachment process, the number and placement of air terminals set forth in this Manufacturer's standard is based solely on Heary Bros.' experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lightning protection NFPA 780, states that the NFPA, "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

(Note: B)

Manufacturer's Installation Standard HBP-21 Level 3 requires one (1) ESE Air Terminal to be installed on the roof for every circular area of 70,650 feet. Structures may be of any height and the ESE lightning protection system must comply with all other requirements within this Manufacturer's Installation Standard HBP-21. The recommended number and placement of air terminals is based solely on Heary Bros.' 30 years of experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lighting protection, NFPA 780, states that the NFPA, "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

LEVEL 1

MANUFACTURER'S INSTALLATION STANDARD
FOR
EARLY STREAMER EMISSION LIGHTNING PROTECTION SYSTEMS

4. Level 1 General Installation and Component Requirements

4.1 An ESE lightning protection system installation consists of the following interconnected parts

(a) One or more ESE air terminals
(b) Mast and mounting systems - as required based on level of protection desired.
(c) Bonding conductors - as required based on level of protection.
(d) Ground system – Single grid to loop conductor system.
(e) Equipotential Bonding.
(f) Transient Voltage Surge Suppression.

4.1.1 The number of ESE air terminals will depend on the system design under the Manufacturer's Standard based upon the area indicated in Figure 3.5.1 for Level 1 type systems. The recommended number and placement of air terminals is based solely on Heary Bros.' 30 years of experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lightning protection, NFPA 780, states that the NFPA, "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

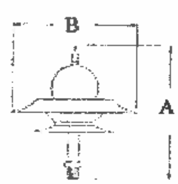
4.1.2 Components Tables 4.1.1.1 and Figure 4.1.1.2 provides minimum sizes and weights for use in ESE lightning protection system installation.

Figure 4.1.1.1

Type of conductor	Minimum Diameter	Copper Standard/ Metric	Aluminum Standard/ Metric
ESE Air Terminal	½" /12.7mm	½"/ 12.7 mm	½"/ 12.7 mm
Main Conductor Cable	Min Size each strand Weight Per Length Cross Sectional area	14AWG 375lbs /1000/ or 558 g/m 115,000 CM / 58 mm ^{2}	13AWG 190lbs/1000/ 283 g/m 192000 CM/ 97 mm ^{2}
Ground Terminals	Ground Rod / Ground Plate	¾" x 10' (20mm x 3000mm)/ 24" x 24" x 20 gauge (600mm x 600mm) pure Copper plate minimum of 2 contact points each 8 sq inch contact to plate	NA

Figure 4.1.1.2 Early Streamer Emission Air Terminal

A= 12"
B= 9"



4.2 ESE Air terminals shall be sufficiently rigid to withstand mechanical damage. They shall be constructed of copper, copper alloy, aluminum or stainless steel. The main conductive parts of the ESE air terminal shall have the minimum dimensions in accordance with table 4.1.1.1 and Figure 4.1.1.2 for minimum dimensions of ESE Air Terminal.

4.2.1 Installation: Air terminals and their supports shall be mounted in such a way as to withstand the lightning currents, electromotive force, corrosion and effects of weather, heat, humidity, snow and wind.

NOTE: Wind design requirements should be consistent with local building code requirements.

4.2.2 Where an air terminal or mast is supported by conductive guys, the guys shall be connected from their points of anchorage to the closest down conductor(s) by a conductor equivalent in size to that of the down conductor(s).

4.2.3 The tip of any ESE air terminal or mast shall not be less than 20' (6.1m) above the protected structures, including antennas, cooling towers, tanks, roofs and masts.

4.2.4 The ESE air terminal shall be mounted on structures such as flagpoles, the top of pylons, light standards or on dedicated supports for structures at certain facilities, such as, sports facilities and stadiums, golf courses, public parks, camping sites and racetracks. The ESE unit shall be mounted at an elevation indicated in Section 4.2.3.

4.3 Storage areas for Flammable and Combustible Liquids or Flammable Gases. Structures containing these materials shall be grounded, but grounding alone does not constitute sufficient protection against atmospheric discharges.

4.4 Surge Suppression devices shall be installed on electric and telephone service entrances, antenna lead-ins, and electrical and electronic cables/ conductors entering or exiting the building.

4.4.1 Electrical Surge Suppression device shall be internally redundant and modular, in both surge suppression elements and fusing in construction for ease of field reparability. Manufacturers shall warranty the modules and fuse for the lifetime of the unit, with a minimum 10-year full unit warranty. Units shall be mounted as to minimize inductance installation. (i.e. As close to equipment to be protected or by use of documented low inductance cabling).

4.5 General, In determining the necessity of bonding a metal body to a lightning protection system, the following factors shall be considered:

A. Bonding is required only if there is a likely to be a side flash between the lightning protection system and other grounded medium.

B. The influence of a non-grounded metal body, such as metal window frame in a non-conductive medium, is limited to its effectiveness as a short circuit conductor if a side flash occurs therefore, does not necessarily require bonding to the lightning protection system.

C. Bonding distance requirements depend on the technical evaluation of the number of down conductors and their location, the interconnection of other grounded systems, the proximity of grounded metal bodies to the down conductors and the flashover medium (Air or solid materials).

D. Metal bodies located in a steel frame structure shall be permitted to be inherently bonded through construction and further bonding shall not be required.

E. Metal antenna masts or supports located on a protected structure shall be bonded to the lightning protection system using main size conductors and listed fittings. The height of the air terminal shall maintain the minimum protection above these objects as specified in Section 4.2.3

NOTE: For additional bonding requirements see Section 5.2 and 5.3.

4.6 Components

4.6.1 A lightning protection system shall be made of components that are resistant to corrosion or shall be acceptably protected against corrosion. The following materials are acceptable:

A. Copper of the grade required for commercial electrical work. Or a copper alloy with similar characteristics. Usually of 98 percent conductivity when annealed.

B. Aluminum conductors as acceptable as electrical grade aluminum.

4.6.2 Components shall be protected against deterioration due to local conditions. Any part of a copper system that is exposed to direct action of chimney gasses or other similar corrosive gases shall be protected. Aluminum components are not required to be protected.

4.6.3 Metals shall be used in combinations that are galvanically compatible.

A. Copper components shall not be installed directly on aluminum roofing, siding or other aluminum surfaces.

B. Aluminum lightning protection components shall not be installed directly on copper roofing material or other copper surfaces or below the run off of a copper surface.

C. Aluminum conductors and components shall not be:

a. Embedded in concrete or masonry.

b. In direct contact with a surface coated with alkaline base paint, or

c. Installed in wet locations, for example eave troughs or downspouts.

d. Installed in direct contact with earth.

D. Components used for connection of aluminum down conductors to copper or copper-clad grounding equipment shall provide separation between aluminum and copper materials. These fittings may be a Stainless steel sleeve with internal separation or other connector that provides proper separation of aluminum and copper components.

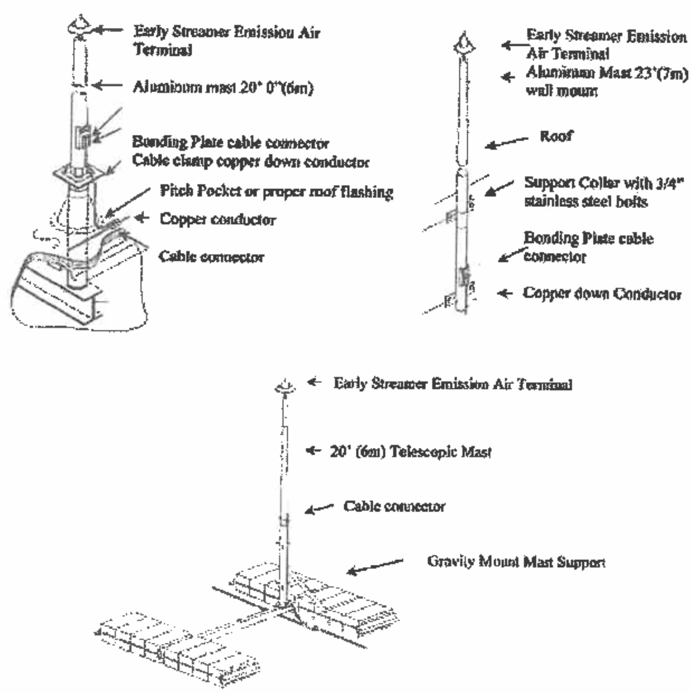
4.6.4 Unless otherwise indicated in this standard, an air terminal shall be provided for each part of a structure that is likely to be damaged by lightning. Based on the individual design requirements of the level of protection required.

5. Level 1 Air Terminal Installation Requirements

5.1 Early Streamer Emission Air Terminals

A. ESE Air Terminals shall be mounted at a height consistent with the requirements of Section 4.2.3 or a minimum of 20' above all projections on the roof.
See Figure 5.1.1 for sample mast mounting details.

Figure 5.1.1



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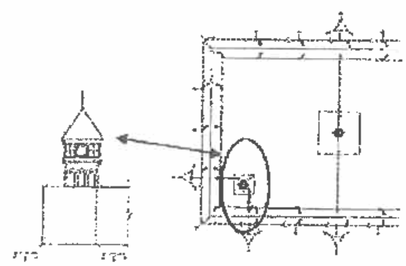
B. ESE Air Terminals shall be provided in proper quantity and location based on the system design under Manufacturer's Standard. See Figure 3.5.1 Level 1 requirements. The recommended number and placement of air terminals is based on Heary Bros.' experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lightning protection, NFPA 780, states that the NFPA "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

C. Additional ESE air terminals shall be provided in situations where steeples, cupolas, crosses, stacks, chimneys, etc. project above the protected roof area. This requirement applies to all projections which could provide a potential upward streamer release. The addition air terminals shall be provided regardless of whether or not the projection is within or outside the area covered by the system design under the Manufacturer's Standard. See Figure 5.1.2. The recommended number and placement of air terminals is based on Heary Bros.' experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lightning protection, NFPA 780, states that the NFPA "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

Figure 5.1.2



D. Conductors shall be securely fastened to roof or structure at intervals not exceeding 3'0" on center.

E. ESE Air Terminals shall be provided with a minimum of two paths to ground. Cables shall maintain a horizontal or downward path to ground to avoid "U" and "V" (down and up) pockets. See Figure 5.1.4

F. No Bend of a conductor shall form an included angle of less than 90 degrees or have a radius of bend less than 8 inches nor shall a conductor rise greater than 8". However conductors may raise a rate of 3" per 12" of run. See Figure 5.1.3 and Figure 5.1.4

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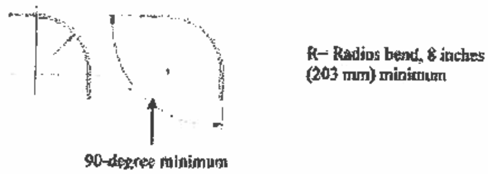
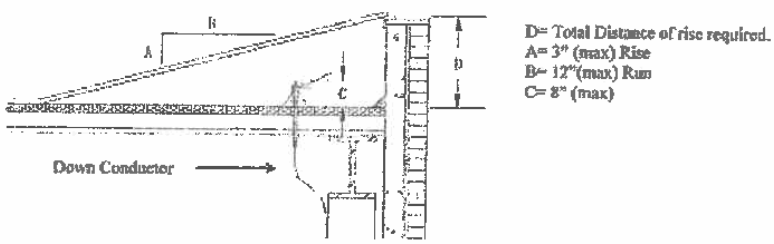
Figure 5.1.3



NOTE: Through roof, through wall and tee type connectors do not need to comply with this requirement

Figure 5.1.4

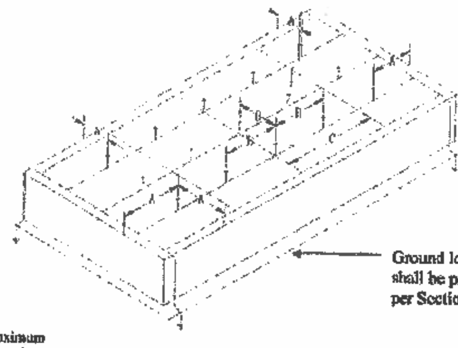


Note: Ramp may be constructed of wood, metal, fiberglass, plastic, PVC etc, provided the construction is such that it will be resistant to corrosion and rot. The conductor shall be attached or support on ramp as required in Section 5.1.D

5.1.1 In situations where multiple air terminals are required, the perimeter air terminals shall be positioned so that they are not more than 230' (70m) for the outside edge of the building nor shall the ESE Air Terminals be spaced more than 460' (140m) apart at any time. A cross run cable shall be provided at intervals of 1000' (305m) when building exceeds 2000' (610m) in length in any direction. See Fig 5.1.1.1. The recommended number and placement of air terminals is based solely on Heary Bros.' 30 years of experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed ho have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lightning protection, NFPA 780, states that the NFPA, "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

5.1.2 Down Conductors in situations where multiple ESE Air Terminals are required shall be spaced at intervals no more than 500' (152m) apart around the perimeter of the structure. The recommended number and placement of air terminals is based solely on Heary Bros.' 30 years of experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lightning protection, NFPA 780, states that the NFPA, "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

Figure 5.1.1.1



A= 230' (70m) maximum
B= 460' (140 m) maximum
C= 1000' (305m)

6. Level I Bonding Requirements

6.1 Roof top Interconnection loop

A. An interconnection loop around the perimeter of the roof structure shall be provided to which ESE Ground Conductors shall be bonded.

B. Loops shall be provided at all intermediate and lower roof levels and connected at a minimum of two (2) locations to the down conductors.

a. Bonding connections shall be made with main size conductor to all rebar, reinforcing rod, structural steel, interior wall wire mesh, nylon mesh in stucco walls, etc. whether exposed or not at all inside and outside corners of structure as a minimum. Additional bonding connections shall be made at intervals not exceeding 60' (18m) around the perimeter of the structure. Care shall be taken to assure that all rebar, reinforcing rod, structural steel, interior wall wire mesh, nylon mesh in stucco walls, et. Whether exposed or not is electrically continuous or made so. (See Fig. 6.2.4 and Fig 6.25).

b. Down Conductors shall be bonded to the structural steel, reinforcing rod or other structural support at the top and bottom of conductor run.

Figure 6.2.4

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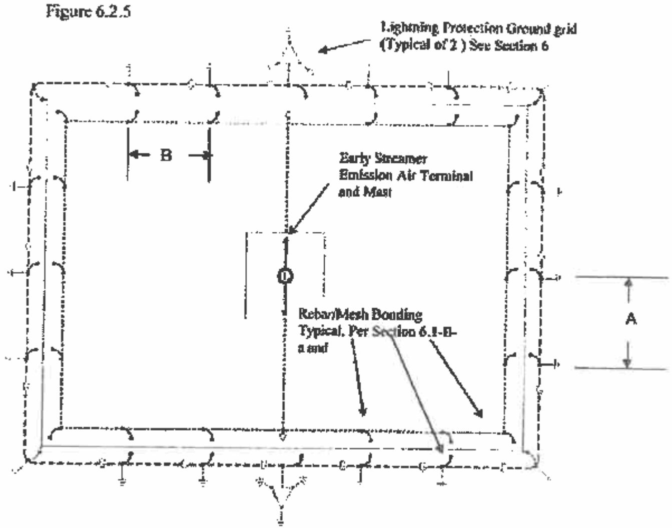
Figure 6.2.5



A= 60' (18m) Maximum Spacing
B= 60' (18m) Maximum Spacing

Note: For Base Grounding requirements see Section 7

6.2 Bonding Requirements

A. Roof top air handling units, equipment, or other roof top equipment shall be bonded to the system where the equipment is within 6' (1.8m) of a lightning protection conductor unless;

B. Inherently bonded to the lightning protection system.

C. Sanitary vents, roof drains, flashings, copings, etc. located within 6' (1.8m) of a lightning protection conductor, shall be bonded via secondary sized conductor to the lightning protection system.

7. Level 1 Grounding System Requirements

7.1 Down Conductors"

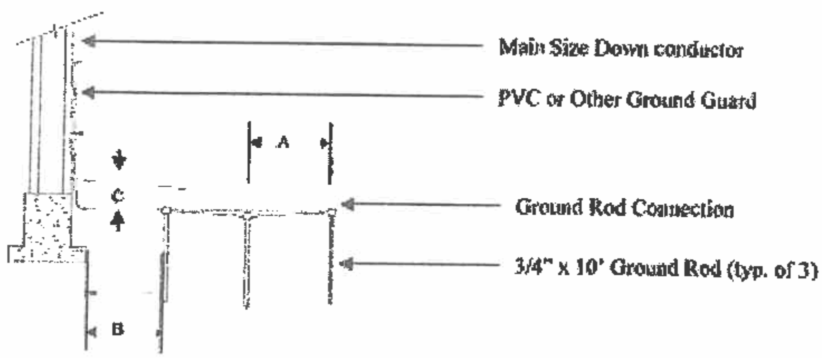
7.1.1 A minimum of Two (2) Down Conductors Shall be provided for each ESE Lightning Protection System. In cases where multiple ESE Air Terminals are used then additional down conductors shall be provided in accordance with Section 5.1.2

7.1.2 Down Conductors shall be spaced at least 10' (3m) apart.

7.1.3 Down conductors and other conductor where exposed to potential mechanical damage shall be protected against such damage by means of PVC, Fiberglass conduit sleeve, or metal conduit. (Metal conduit may be used provided the upper and lower portions are bonded to the down conductor). At ground level the bottom 8' (2.4m) of exposed down conductor shall be protected. See figure 7.2.1.1

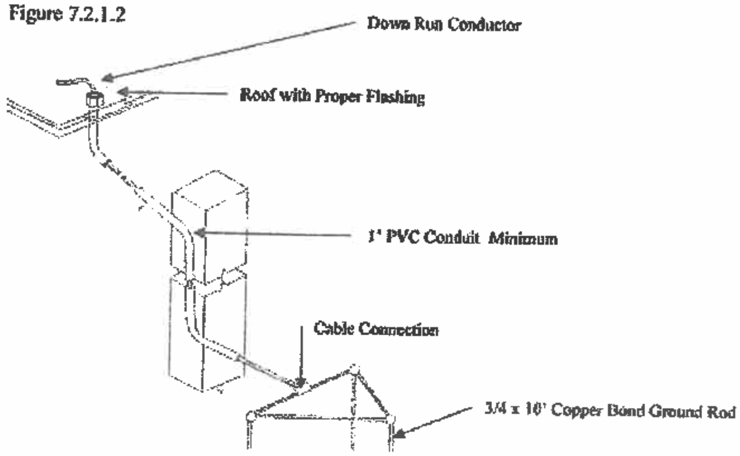
7.1.4 Down Conductors may be coursed within the construction of the building provided they are properly protected. See Figure 7.2.1.2

Figure 7.2.1.1



A= 10' (3 m) Minimum
B= 2' (0.6m) Minimum
C= 3' (0.3m) Minimum

Figure 7.2.1.2



7.1.5 For masts that are electrically conductive then the mast shall be permitted to be used as a down conductor.

A. If electrically continuous, structural steel shall be permitted to be used as the down conductor.

B. Test joints shall be provided for each down conductor. They shall be accessible and located as near as practicable to the ground termination.

7.1.6 Masonry Anchors used to secure the lightning protection materials shall have a minimum outside diameter of ¼ in. (6.4mm) and shall be set with care. Holes made to receive the body of the anchor shall be of correct size, made with the proper tools and made in brick, stone or other masonry unit. Fasteners shall not be installed in mortar joints. When anchors are installed, the fit shall be tight against moisture, thus reducing the possibility of damage due to freezing.

7.1.7 Connector Fittings shall be used at all "end to end, "tee" or "Y" splices of lightning conductors. They shall be attached so as to withstand a pull test of 200 lbs. Fittings used for required connections shall be of bolted, welded or high compression type and bear the ARL Listing and UL Listing.

7.1.8 Conductors shall be fastened securely to the structure upon which they are placed at intervals not exceeding 3 ft (1m). The fasteners, attached by nails, screws, bolts or adhesives as necessary, shall not be subject to breakage and shall be of the same material as the conductor or of a material as resistant to corrosion as that of the conductor. No combination of materials shall be used that forms an electrolytic couple of such nature that, in the presence of moisture, corrosion is accelerated.

7.2 Grounding

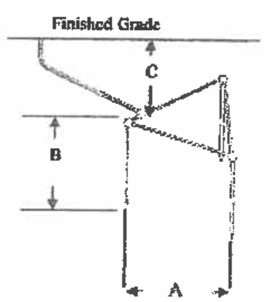
7.2.1 Ground Terminations: A study shall be conducted to engineer a grounding system to a maximum of 10 ohms resistance in accordance with IEEE fall of potential ANSI/IEEE 141, *Recommended Practice for Electric Power Distribution for Industrial Power Plants,* method. The components for the grounding system shall be selected to be suitable for the soil conditions and the other side factors such as cathodic protection.

7.2.2 Ground electrodes shall be of copper-bond steel in sufficient number as to achieve a 10-ohm maximum resistance to ground. Ground electrodes shall be installed so that the top of the electrode is a minimum 3' (1m) below finished grade minimum and 2' (0.6m) away from the foundation wall. See Figure 7.2.1.1

7.2.3 Ground rod terminations. The down conductor shall be attached to the ground rod by mechanical clamp, exothermic welding or brazing. Clamps shall be suitable for direct burial.

7.2.4 Each down conductor shall terminate at a ground terminal system. A minimum of 3 ground terminals shall be provided per down conductor location. Configured either in a straight line or in delta formation. Where the ground terminals are spaced a minimum of 10' (3m) apart. See Figures 7.2.3.1 and 7.2.3.2

Figure 7.2.3.1



A– 10' (3m) Minimum

B– 10' (3m) Minimum (Typical)

C– 3' (1m) Minimum

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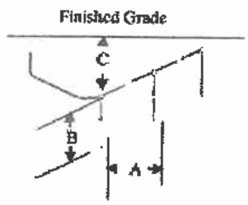
Figure 7.2.3.2



A- 10' (3m) Minimum

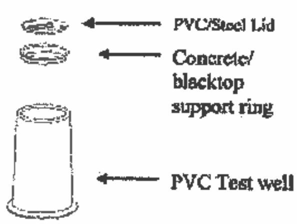
B- 10' (3m) Minimum (Typical)

C- 3' (1m) Minimum

7.2.5 Ground terminals located under slabs or in crawl spaces shall be installed as near as practicable to the outside perimeter of the structure.

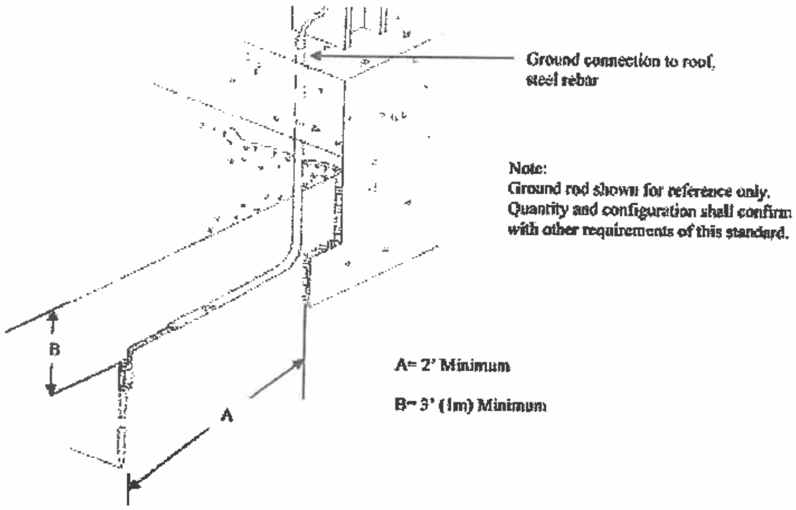
7.2.6 Electrical system grounding electrodes shall not be used in lieu of lightning ground rods. This provision shall not prohibit the required bonding together of grounding electrodes of different systems.
NOTE 1: For Further information, see NFPA 70 National Electric Code, which contains detailed information on the grounding of electrical systems.
NOTE 2: Ground rod or ground ring/loop electrodes should be installed below the frost line where practicable and in accordance with Section 7.2.8

Figure 7.2.6.1



7.2.7 Grounding ring/loop Electrode encircling the structure shall be provided and in direct contact with the earth at a depth of not less than 2ft. The ground ring conductor shall be sized at a minimum of that of the main sized conductor. See Figure 7.2.8.1

Figure 7.2.8.1



7.2.8 Common Grounding. All grounding media in or on a structure shall be interconnected to provide a common ground potential. This shall include, but not be limited to lightning protection, electrical services, telephone and antenna system grounds as well as underground metallic piping systems. Such piping systems include water service, well casings located within 25ft (7.6m) of the structure, underground conduits (not already bonded) etc. Main size lightning conductors shall be used for interconnecting these grounding systems to the lightning protection system.

7.2.9 Common Ground Bonding. If electric telephone or other systems are bonded to metallic water pipe, only one connection from the lightning protection system to the water pipe system is necessary, provided that the water pipe is electrically continuous between all systems. In situations where there are separate services for domestic and fire water entering the building both systems shall be bonded to the lightning protection grounding system. This may be accomplished via direct connection or through the ground loop system.

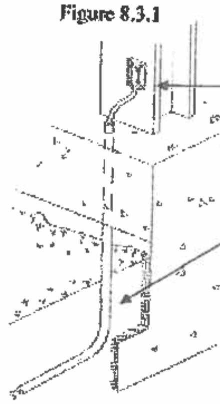
8. Level 1 Structural Steel Systems

8.1 General. The steel framework of a structure shall be permitted to be utilized as the main conductor of a lightning protection system if it is electrically continuous or is made electrically continuous.

8.2 Steel Structure Terminals. Ground terminals shall be connected to approximately every other steel column around the perimeter of the structure at intervals averaging not more than 60ft (18m). Ground terminals shall be connected together via a main size conductor as indicated in sec 7.2. Connections shall be made near the base of the column, with a surface contact area not less than 8 sq inches (5200mm²) or by exothermic welding. Bonding plates shall have bolt pressure cable connectors and shall be bolted securely to the structural steel framework so as to maintain electrical continuity.

8.3 Connections to Framework. Conductors shall be connected to cleaned areas of the structural steel framework by the bonding of plates having a surface contact area of not less than 8 sq in (5200mm²). The area of attachment shall be free of paint, grease oil and debris. (See Figure 8.3.1)

Figure 8.3.1



8.4 Early Streamer Emission Air terminals shall be permitted to be bonded directly to structural, by means of direct attachment through mast or by use of two interconnection wires routed through roof and bonded at the top of the structural steel in the manner described in Section 8.3

8.5 Metal Bodies. Certain Metal bodies located outside or inside the structure contribute to lightning hazards because they are grounded or assist in providing a path to ground for lightning currents. Such metal bodies shall be bonded to the lightning protection system in accordance with Section 4.5.

8.6 Concealment in Steel Reinforced Concrete. Conductors or other components of the lightning protection system concealed in steel reinforced concrete units shall be connected to the reinforcing steel. Concealed down conductors shall be connected to vertical reinforcing steel. Roof conductors or other concealed horizontal conductors runs shall be connected to reinforcing steel/structural steel at intervals not exceeding 60ft (18m) and at all corners. See Section 6.

8.7 Down Conductors coursed on or in reinforced concrete columns or on structural steel columns shall be connected to the reinforcing steel and/or structural steel member at its upper and lower extremities. In the case of long vertical members an additional connection shall be made at intervals not exceeding 200ft (60m). Such connections shall be made using listed clamps or listed bonding plates or by exothermic welding. The use of PVC conduit or other non-metallic chase does not negate the need for these interconnections.

LEVEL 2

MANUFACTURER'S INSTALLATION STANDARD

FOR

EARLY STREAMER EMISSION LIGHTNING PROTECTION SYSTEMS

9. Level 2 General Installations and Component Requirements

9.1 An ESE lightning protection system installation consists of the following interconnected parts

(a) One or more ESE air terminals
(b) Mast and mounting systems – as required based on level of protection desired
(c) Bonding conductors – as required based on level of protection.
(d) Ground system – Single grid to loop conductor system
(e) Equipotential Bonding
(f) Transient Voltage Surge Suppression

9.2 The number of ESE air terminals will depend on the system design under the manufacturer's Standard based on the area as indicated in Figure 3.5.1 for Level 2 Systems. The recommended number and placement of air terminals is based solely on Heary Bros.' 30 years of experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumer should be aware that the NFPA, in issuing its standard for lightning protection, NFPA 780, states that the NFPA, "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

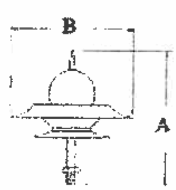
9.3 Components Tables Figure 9.3.1 and Figure 9.3.2 provide minimum sizes and weights for use in ESE lightning protection system installation.

Figure 9.3.1

Type of conductor	Minimum Diameter	Copper Standard/ Metric	Aluminum Standard/ Metric
ESE Air Terminal	1/2 "/ 12.7mm	1/2" / 12.7 mm	1/2" / 12.7 mm
Main Conductor Cable	Min Size each strand Weight Per Length Cross Sectional area	14AWG 375lbs /1000/ or 558 g/m 115,000 CM / 58 mm^2	13AWG 190lbs/1000/ 283 g/m 192000 CM/ 97 mm^2
Ground Terminals	Ground Rod / Ground Plate	¾" x 10' (20mm x 3000mm)/ 24" x 24"x 20 gauge (600mm x 600mm) pure Copper plate minimum of 2 contact points each 8 sq inch contact to plate	NA

Figure 9.3.2 Early Streamer Emission Air Terminal

A= 12"
B= 9"



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9.4 ESE Air Terminals shall be sufficiently rigid to withstand mechanical damage. They shall be constructed of copper, copper alloy, aluminum or stainless steel. The main conductive parts of the ESE air terminals shall have the minimum dimensions in accordance with Figures 9.3.1 and Figure 9.3.2 for minimum dimensions of ESE Air Terminals Installation: Air terminals and their supports shall be mounted in such a way as to withstand the lightning currents, electromotive force, corrosion and effects of weather, heat, humidity, snow and wind

NOTE: Wind design requirements should be consistent with local building code requirements.

9.4.1 Where an air terminal or mast is supported by conductive guys, the guys shall be connected from their points of anchorage to the closest down conductor(s) by a conductor equivalent in size to that of the down conductor(s).

9.4.2 The tip of any ESE air terminal shall not be less than 20' (6.1m) above the protected structures, including antennas, cooling towers, tanks, roof and masts.

9.4.3 The ESE air terminals shall be mounted on structures such as flagpole, the top of pylons, light standards or on dedicated supports for structures at certain facilities, such as, sports facilities and stadiums, golf courses, public parks, camping sites and racetracks. The ESE unit shall be mounted at an elevation as indicated in Section 9.4.2.

9.5 Storage Areas for flammable and combustible liquids or flammable gases. Structures containing these materials shall be grounded, but grounding alone does not constitute sufficient protection against atmospheric discharges.

9.5.1 Electrical Surge Suppression device shall be internally redundant and modular, in both surge suppression elements and fusing in construction for ease of field reparability. Manufacturers shall warranty the modules and fuse for the lifetime of the unit, with a minimum 10-year full unit warranty. Units shall be mounted as to minimize inductance installation. (I.e. As close to equipment to be protected or by use of documented low inductance cabling.)

Note 1: Electrical systems and utilization equipment within the structure may require further surge suppression. Such protection is not part of this standard. NFPA 70, National Electric Code and ANSI/IEEE C62.41-1991 2nd Edition, shall be consulted for further information and installation requirements.

Note 2: Illustrations shown in this are those of Heary Brothers Lightning Protection Co., Inc. (HBLP) and its division Lightning Preventor of America (LPA). HBLP and LPA do not manufacture or warranty surge protection devices. Warranties required of this standard shall be the responsibility or the surge protection device manufacturer.

9.6 General. In determining the necessity of bonding a metal body to a lightning protection system, the following factors shall be considered:

A. Bonding is required only if there is a likely to be a side flash between the lightning protection system and other grounded medium.

B. The influence of a non-grounded metal body, such as a metal window frame in a non-conductive medium, is limited to its effectiveness as a short circuit conductor if a side flash occurs therefore, does not necessarily require bonding to the lightning protection system.

C. Bonding distance requirements depend on the technical evaluation of the number of down conductors and their location, the interconnection of other grounded systems, the proximity of grounded metal bodies to the down conductors and the flashover medium (air or solid materials).

(a) Metal bodies located in a steel frame structure shall be permitted to be inherently bonded through construction and further bonding shall not be required.

(b) Metal antenna masts or supports located on a protected structure shall be bonded to the lightning protection system using main size conductors and listed fittings. The height of the air terminal shall still maintain the minimum protection above these objects as specified in Section 9.4.2.

9.7 Components

9.7.1 A lightning protection system shall be made of components that are resistant to corrosion or shall be acceptably protected against corrosion. The following materials are acceptable:

A. Copper of the grade required for commercial electrical work. Or a copper alloy with similar characteristics. Usually of 98 percent conductivity when annealed.

B. Aluminum conductors as acceptable as electrical grade aluminum.

9.7.2 Components shall be protected against deterioration due to local conditions. Any part of a copper system that is exposed to direct action of chimney gases or other similar corrosive gases shall be protected. Aluminum components are not required to be protected.

9.7.3 Metals shall be used in combinations that are galvanically compatible.

A. Copper components shall not be installed directly on aluminum roofing, siding, or other aluminum surfaces.

B. Aluminum lightning protection components shall not be installed directly on copper roofing material or other copper surfaces or below the run off of a copper surface.

C. Aluminum Conductors and components shall not be:

a) Embedded in concrete or masonry;

b) In direct contact with a surface coated with alkaline base paint; or

c) Installed in wet locations, for example eave troughs or downspouts.

d) Installed in direct contact with earth

D. Components used for connection of aluminum down conductors to copper or copper-clad grounding equipment shall provide separation between aluminum and copper materials. These fittings may be a stainless steel sleeve with internal separation or other connector that provides proper separation of aluminum and copper materials.

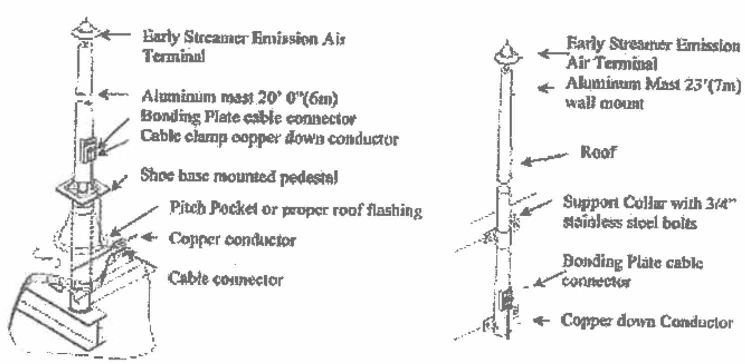
9.7.4 Unless otherwise indicated in this standard, an air terminal shall be provided for each part of a structure that is likely to be damaged by lightning. Based on the individual design requirements of the level of protection required.

10. Level 2 Air Terminals Installation Requirements

10.1 Early Streamer Emission Air Terminals

A. ESE Air Terminals shall be mounted at a height consist with the requirements of Section 9.4.2 or a minimum of 20' above all projections on the roof. See Figure 10.1.1 for sample mast mounting details.

Figure 10.1.1



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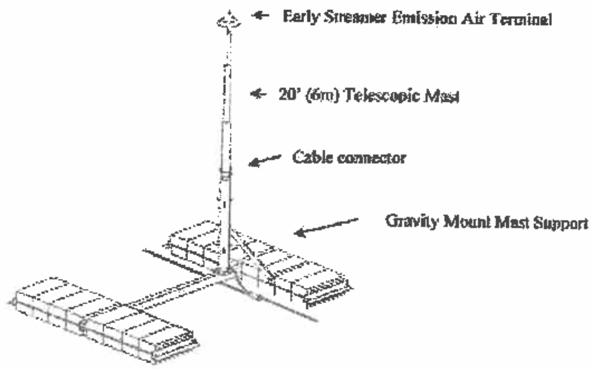
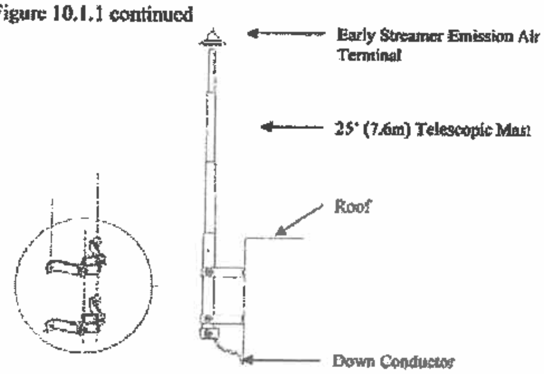


Figure 10.1.1 continued



10.2 ESE Air Terminals shall be provided in proper quantity and location based on the system design under the Manufacturer's Standard. See Figure 3.5.1 for Level 2. The recommended number and placement of air terminals is based on Heary Bros.' experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lightning protection, NFPA 780, states that the NFPA "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

10.3 Conductors shall be securely fastened to roof or structure at intervals not exceeding 3'0" on center.

10.4 Additional ESE air terminals shall be provided in situations where steeples, cupolas, crosses, stacks, chimneys, etc project above a protected roof area. This requirement applies to all projections which could provide a potential upward streamer release. The addition air terminals shall be provided regardless of whether or not the projection is within or outside the area covered by the system design under the Manufacturer's Standard. See Figure 10.2.1. The recommended number and placement of air terminals is based on Heary Bros.' experience and its air terminals and the configuration of those

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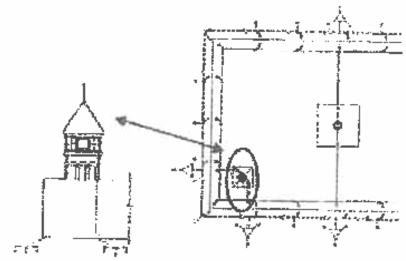
terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lightning protection, NFPA 780, states that the NFPA "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

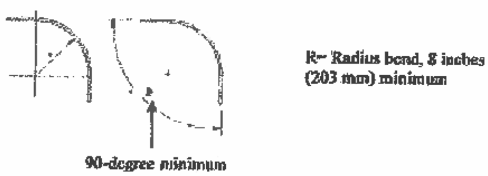
Figure 10.2.1



10.5 ESE Air Terminals shall be provided with a minimum of two paths to ground. Cables shall maintain a horizontal or downward path to ground to avoid "U" and "V" (down and up) pockets.

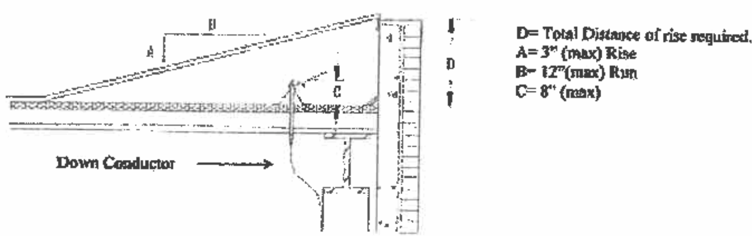
10.6 No Bend of a conductor shall form an included angle of less than 90 degrees or have a radius of bend less than 8 inches nor shall a conductor rise greater than 8". However Conductors may rise at a rate of 3" per 12" of run. See Figure 10.5.1 and Figure 10.6.1

Figure 10.5.1



NOTE: Through roof, through wall and tee type connectors do not need to comply with this requirement.

Figure 10.6.1



Note: Ramp may be constructed of wood, metal, fiberglass, plastic, PVC etc, provided the construction is such that it will be resistant to corrosion and rot. The conductor shall be attached or support on ramp as required in

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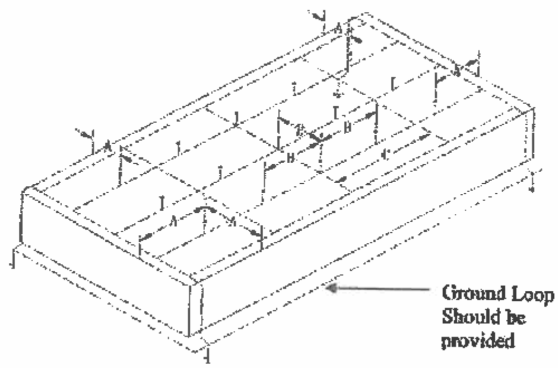
10.7 In situations where multiple air terminals are required, the perimeter air terminals shall be positioned so that they are no more than 230' (70m) from the outside edge of the building nor shall be ESE Air Terminals be spaced more than 460' (140m) apart at any time. A cross run cable shall be provided at intervals of 1000' (305m) When building exceed 200' (610m) in length in any direction. See Figure 10.8.1. The recommended number and placement of air terminals is based solely on Heary Bros.' 30 years of experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lightning protection, NFPA 780, states that the NFPA, "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

10.8 Down Conductors in situations where multiple ESE Air Terminals are required shall be spaced at intervals no more than 500' (152m) apart around the perimeter of the structure.

Figure 10.8.1



A– 230' (70m) maximum
B– 460' (140 m) maximum
C– 1000' (305m)

10.9 Bonding connections shall be made with main size conductor to all rebar, reinforcing rod, structural steel, interior wall wire mesh, nylon mesh in stucco walls, etc., whether exposed or not, at the upper and lower extremities of each down conductor. Care shall be taken to assure that all rebar, reinforcing rod, structural steel, interior wall mesh, nylon mesh in stucco walls etc, whether exposed or not is electrically continuous or made so. (See Fig. 10.9.1 and Fig 10.9.2).

Figure 10.9.1

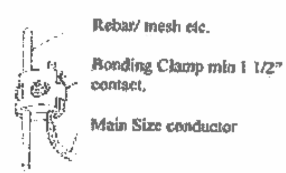


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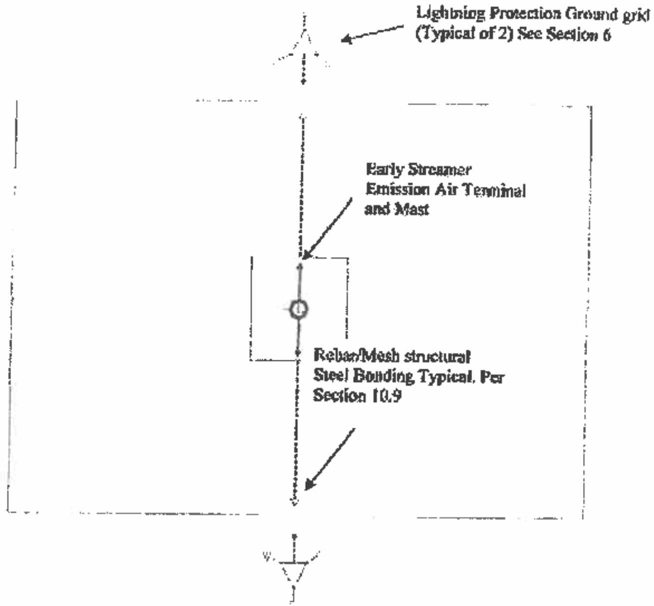
Figure 10.9.2



11. Level 2 Bonding Requirements

11.1 Roof top air handling units, equipment, or other roof top equipment shall be bonded to the system where the equipment is within 6' (1.8m) of a lightning protection conductor unless.

A. Inherently bonded to the lightning protection system.

11.2 Sanitary vents, roof drains, flashings, copings, etc located within 6' (1.8m) of a lightning protection conductor, shall be bonded via secondary sized conductor to the lightning protection system.

12. Level 2 Grounding System Requirements

12.1 Down Conductors and Grounding

12.2 A minimum of two (1) down conductors shall be provided for each ESE Lightning Protection System. In cases where multiple ESE Air Terminals are used then additional down conductors shall be provided in accordance with Section 10.8.

12.3 A single down conductor shall be permitted to be used where the length of run does not exceed 65ft (19m).

12.4 If the horizontal length is greater than the vertical length, two (2) down conductors shall be required and separated a minimum of 10' (3m).

12.4.1 For lengths greater than 65' (19m) two conductors shall be required.

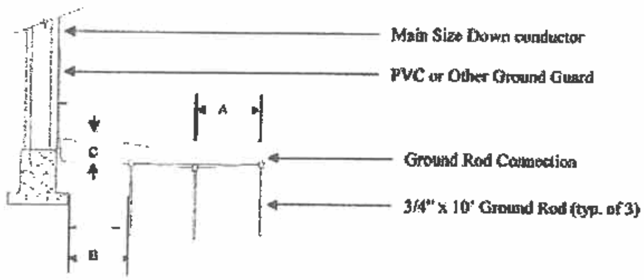
12.4.2 For masts, a single down conductor only shall be required.

12.4.3 If electrically conductive, the mast shall be permitted to be used as the down conductor.

12.5 Down Conductors and other conductor where exposed to potential mechanical damage shall be protected against such damage by means of PVC, Fiberglass conduit sleeve, or metal conduit. (Metal conduit may be used provided the upper and lower portions are bonded to the down conductor). At ground level the bottom 8' (2.4m) of exposed down conductor shall be protected. See figure 12.4.1.

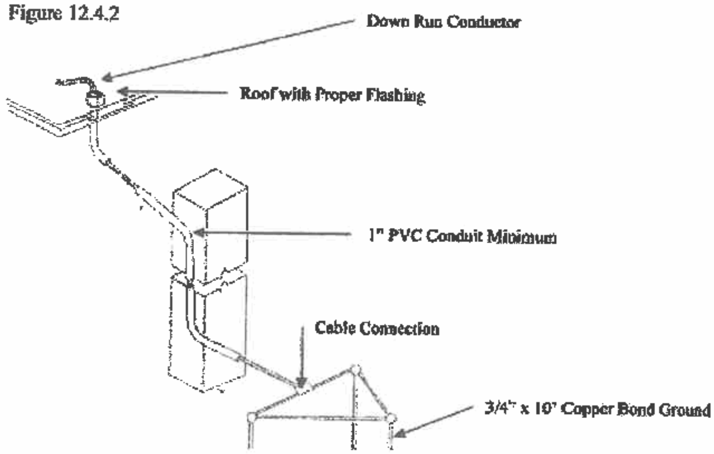
12.6 Down Conductors may be coursed within the construction of the building provided they are properly protected. See Figure 12.4.2.

Figure 12.4.1



A= 10' (3 m) Minimum
B= 2' (0.6m) Minimum
C= 1' (0.3m) Minimum

Figure 12.4.2



12.7 For masts that are electrically conductive then the mast shall be permitted to be used as a down conductor.

12.7.1 If electrically continuous, structural steel shall be permitted to be used as the down conductor.

12.8 Masonry Anchors used to secure the lightning protection components shall have a minimum outside diameter of ¼" (6.4mm) and shall be set with care. Holes made to receive the body of the anchor shall be of correct size, made with the proper tools and made in brick, stone or other masonry unit. Fasteners shall not be installed in mortar joints. When anchors are installed the fit shall be tight against moisture, thus reducing the possibility of damage due to freezing.

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12.9 Connector Fittings shall be used at all "end to end", "tee" or "y" splices of lightning conductors. They shall be attached so as to withstand a pull test of 200 lbs. Fittings used for required connections shall be of bolted, welded, or high compression type and bear the ARL Listing and UL Listing.

12.10 Conductors shall be fastened securely to the structure upon which they are placed at intervals not exceeding 3 ft (1m). The fasteners, attached by nails, screws, bolts or adhesives as necessary, shall not be subject to breakage and shall be of the same material as the conductor or of a material as resistant to corrosion as that of the conductor. No combination of materials shall be used that forms an electrolytic couple of such nature that, in the presence of moisture, corrosion is accelerated.

12.11 Ground Terminations: A study shall be conducted to engineer a grounding system to a maximum of 10 ohms resistance in accordance with IEEE fall of potential ANSI/IEEE 141, *Recommended Practice for Electric Power Distribution for Industrial Power Plants,* method. The components for the grounding system shall be selected to be suitable for the soil conditions and the other side factors such as cathodic protection.

12.12 Ground electrodes shall be of copper-bond steel in sufficient number as to achieve a 10-ohm maximum resistance to ground. Ground electrodes shall be installed so that the top of the electrode is a minimum 1' (0.3m) below finished grade minimum and 2' (0.6m) away from the foundation wall. See Figure 12.4.1

12.13 Ground Rod terminations. The down conductor shall be attached to the ground rod by mechanical clamp, exothermic welding or brazing. Clamps shall be suitable for direct burial.

12.14 Each down conductor shall terminate at a ground terminal system. A minimum of 3 ground terminals shall be provided per down conductor location. Configured either in a straight line or in delta formation. Where the ground terminals are spaced a minimum of 10' (3m) apart. See Figures 12.4.1 and 12.4.2.

12.15 Ground terminals located under slabs or in crawl spaces shall be installed as near as practicable to the outside perimeter of the structure.

12.16 Electrical system grounding electrodes shall not be used in lieu of lightning ground rods. This provision shall not prohibit the required bonding together of grounding electrodes of different systems.

NOTE 1: For further information, see NFPA 70 National Electric Code, which contains detailed information on the grounding of electrical systems.

12.17 Ground ring/loop electrode encircling the structure should be provided and in direct contact with the earth at a depth of not less than 2 ft. The ground ring conductor shall be sized at a minimum of that of the main sized conductor.

12.18 Common Grounding. All grounding media in or on a structure shall be interconnected to provide a common ground potential. This shall include lightning protection, electric service, telephone and antenna system grounds as well as underground metallic piping systems. Such piping systems include water service, well casings located within 25ft (7.6m) of the structure, underground conduits (not already bonded) etc. Main size lightning conductors shall be used for interconnecting these grounding systems to the lightning protection system.

12.19 Common Ground Bonding. If electric, telephone or other systems are bonded to metallic water pipe; only on connection from the lightning protection system to the water pipe system is necessary, provided that the water pipe is electrically continuous between all systems. In situations where there are separate services for domestic and fire water entering the building both systems shall be bonded to the lightning protection grounding system. This may be accomplished via direct connection or through the ground loop system.

12.20 If the horizontal length is greater than the vertical length, two down conductors shall be required and separated a minimum of 10' (3m).

(a) For lengths greater than 65' (19m) two conductors shall be required.

(b) For masts, a single down conductor only shall be required.

(c) If electrically conductive, the mast shall be permitted to be used as the down conductor.

13. Level 2 Structural Steel Systems

13.1 General. The steel framework of a structure shall be permitted to be utilized as the main conductor of a lightning protection system if it is electrically continuous or is made electrically continuous.

13.2 Steel Structure Terminals. Ground terminals shall be connected to approximately every other steel column around the perimeter of the structure at intervals averaging not more than 60 ft (18m). Connections shall be made near the base of the column, with a surface contact area not less than 8 sq inches (5200mm²) or by exothermic welding. Bonding plates shall have bolt pressure cable connectors and shall be bolted securely to the structural steel framework so as to maintain electrical continuity.

13.3 Connections to Framework. Conductors shall be connected to cleaned areas of the structural steel framework by the bonding of plates having a surface contact area of not less than 8 sq inches (5200mm²). The area of attachment shall be free of paint, grease oil and debris.

13.4 Early Streamer Emission Air Terminals shall be permitted to be bonded directly to structural, by means of direct attachment through mast or by use of two interconnection wires routed through roof and bonded at the top of the structural steel in the manner described in Section 13.3.

13.5 Metal Bodies. Certain metal bodies located outside or inside the structure contribute to lightning hazards because they are grounded or assist in providing a path to ground for lightning currents. Such metal bodies shall be bonded to the lightning protection system in accordance with Section 11.

13.6 Concealment in Steel Reinforced Concrete. Conductors or other components of the lightning protection system concealed in steel reinforced concrete units shall be connected to the reinforcing steel. Concealed down conductors shall be connected to vertical reinforcing steel. Roof conductors or other concealed horizontal conductor runs shall be connected to reinforcing steel and structural steel at intervals not exceeding 60ft (18m) and at all corners. See Section 10.9.

13.7 Down Conductors coursed on or in reinforced concrete columns or on structural steel columns shall be connected to the reinforcing steel and/or structural steel member at its upper and lower extremities. In the case of long vertical members an additional connection shall be made at intervals not exceeding 200 ft (60m). Such connections shall be made using listed clamps or listed bonding plates or by exothermic welding. The use of PVC conduit or other non-metallic chase does not negate the need for the interconnections.

LEVEL 3

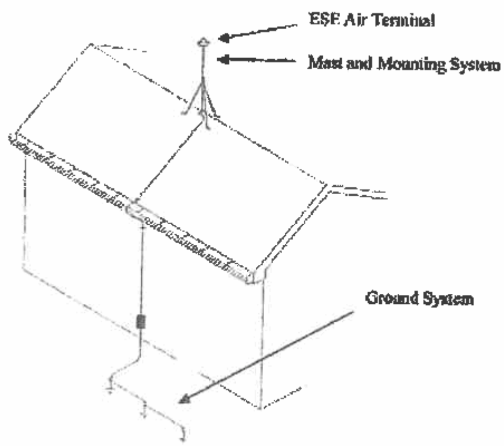
MANUFACTURER'S INSTALLATION STANDARD FOR EARLY STREAMER EMISSION LIGHTNING PROTECTION SYSTEMS

14. Level 3 General Installation Requirements

14.1 An ESE lightning protection system installation consists of the following interconnected parts see figure 14.1.1.

a. One or more ESE air terminals.
b. Mast and mounting systems – as required based on level of protection.
c. Ground system – Single grid to loop conductor system.
d. Equipotential Bonding.
e. Transient Voltage Surge Suppression.

Figure 14.1.1



14.2 The number of ESE air terminals will depend on the system design under the Manufacturer's Standard based on the area as indicated in Figure 3.5.1 for Level 3 Systems. The recommended number and placement of air terminals is based solely on Heary Bros.' 30 years of experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lightning protection, NFPA 780, states that the NFPA, "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

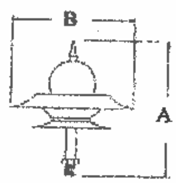
14.3 Components Tables Figure 14.3.1 and Figure 14.3.2 provide minimum sizes and weights for use in ESE lightning protection system installation.

Figure 14.3.1

Type of conductor	Minimum Diameter	Copper Standard/ Metric	Aluminum Standard/ Metric
ESE Air Terminal	1/2 "/ 12.7mm	1/2" / 12.7 mm	1/2" / 12.7 mm
Main Conductor Cable	Min Size each strand Weight Per Length Cross Sectional area	16AWG 190lbs /1000/ or 278 g/m 61900 CM / 35 mm ^{2}	14AWG 110lbs/1000/ 164 g/m 98600 CM/ 50 mm ^{2}
Ground Terminals	Ground Rod / Ground Plate	5/8" x 8' (16 mm x 2400mm)/ 18" x 18"x 20 gauge (460mm x 460mm) pure Copper plate minimum of 2 contact points each 8 sq inch contact to plate	NA

Figure 14.3.2 Early Streamer Emission Air Terminal

A= 12" (300mm)
B= 9" (230mm)



14.4 ESE Air Terminals shall be sufficiently rigid to withstand mechanical damage. They shall be constructed of aluminum, copper, copper alloy, or stainless steel. The main conductive parts of the ESE air terminal shall have the minimum dimensions in accordance with Figures 14.3.1 and Figure 14.3.2.

14.5 ESE Air Terminals Installation: Air terminals and their supports shall be mounted in such a way as to withstand the lightning currents, electromotive force, corrosion and effects of weather, heat, humidity, snow and wind.

14.5.1 Where an air terminals or mast is supported by conductive guys, the guys shall be connected from their points of anchorage to the closest down conductor(s) by a conductor equivalent in size to that of the down conductor(s).

14.5.2 The tip of any ESE air terminal shall not be less than 7' (2.1m) above the protected structures, including antennas, cooling towers, tanks, roof and masts.

14.5.3 The ESE air terminals shall be mounted on structures such as flagpole, the top of pylons, light standards or on dedicated supports for structures at certain facilities, such as sports facilities and stadium, golf courses, public parks, camping sites and racetracks. The ESE unit shall still be mounted at an elevation as indicated in Section 14.5.2

14.5.4 Storage areas for flammable and combustible liquids or flammable gases. Structures containing these materials shall be grounded, but grounding alone does not constitute sufficient protection against atmospheric discharges.

14.5.5 Electrical Surge Suppression devices shall be internally redundant and modular, in both surge suppression elements and fusing in construction for ease of field reparability. Manufacturers shall warranty the modules and fuse for the lifetime of the unit, with a minimum 10-year full unit warranty.

Units shall be mounted as to minimize inductance installation. (I.e. As close to equipment to be protected or by use of documented low inductance cabling).

NOTE 1: Electrical systems and utilization equipment within the structure may require further surge suppression. Such protection is not part of this standard. NFPA 70, National Electric Code and ANSI/IEEE C62.41-1991 2nd Edition, shall consulted for further information and installation requirements.

NOTE 2: Illustrations shown in this standard are those of Heary Brothers Lightning Protection Co., Inc. (HBLP) and its division Lightning Preventor of America (LPA). HBLP and LPA do not manufacture or warranty surge protection devices. Warranties required of this standard shall be the responsibility of the surge protection device manufacturer.

14.6 General. In determining the necessity of bonding a metal body to a lightning protection system, the following factors shall be considered:

A. Bonding is required only if there is a likely to be a side flash between the lightning protection system and other grounding medium.

B. The influence of a non-grounded metal body, such as metal window frame in a non-conductive medium, is limited to its effectiveness as a short circuit conductor if a side flash occurs therefore, does not necessarily require bonding to the lightning protection system.

C. Bonding distance requirements depend on the technical evaluation of the number of down conductors and their location, the interconnection of other grounded systems, the proximity of grounded metal bodies to the down conductors and the flashover medium, (Air or solid materials).

D. Metal bodies located in a steel frame structure shall be permitted to be inherently bonded through construction and further bonding shall not be required.

E. Metal antenna masts or supports located on a protected structure shall be bonded to the lightning protection system using main size conductors and listed fittings. The height of the air terminal shall still maintain the minimum projection above these objects as specified in section 14.5.2 and the object shall be bonded to the lightning protection system by means of main sized conductor.

15. Level 3 Components

15.1 A lightning protection system shall be made of components that are resistant to corrosion or shall be acceptably protected against corrosion. The following materials are acceptable:

A. Copper of the grade required for commercial electrical work. Or a copper alloy with similar characteristics. Usually of 98 percent conductivity when annealed.

B. Aluminum conductors as acceptable as electrical grade aluminum.

15.1.1 Components shall be protected against deterioration due to local conditions. Any part of a copper system that is exposed to direct action of chimney gases or other similar corrosive gases shall be protected. Aluminum components are not required to be protected.

15.2 Metals shall be used in combinations that are galvanically compatible.

A. Copper components shall not be installed directly on aluminum roofing, siding, or other aluminum.

B. Aluminum lightning protection components shall not be installed directly on copper roofing material or other copper surfaces or below the run off of a copper surface.

C. Aluminum conductors and components shall not be embedded in concrete or masonry;

a) In direct contact with a surface coated with alkaline base paint; or installed in wet locations, for example eave troughs or downspouts.

b) Installed in direct contact with earth.

c) Components used for connection of aluminum down conductors to copper or copper-bond grounding equipment shall provide separation between aluminum and copper materials. These fitting may be a stainless steel sleeve with internal separation or other connector that provides proper separation of aluminum and copper materials.

15.2.1 Unless otherwise indicated in this standard, an air terminals shall be provided for each part of a structure that is likely to be damaged by lightning. Based on the individual design requirements of the level of protection required.

16. Level 3 Air Terminal Installation Requirements

16.1 Early Streamer Emission Air Terminals

16.1.1 ESE Air Terminals shall be mounted at a height consistent with the requirements of Section 14.5.2 or a minimum of 7' (2.1m) above all projections on the roof. See Figure 16.1.1 for sample mast mounting details and figure 16.1.2 for installation diagram.

Figure 16.1.1

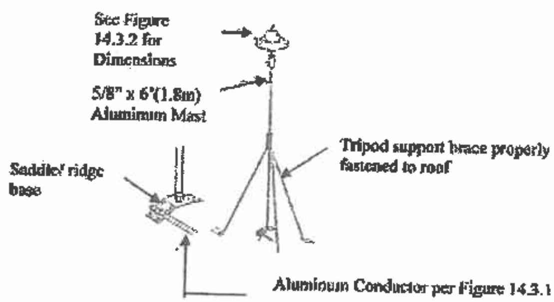


Figure 16.1.1 (Continued)

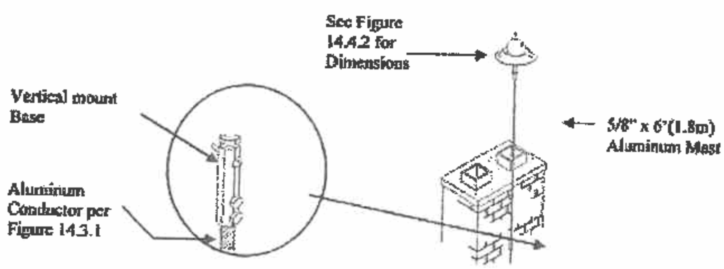


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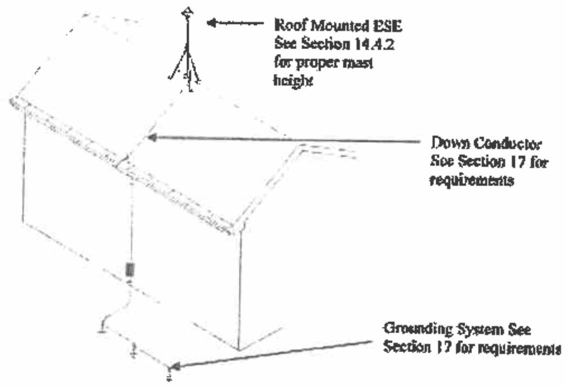
Figure 16.1.2



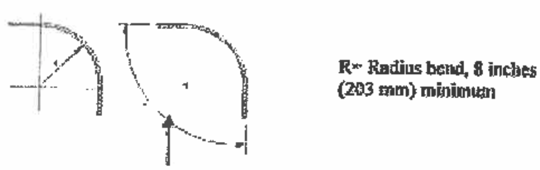
16.1.2 ESE Air Terminals shall be provided in proper quantity and location based on the system design under the Manufacturer's Standard. See Figure 3.5.1 and for Level 3 Systems. The recommended number and placement of air terminals is based on Heary Bros.' experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lightning protection, NFPA 780, states that the NFPA "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

16.1.3 Conductors shall be securely fastened to roof or structure at intervals not exceeding 3' (1m) on center.

16.1.4 The ESE Air Terminals shall be provided with a minimum of one path to ground. (See Section 17 for additional requirements) Cables shall maintain a horizontal or downward path to ground to avoid "U" and "V" (down and up) pockets. See Figure 16.1.4

16.1.5 No bend of a conductor shall form an included angle of less than 90 degrees or have a radius of bend less than 8 inches nor shall a conductor rise greater than 8". However Conductors may raise a rate of 3" per 12" of run. See Figure 16.1.3 and Figure 16.1.4

Figure 16.1.3



NOTE: *Through roof, through wall and tee type connectors do not need to comply with this requirement.*

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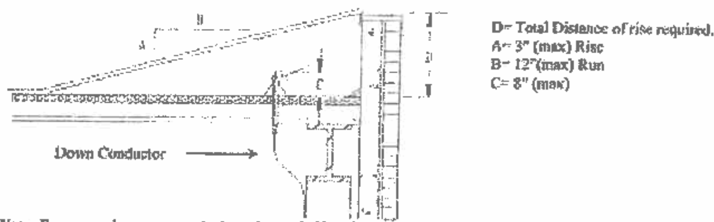
Figure 16.1.4



Note: Ramp may be constructed of wood, metal, fiberglass, plastic, PVC etc, provided the construction is such that it will be resistant to corrosion and rot. The conductor shall be attached or support on ramp as required in Section 16.1.3.

16.1.6 In situations where multiple air terminals are required, air terminals shall be positioned so that they are no more than 150' (45m) from the outside edge of the building nor shall they be more than 300' (90m) apart. The recommended number and placement of air terminals is based on Heary Bros.' experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lightning protection, NFPA 780, states that the NFPA "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

16.1.7 Down Conductors in situations where multiple ESE Air Terminals are required shall be installed in accordance with Section 17.

16.1.8 Bonding connections shall be made to all rebar, reinforcing rod, structural steel etc. at the upper on lower extremities of the down conductor. See Figure 16.18.

Figure 16.18

16.2 Roof Top Bonding Requirements;

16.2.1 Roof top air handling units, equipment, or other roof top equipment shall be bonded to the system where the equipment is within 6' (1.8m) of a lightning protection conductor unless the equipment is inherently connected to the ground system through direct bond or common bond.

16.2.2 Sanitary vents, roof drains, flashings, gutters, copings etc. Located within 6' (1.8m) of the lightning protection system, shall be bonded via a secondary sized conductor to the system unless the equipment is inherently bonded to the lightning protection system.

17. Level 3 Grounding System Requirements

17.1 A minimum of two (2) down conductors shall be provided for each ESE Lightning Protection System. In cases where multiple ESE Air Terminals are used then additional down conductors shall be provided in accordance with Section 16.1.7.

17.2 A single down conductor shall be permitted to be used where the length of run does not exceed 65ft (19m).

17.3 If the horizontal length is greater than the vertical length, two down conductors shall be required and separated a minimum of 10' (3m).

17.4 For lengths greater than 65' (19m) two conductors shall be required.

17.5 For masts, a single down conductor only shall be required.

17.6 If electrically conductive, the mast shall be permitted to be used as the down conductor.

17.7 Down Conductors and other conductor where exposed to potential mechanical damage shall be protected against such damage by means of PVC, fiberglass conduit sleeve, or metal conduit. (Metal conduit may be used provided the upper and lower portions are bonded to the down conductor). At ground level the bottom 8' (2.4m) of exposed down conductor shall be protected. See Figure 17.8.1

17.8 Down Conductors may be coursed within the construction of the building provided they are properly protected. See Figure 17.8.3.

Figure 17.8.1

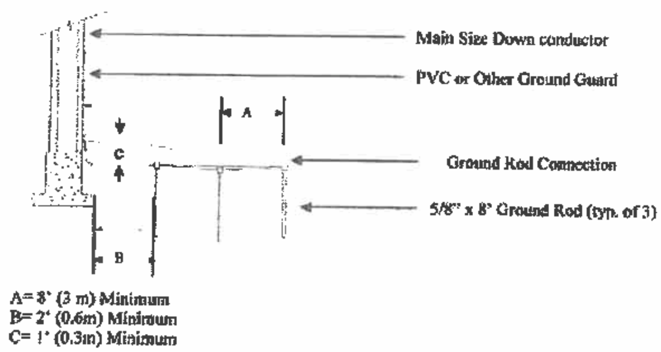
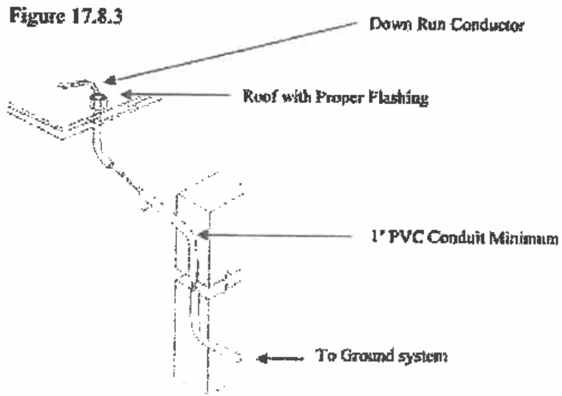


Figure 17.8.3



17.9 For masts that are electrically conductive then the mast shall be permitted to be used as a down conductor.

17.10 If electrically continuous, structural steel shall be permitted to be used as the down conductor.

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17.11 Masonry Anchors used to secure the lightning protection components shall have a minimum outside diameter of ¼ in. (6.4mm) and shall be set with care. Holes made to receive the body of the anchor shall be of correct size, made with the proper tools and made in brick, stone or other masonry unit. Fasteners shall not be installed in mortar joints. When anchors are installed, the fit shall be tight against moisture, thus reducing the possibility of damage due to freezing.

17.12 Connector Fittings shall be used at all "end to end", "tee", or "y" splices of lightning conductors. They shall be attached so as to withstand a pull test of 200 lb. Fittings used for required connections shall be of bolted, welded or high compression type and bear the ARL Listing and UL Listing.

17.13 Conductors shall be fastened securely to the structure upon which they are placed at intervals not exceeding 3 ft (1m). The fasteners, attached by nails, screws, bolts or adhesives as necessary, shall not be subject to breakage and shall be of the same material as the conductor or of a material as resistant to corrosion as that of the conductor. No combination of components shall be used that forms an electrolytic couple of such nature that in the presence of moisture, corrosion is accelerated.

17.14 Ground Terminations: A study shall be conducted to engineer a grounding system to a maximum of 25 ohms resistance in accordance with IEEE fall of potential ANSI/IEEE 141, *Recommended Practice for Electric Power Distribution for Industrial Power Plants,* method. The components for the grounding system shall be selected to be suitable for the soil conditions and the other side factors such as cathodic protection.

17.15 Ground electrodes shall be of copper-bond steel or copper plate in sufficient number as to achieve a 25 ohm maximum resistance to ground. Ground electrodes shall be installed so that the top of the electrode is a minimum 1' (0.3m) below finished grade minimum and 2' (0.6m) away from the foundation wall. See Figure 17.8.1.

17.16 Ground Rod Terminations. The down conductor shall be attached to the ground rod by mechanical clamp, exothermic welding or brazing. Clamps shall be suitable for direct burial.

17.17 Each down conductor shall terminate at a ground terminal system. A minimum of 3 ground terminals shall be provided per down conductor location. Configures in a straight line. Where the ground terminals are spaced a minimum of 8' (3m) apart. See Figure 17.8.1.

17.18 Ground terminals located under slabs or in crawl spaces shall be installed as near as practicable to the outside perimeter of the structure.

17.19 Electrical system grounding electrodes shall not be used in lieu of lightning ground rods. This provision shall not prohibit the required bonding together of grounding electrodes of different systems. *NOTE 1: For further information, see NFPA 70National Electric Code, which contains detailed information on the grounding of electrical systems.*

17.20 Common Grounding. All grounding media in or on a structure shall be interconnected to provide a common ground potential. This shall include lightning protection, electric service, telephone and antenna system grounds as well as underground metallic piping systems. Such piping systems include water service, well casings located within 25 ft (7.6m) of the structure, underground conduits (not already bonded) etc. Main size lightning conductors shall be used for interconnecting these grounding systems to the lightning protection system.

17.21 Common Ground Bonding. If electric, telephone or other systems are bonded to metallic water pipe; only one connection from the lightning protection system to the water pipe system is necessary, provided that the water pipe is electrically continuous between all systems. In situations where there are separate services for domestic and fire water entering the building both systems shall be bonded to the lightning protection grounding system. This may be accomplished via direct connection or through the ground loop system.

18. Level 3 Structural Steel Systems

18.1 General. The steel framework of a structure shall be permitted to be utilized as the main conductor of a lightning protection system if it is electrically continuous or is made electrically continuous.

18.2 Steel Structure Terminals. Ground terminals shall be connected to approximately every other steel column around the perimeter of the structure at intervals averaging not more than 60ft (18m). Connections shall be made near the base of the column, with a surface contact area not less than 8 sq inches (5200mm²) or by exothermic welding. Bonding plates shall have bolt pressure cable connectors and shall be bolted securely to the structural steel framework so as to maintain electrical continuity.

18.3 Connections to Framework. Conductors shall be connected to cleaned areas of the structural steel framework by the bonding of plates having a surface contact area of not less than 8 sq inches (5200mm²). The area of attachment shall be free of paint, grease, oil, and debris.

18.4 Early Streamer Emission Air Terminals shall be permitted to be bonded directly to structural, by means of direct attachment through mast or by use of two interconnection wires routed through roof and bonded at the top of the structural steel in the manner described in Section 18.3.

EXHIBIT B

USI®

April 29th, 2019

Heary Bros Lightning Protection Co Inc
11291 Moore Rd
Springville, NY 14141

To Whom It May Concern:

During the many years we have done business with Heary Brothers Lightning Protection Co. Inc., we have found your commitment to developing quality products for your customers as paramount. Included in that commitment would be the successful line of the Early Streamer Lightning Protection Equipment.

Your dedication has allowed us to establish a comprehensive and cost-effective insurance program for your companies. Because of your dedication, we have been able to secure 11 million dollars of Liability limits. This includes coverage for damage from direct lightning strikes to the structure of any buildings. Please see enclosed America Certificate of Guarantee as additional evidence.

In addition, claims activity has been negligible and we, as your broker, the The Travelers Insurance Company, as your carrier, appreciate your attention to workplace safety and products liability quality control efforts. In today's highly competitive world, this is critical.

Without a doubt, your company was built around a commitment to give customers the products they need and confidence in our ability to meet or exceed expectations. We encourage your efforts and with you continued success.

Sincerely,

Timothy M. Wroblewski

Timothy M. Wroblewski
Vice President

TW/lam

Property & Casualty • Employee Benefits • Personal Risk • Retirement Consulting
The USI ONE Advantage®

FIRST NIAGARA

April 24, 2015

Heary Bros Lightning Protection Co Inc
11291 Moore Rd
Springville, NY 14141

To Whom It May Concern:

During the many years we have done business with Heary Brothers Lightning Protection Co. Inc., we have found your commitment to developing quality products for your customers as paramount. Included in that commitment would be the successful line of the Early Streamer Lightning Protection Equipment.

Your dedication has allowed us to establish a comprehensive and cost-effective insurance program for your companies. Because of your dedication, we have been able to secure 11 million dollars of Liability limits. This includes coverage for damage from direct lightning strikes to the structure of any buildings. Please see enclosed America Certificate of Guarantee as additional evidence.

In addition, claims activity has been negligible and we, as your broker, the The Travelers Insurance Company, as your carrier, appreciate your attention to workplace safety and products liability quality control efforts. In today's highly competitive world, this is critical.

Without a doubt, your company was built around a commitment to give customers the products they need and confidence in our ability to meet or exceed expectations. We encourage your efforts and with you continued success.

Sincerely,

Timothy M. Wroblewski
Vice President

TW/lam

First Niagara Risk Management, Inc.
726 Exchange Street, Suite 900 • Buffalo, NY 14210
Phone: 716-819-5500 • Toll Free: 800-854-9121 • Fax: 716 819-5140

EXHIBIT C

Preventor System Installations In Florida

ProjectName	Address	City	State
7000 Williams Island Building		Adventura	FL
Florida Hospital Altamonte Office		Altamonte Springs	FL
Turner Agriculture Center and Extension Office		Arcadia	FL
Marriott - Aventura Hotel		Aventura	FL
Alliant Food Service		Boca Raton	FL
Boca Museum		Boca Raton	FL
Boca Raton Condos		Boca Raton	FL
Caterpillar C-2 Expansion		Boca Raton	FL
Sears Store	Glades Road	Boca Raton	FL
TAG (The Answer Group) Main Building		Boca Raton	FL
TAG Main Building East Emissions Building		Boca Raton	FL
The Polo Club of Boca Raton		Boca Raton	FL
Bealls Corp Headquarters		Bradenton	FL
Paul Azinger Residence		Bradenton	FL
St. Stephens School		Bradenton	FL
Tara Preserve Golf Clubhouse		Bradenton	FL

ProjectName	Address	City	State
Suntree Elementary and Chiller Building		Brevard Co	FL
Florida Welcome Center		Campbelton	FL
Advanced Elastomers		Cantonement	FL
Cape Canaveral AF Station Patrick AFB Cape Arrays		Cape Canaveral	FL
Cape Canaveral Station	Patrick Air Force Ba	Cape Canaveral	FL
Satellite Assembly Bldg Cape Canaveral		Cape Canaveral	FL
Kreiseder Residence		Casey Key	FL
Silverstein Residence		Casey Key	FL
Florida Hospital		Celebration	FL
Clyde Dyal Water Treatment Plant		Christmas	FL
Citrus Springs Utilities	1360 N. Citrus Spri	Citrus Springs	FL
Baystreet Plaza @ International Mall		Clearwater	FL
Capitol One Phase IV		Clearwater	FL
Catile Tower		Clearwater	FL
Church of Scientology Sandcastle Addition		Clearwater	FL
Crescent Beach Club		Clearwater	FL
Crescent Beach Club		Clearwater	FL
General Services Bldg		Clearwater	FL

ProjectName	Address	City	State
Pinellas County Utilities		Clearwater	FL
Ruth Eckerd Hall		Clearwater	FL
Ruth Eckerd Hall - CEP Addition		Clearwater	FL
St. Cecelia Intraparochial School		Clearwater	FL
The Sirata Beach Resort		Clearwater	FL
The Tides@ Feather Sound		Clearwater	FL
Worthington Square Apartments		Clearwater	FL
City of Coconut Creek - Council Building		Coconut Creek	FL
City of Coconut Creek - Motor Pool Building		Coconut Creek	FL
Coconut Creek Public Safety		Coconut Creek	FL
Sabal Pines - Ball Field #2		Coconut Creek	FL
Sabal Pines - Elementary School		Coconut Creek	FL
Sabal Pines - Hockey Rink		Coconut Creek	FL
Sabal Pines - Maintenance Facility		Coconut Creek	FL
Sabal Pines - Pines Pavilion		Coconut Creek	FL
Sabal Pines - Soccer Field #1		Coconut Creek	FL
Body of Christ Family Life Center		College	FL
Stone/Bag Paper Container Facility	Hwy 29 & Becks La	Contonement	FL

ProjectName	Address	City	State
Alahamra Tower		Coral Gables	FL
The Alhambra Hotel/Office	50 Alhambra Circle	Coral Gables	FL
University of Miami Intra Mural Fields		Coral Gables	FL
Sheik Island Horse Farm		Dade City	FL
BCC Building 27/ New Child Develop. CTR		Davie	FL
BCC Student Services Building		Davie	FL
Nova Southeastern College Parking Garage		Davie	FL
Phil Smith Toyota		Davie	FL
Rolling Hills Golf and Country Club		Davie	FL
Daytona Auto Dealers Exchange		Daytona Beach	FL
Daytona Marriott Hotel	100 N Atlantic Ave	Daytona Beach	FL
Deerfield Beach Grand Hilton	100 Fairway Drive	Deerfield Beach	FL
Granada Royale Hotel	902 S. E. 20th Ave.	Deerfield Beach	FL
Deltona Lake Track "A"	Diamond Street	Deltona	FL
Deltona WWTP	Saxton & Agatha	Deltona	FL
Deltona WWTP	Lombardy Ctr	Deltona	FL
Deltona WWTP	Cortland Blvd	Deltona	FL
Deltona WWTP	Fisher Drive	Deltona	FL

ProjectName	Address	City	State
Well # 2 & High Service Pump	Unit 21 Sagmore Dr	Deltona	FL
Silver Beach Condominium		Destin Beach	FL
Guardian Angel School		Dunedin	FL
Our Lady of Lourdes		Dunedin	FL
Burdines Dept. Store		Fort Lauderdale	FL
Marriott - Ft Pierce Travel Plaza	Florida Turnpike Mi	Ft Pierce	FL
Granada Royale Hotel	1101 S.E. 17th Stree	Ft. Lauderdale	FL
Riverside Hotel		Ft. Lauderdale	FL
McGregor Point Hotel		Ft. Myers	FL
Raymond Building Products		Ft. Myers	FL
Raymond Building Supply Rack Storage		FT. Myers	FL
Raymond Building Supply Warehouse Building		FT. Myers	FL
Palm Court Yacht Club		Ft. Walton Beach	FL
Holy Faith Church	700 N.W. 39th Roa	Gainesville	FL
Main Library	on SR-26 Across fro	Gainesville	FL
Nordstrom Distribution Center		Gainesville	FL
UF Hotel and Conference Center		Gainesville	FL
Union Street Station		Gainesville	FL

ProjectName	Address	City	State
Jack Sawyer	608 Fairpoint Drive	Gulf Breeze	FL
Palmento General Hospital	W. 20th & W. 68th	Hialeah	FL
Aqua Penn Water Co.		High Springs	FL
City of Holmes Beach Baseball Field	5901 Marina Drive	Holmes Beach	FL
North Lake Elementary		Indian River	FL
Sebastian Highlands WTP	1001 Prineville Roa	Indian River City	FL
Richard Herrmann II Residence	405 15th Ave	Indian Rocks Beach	FL
Florida Power/Light Co Martin Combined Cycle # 3,4	State Road 710	Indiantown	FL
Martin Plant Combined Cycle 3 & 4		Indiantown	FL
Allbritton Communications	7025 AC Skinner Pk	Jacksonville	FL
Berkman Plaza		Jacksonville	FL
Cathedral Terrace		Jacksonville	FL
Cathedral Towers		Jacksonville	FL
Cathedral Townhouses		Jacksonville	FL
Cypress Village Apartments	4600 Middleton Par	Jacksonville	FL
Sears Logistics Center		Jacksonville	FL
The Pointe		Jupiter	FL
The Phoenix @ Peachtree		Kennesaw	FL

ProjectName	Address	City	State
Dolphin Hotel - Epcot Center	1500 Epcot Resort	Lake Buena Vista	FL
Dolphin/Swan Hotel Causeway & Grotto	1500 Epcot Resort	Lake Buena Vista	FL
Royal Plaza Hotel	1905 Preview Blvd	Lake Buena Vista	FL
Swan Hotel - Epcot Center	1500 Epcot Resort	Lake Buena Vista	FL
Westgate Lakes Sales Center		Lake Buena Vista	FL
Columbia Correctional Institution		Lake City	FL
Marriott - Lake Worth Travel Plaza	Florida Turnpike Mi	Lake Worth	FL
Publix Deli Plant	PO Box 407	Lakeland	FL
RMC Ewell Corp		Lakeland	FL
FCCI Insurance Group		Lakewood Ranch	FL
US Post Office - Land O Lakes		Land O Lakes	FL
Central Catholic High School		Lecanto	FL
Citrus Co. Landfill		Lecanto	FL
St. Stalastic Church		Lecanto	FL
FDOT District 5		Leesburg	FL
Lehigh Post Office		Lehigh	FL
Ben Price Residence	Gulf of Mexico Driv	Longboat Key	FL
James Gradner Residence		Longboat Key	FL

ProjectName	Address	City	State
Sea Place Condominium Complex M1 & M2	1945 Gulf of Mexic	Longboat Key	FL
Wagner Residence	5940 Gulf of Mexic	Longboat Key	FL
Albert Whitted Expansion		Longwood	FL
Lowell Correctional Institution		Lowells	FL
St. Timothy's Catholic Church		Lutz	FL
Marco Island Pump Station	RTE 951	Marco Island	FL
South Fork High School		Martin Co.,	FL
Brevard Educational Facility		Melborne	FL
Eau Gallie High School Gymnasium & Auditorium		Melborne	FL
Brickell Station Towers	30 S.W. 8th Street	Miami	FL
Doral Concourse		Miami	FL
La Tour Condo		Miami	FL
Lincoln Financial Center	701 Brickell Ave.	Miami	FL
Marriott - Snapper Creek Travel Plaza	Florida Turnpike Mi	Miami	FL
Metropolitan Sun Bank	777 Brickell Ave	Miami	FL
Porta Vita		Miami	FL
Pro-Player Stadium		Miami	FL
Sienna		Miami	FL

ProjectName	Address	City	State
Softel Hotel	5800 Blue Lagoon	Miami	Fl
Telemundo Networf		Miami	FL
Tequesta Condominium	808 Bricknell Key D	Miami	FL
Three Tequesta Point		Miami	FL
University of Miami Hecht Athletic Center		Miami	FL
University of Miami Knight Baseball Stadium & Foot		Miami	FL
University of Miami Schiff Tennis Ctr & Hecht Ath		Miami	FL
Loews Hotel & Convention Center		Miami Beach	FL
Portofino Tower		Miami Beach	FL
Sandy Park Health Care Center		Miami Beach	FL
US Naval Air Station Bldg 1406 & 1424	Whiting Field South	Milton	FL
Mulberry Post Office		Mulberry	FL
North Port St. Lucie WTP	Gulf Port Terrace	N. Port St. Lucie	FL
Collier Residence		Naples	FL
Gerry Residence	3400 Gordon Drive	Naples	FL
HorseCreek Properties Collier Equestrian Facility		Naples	FL
Horsecreek Properties Collier Equestrian Facility	Daniels Road	Naples	FL
Naples Cay Seapointe Condo	10 Seagate Drive	Naples	FL

ProjectName	Address	City	State
Royal Poinciana Country Club	Goodlette Rd	Naples	FL
The Savoy Condo	4041 Gulf Shore Blv	Naples	FL
Blazer Residence		Navarre	FL
Caribbean Resort Condo		Navarre Beach	FL
The Fountaians Condominium		New Smyrna Beach	FL
Implant Innovations Inc.		North Palm Beach	FL
King Plastics Inc.		North Port	FL
Bishop Larkin Pastoral Center	9th Avenue	North St. Petersburg	FL
Lowell Correctional Facility Water Tower		Ocala	FL
Marion Oaks Water TRT Plant	14170 S.W. 39th Av	Ocala	FL
Marriott - Turkey Travel Plaza	Florida Turnpike Mi	Ocee	FL
Marriott - Ft Drum Travel Plaza	Florida Turnpike Mi	Okeechobee	FL
BIC Manufacturing Plant(III) Myerlake		Oldsmar	FL
Florida Hospital East Orlando		Orlando	FL
Florida Hospital Orlando		Orlando	FL
Martin Marietta Conflow Area Site	Kirtland Road	Orlando	FL
Orlando Utilities Commission Power Plant		Orlando	FL
St. Johns Rive Water Management		Palatka	FL

ProjectName	Address	City	State
St. Johns River Waste Management District Office		Palatka	FL
SWA Tipping Floor Building		Palm Beach	FL
The Diplomat Hotel - Main Building		Palm Beach	FL
SWA West Central Tipping Floor		Palm Beach Co	FL
George Young United Methodist Church		Palm Harbor	FL
St. Mark Village	Rte 19	Palm Harbor	FL
William E. Dunn Water Reclamation Facility		Palm Harbor	FL
Riviera Dunes Marina		Palmetto	FL
St. Andrews Condo		Panama City	FL
Hidden Dunes Condominium		Panama City Beach	FL
Landmark Holiday Beach Resort		Panama City Beach	FL
The Summit Resort	Thomas Drive	Panama City Beach	FL
Camp-O-Pines Pensacola Christian College		Pensacola	FL
Ellyson Industrial Park	Ellyson Field Proj	Pensacola	FL
Gelman Sciences	8780 Fly Road	Pensacola	FL
George Estes Residence		Pensacola	FL
Girls Parking Garage -Pensacola Christian College		Pensacola	FL
H-6 Academic Building		Pensacola	FL

ProjectName	Address	City	State
McKenzie Building- Pensacola Christian College		Pensacola	FL
Phoenix 10 Condominium		Pensacola	FL
University of West FL Admin. Building		Pensacola	FL
University of West FL Classroom Building		Pensacola	FL
Sabine Yacht & Racquet Club	330 Fort Pickens Rd	Pensacola Beach	FL
Eden Condominium		Peridido Key	FL
St. Clements Catholic Church		Plant City	FL
American Heritage Fine Arts Building		Plantation	FL
Crossroads 4		Plantation	FL
Motorola		Plantation	FL
Motorola Inc.		Plantation	FL
Spa Atlantis		Pompano	FL
Ligi Tool		Pompano Beach	FL
Marriott - Pompano Travel Plaza	Florida Turnpike Mi	Pompano Beach	FL
Charlotte County Public Works		Port Charlotte	FL
Dr. Eugene Gregosh Residence		Port Charlotte	FL
East Port Environmental Services		Port Charlotte	FL
Peace River WTP	Kings Hwy	Port Charlotte	FL

ProjectName	Address	City	State
Peace River WTP	Intake Structure	Port Charlotte	FL
Port Malabar WTP		Port Malbar	FL
Bishop Larkin School		Port Richey	FL
Charlotte County Sheriff's Administration	Metro Pkwy	Punta Gorda	FL
Chateau Towers	Gulfport Blvd	S. Pasadena	FL
Espirtu Santo Catholic School		Safety Harbor	FL
The Shipley Residence		Sannibel Island	FL
Baker Electronics		Sarasota	FL
C'A' D' Zan John't Mable Rigling Home		Sarasota	FL
Davis Residence		Sarasota	FL
Ed Windemuller Residence	Saddle Oaks Estates	Sarasota	FL
Ken Miller Barn		Sarasota	FL
Lincoln Properties/ NBD Bank Building	240 N Washington	Sarasota	FL
Marina Towers Condominium		Sarasota	FL
Meridian @ The Oaks Building III		Sarasota	FL
Sarasota Herald Tribune		Sarasota	FL
Scott Sign Systems		Sarasota	FL
Scott Signs Phase II		Sarasota	FL

ProjectName	Address	City	State
Sun Hydraulics Inc.		Sarasota	FL
The Phoenix Condo	Golden Gate Point	Sarasota	FL
The Radisson Hotel Lido Beach	Ben Franklin Drive	Sarasota	FL
The Renaissance		Sarasota	FL
Sebastian WTP	Filbert Street	Sebastian	FL
Lake Jackson Post Office		Sebring	FL
St. Cloud High School		St Cloud	FL
Casa Monica Hotel		St. Augustine	FL
St. Augustine Shores	771 Alahambra	St. Augustine	FL
Marriott - Canoe Creek Travel Plaza	Florida Turnpike Mi	St. Cloud	FL
School "C" Osceola Co. School District		St. Cloud	FL
Incarnation Church		St. Petersburg	FL
Jabil Circuit Inc.	10800 Roosevelt Blv	St. Petersburg	FL
Midcore Parking Garage		St. Petersburg	FL
San Seair Condominiums		St. Petersburg	FL
St. Marks Family Life Center	PO Box 43022	St. Petersburg	FL
Wheelbrator Corp		St. Petersburg	FL
SECO Office Building		Sumterville	FL

ProjectName	Address	City	State
Capital One Building One	8745 Henderson Ro	Tampa	FL
Capital One Phase II Building 2 Renaissance	8745 Henderson Ro	Tampa	FL
Capital One Phase II Parking Garage	8745 Henderson Ro	Tampa	FL
Capital One Phase III Parking Garage	8745 Henderson Ro	Tampa	FL
Capital One Phase IV Flagpole	8745 Henderson Ro	Tampa	FL
Capital One Softball Field	8745 Henderson Ro	Tampa	FL
Capital One Tai Chi Building	8745 Henderson Ro	Tampa	FL
Florida Aquarium		Tampa	FL
Gateway Post Office		Tampa	FL
Group Tech		Tampa	FL
Lee Moffit Cancer Center Parking Garage		Tampa	FL
Marriott -Tampa		Tampa	FL
Muvico	18002 Richmond Pa	Tampa	FL
Myrtle Oaks		Tampa	FL
Notre Dame High School		Tampa	FL
Seaboard Waste Water TRT Plant	8234 Causeway Blv	Tampa	FL
St. Mary's Episcopal Day School		Tampa	FL
St. Pete Catholic High School		Tampa	FL

ProjectName	Address	City	State
Tampa Bay Water Groundwater Clear Well Tank		Tampa	FL
Tampa Bay Water Surface		Tampa	FL
Tampa Juvenile Detention Center		Tampa	FL
The Garrison Condo		Tampa	FL
The Sorelle Residence		Tampa	FL
Westshore Plaza Phase III Expansion		Tampa	FL
City of Titusville Blue Heron WRF		Titusville	FL
City of Titusville Blue Heron WRF		Titusville	FL
Reliant Energy Corp. Maintenance Instrumentation B		Titusville	FL
Reliant Energy Corporation Intake Structure	Highway US 1	Titusville	FL
Sipprelle Residence		Ussepa Island	FL
Meridian @ The Oaks		Venice	FL
Woodmere Clubhouse		Venice	FL
Our Lady of the Rosary-Ballfield	21010 S.R. 54	West Land O'Lakes	FL
Our Lady of the Rosary-Flagpole	21010 S.R. 54	West Land O'Lakes	FL
SWA (CMRF)		West Palm Beach	FL
Marriott - Okahumpka Travel Plaza	Florida Turnpike Mi	Wildwood	FL
Florida Hospital		Winter Park	FL

ProjectName	Address	City	State
Florida Brewing Company		Ybor City	FL

EXHIBIT D

Preventor 2005 Installations (Government)

Project Name	Address	City	State
Kodiak Building (SCAT) Mobile Structure on Rails		Kodiak	AK
Huntsville Public Safety Complex		Huntsville	AL
New Phoenix City Hall	Package Street	Phoenix	AZ
Phoenix Central Library		Phoenix	AZ
Los Angeles Federal Bldg. GSA	255 E. Temple Street	Los Angeles	CA
GSA Oakland Federal Building		Oakland	CA
California Federal Service Center	1515 Walnut Grove Avenue	Rosemead	CA
V.A. Medical Center		San Diego	CA
FBI Center New 9 Story Office Bldg		Washington	DC
Florida Welcome Center		Campbelton	FL
Cape Canaveral AF Station Patrick AFB Cape Arrays		Cape Canaveral	FL
Cape Canaveral Station	Patrick Air Force Base	Cape Canaveral	FL
Satellite Assembly Bldg Cape Canaveral		Cape Canaveral	FL
General Services Bldg		Clearwater	FL
City of Coconut Creek - Council Building		Coconut Creek	FL
City of Coconut Creek - Motor Pool Building		Coconut Creek	FL

Project Name	Address	City	State
Coconut Creek Public Safety		Coconut Creek	FL
Marriott - Ft Pierce Travel Plaza	Florida Turnpike Mile Mkr 144	Ft Pierce	FL
City of Holmes Beach Baseball Field	5901 Marina Drive	Holmes Beach	FL
Marriott - Lake Worth Travel Plaza	Florida Turnpike Mile Mrk. 94	Lake Worth	FL
US Post Office - Land O Lakes		Land O Lakes	FL
FDOT District 5		Leesburg	FL
Marriott - Snapper Creek Travel Plaza	Florida Turnpike Mile Mkr 19	Miami	FL
US Naval Air Station Bldg 1406 & 1424	Whiting Field South & North Tower	Milton	FL
Mulberry Post Office		Mulberry	FL
Marriott - Turkey Travel Plaza	Florida Turnpike Mile Mkr 263	Ocee	FL
Marriott - Ft Drum Travel Plaza	Florida Turnpike Mile Mkr 184	Okeechobee	FL
St. Johns Rive Water Management		Palatka	FL
Marriott - Pompano Travel Plaza	Florida Turnpike Mile Mrk 65	Pompano Beach	FL
East Port Environmental Services		Port Charlotte	FL
Charlotte County Sheriff's Administration	Metro Pkwy	Punta Gorda	FL
Marriott - Canoe Creek Travel Plaza	Florida Turnpike Mile Mrk 229	St. Cloud	FL
Gateway Post Office		Tampa	FL
Marriott - Okahumpka Travel Plaza	Florida Turnpike Mile Mrk 299	Wildwood	FL

Project Name	Address	City	State
Cherokee County Public Safety Complex		Canton	GA
Montgomery County Courthouse		Chula	GA
Paulding County Courthouse	Courthouse Square	Dallas	GA
Handcock Co. Courthouse		Greenfield	IN
Courthouse		Tipton	IN
Campbell County Courthouse	4th Street	Newport	KY
Westover AFB Hangar		Chicopee	MA
Westover AFB Upgrade Hangar B-700		Chicopee Falls	MA
Melrose City Hall	Essex& Main St	Melrose	MA
Natick Municipal Complex		Natick	MA
Mt. Holyoke Summit Lodge	Holyoke State Park	S. Hadley	MA
Wellesley Town Hall	525 Washington St	Wellesley	MA
Bethesda Metro Center	7450 Wisconsin Ave	Bethesda	MD
National Park		Landover	MD
Van Buren County Courthouse		Paw Paw	MI
Public Service of New Hampshire Corporate Hdqrts.		Mancester	NH
Veterans Memorial Home	132 Evergreen Rd	Edison	NJ
Oyster Creek Emergency Bldg	Route 9	Forked River	NJ

Project Name	Address	City	State
Municipal Complex		Hanover Twp.	NJ
Manchester Town Hall	1 Colonial Drive @ Rte 37	Lakehurst	NJ
Morris County Hall of Records	Ann Street	Morristown	NJ
NJIT Library Bldg	Central Ave	Newark	NJ
South Brunswick Maintenance. Storage Complex		S. Brunswick	NJ
City Hall and Police Dept	Morris & Springfield Aves	Summit	NJ
GTE Government Systems White Sands Missile Range		WSMR	NM
State Legislature Building			NV
Yuca Mountain Test Site			NV
Regional Justice Center		Las Vegas	NV
New Reno Federal Building		Reno	NV
Galena Maintenance Station		Washoe	NV
Broadway Office Complex	625 Broadway	Albany	NY
Transitional Housing	Jackson & Cypress	Bronx	NY
Transitional Housing	141st	Bronx	NY
Transitional Housing for the Homeless	50 W. Mt Eden & Inwood	Bronx	NY
Transitional Housing	Linden Blvd	Brooklyn	NY
Transitional Housing for the Homeless	St. Johns Place & E. NY Ave.	Brooklyn	NY

Project Name	Address	City	State
Family Court Building		Buffalo	NY
The Rath County Office Building		Buffalo	NY
Tompkins County DOT Admin Facility. Bus Garage	Willow Ave	Ithaca	NY
Police & Hwy Dept Bldg	525 Pavement Road	Lancaster	NY
Niagara Falls Housing Authority-Wrobel Towers	Main Street	Niagara Falls	NY
Orchard Park Municipal Center	S-4295 South Buffalo Street	Orchard Park	NY
Criminal Courts Building		Riverhead	NY
Roosevelt Island Phase II	Building I	Roosevelt	NY
Manhasset Fire House	Prospect Rd	Thomaston	NY
West Valley Nuclear Services		West Valley	NY
Logan County Court House		Bellefontaine	OH
Wood County Court House		Bowling Green	OH
Gurnet County Courthouse		Cambridge	OH
Pickway County Courthouse		Circleville	OH
Fayette County Courthouse		Fayette	OH
Trumbull County Courthouse		Trumbull	OH
Owasso City Hall		Owasso	OK
Coudersport Court House		Coudersport	PA

Project Name	Address	City	State
Potter County Courthouse	1 East Second Street	Coudersport	PA
Cameron County Courthouse	20 East Fifth St	Emporium	PA
Emporium Court House		Emporium	PA
Valley Forge Plaza	First & Moore rd	King of Prussia	PA
Berks County Courthouse	6th & Court St,	Reading	PA
Berks County Services Center	Reed & Court Sts	Reading	PA
Elk County Court House		Ridgeway	PA
Warren County Courthouse		Warren	PA
City Hall Ave Parking Facility		Norfolk	VA
FBI Firearms Range Renov. [26m Range & Stress Obst		Quantico	VA
National Parks Service bldg	North Cascades Visitor Ctr	New Halem	WA

EXHIBIT E

Preface from NFPA 780

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3/02

EXHIBIT F

REPORT OF THE THIRD-PARTY INDEPENDENT EVALUATION PANEL ON THE EARLY STREAMER EMISSION LIGHTNING PROTECTION TECHNOLOGY

BY

John L. Bryan

Richard G. Biermann

Glenn A. Erickson

Submitted to the National Fire Protection Association Standards Council on September 1, 1999

Rison (336) reported in 1991 on studies conducted at the Langmuir Laboratory from July 15 to August 23, 1991 to evaluate whether a radioactive ESE air terminal provided protection within a 100 meter radius as reported by the Manufacturer. The ESE device was installed on a twenty foot mast 4 meters below South Baldy Peak. Video cameras were used to record the occurrence of lightning strikes. There were two recorded lightning strikes within the 100 meter radius area during the approximate five week study, one 85 meters from the ESE device and one approximately 78 meters from the device. However, the following statement should be noted from the report:

> Near the end of the test period, it was noticed that the radioactive Preventor had been damaged --the weld had broken between the spherical ball on the Preventor and the nut to which it attached. It is not certain when or how this happened. There was no evidence of tampering or vandalism. Examination of the tip of the Preventor under a microscope showed evidence of melting, such as would occur if lightning were to have struck it. Most likely, the Preventor was struck by lightning at a time when the camcorders were not turned on (when the peak was in a cloud, or a storm occurred in the early morning hours), and the lightning broke the weld.[13]

Thus, it might appear that the ESE device was active in a lightning strike not recorded by the video cameras utilized during the study, since there were periods during the study when the cameras were inactive.

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[13]Rison, William, A Study of Lightning Strikes in The Vicinity of a Radioactive Preventor, Langmuir Laboratory, New Mexico Tech., Socorro, NM, 11-8-91, p. 4.

Moore *et al.* (248) reported in 1998 a summary of all the field tests of the radioactive "Preventor" ESE device during the summers of 1990, 1991, 1993, 1994, 1995, 1996, and 1997. Moore's analysis is as follows:

> In the six summers during which the "preventor" was exposed to thunderstorms overhead, lightning struck six different sites within 100 meters of the device yet the "preventor" itself was never struck.
>
> Digitized measurements with quarter-microsecond time resolution, of the currents that flowed from the "Preventor" during two nearby lightning strikes in September 1997 showed no indication that the "Preventor" emitted any effective "early streamers". In fact, during one of these discharges, lightning struck a blunt rod located 20 meters distant yet no streamers were emitted from the "Preventor" to connect with this close strike.[14]

It should be noted these seven-year tests involved a single ESE device of a radioactive type. It should also be noted that Moore's (243) field studies under natural lightning conditions have questioned the validity of the effectiveness of the sharp-pointed Franklin air terminal as follows:

> The failure of radioactive-ionizing and of sharply pointed air terminals to participate in lightning discharges by being pre-eminent connectors of lightning to earth is no surprise to scientists studying thunderstorms and lightning. For the past 40 years, I have been measuring the electric currents flowing into the air from both radioactive electrodes and from sharply pointed ones under the influence of the strong electric fields beneath thunderstorms but not one of my well-exposed electrodes has ever been struck by lightning.[15]

[14] Moore, C. B., William Rison, and G. D. Aulich, An Assessment of The Radioactive "Preventor" as an Early Streamer Emitting Lightning Protector, New Mexico Tech., Langmuir Laboratory for Atmospheric Research, Socorro,NM, 12-29-98, pp. 24-25.

[15] 243. Moore, Charles B., New Mexico Tech., "Personal Communication to Subcommittee of NFPA Board of Directors", 9-4-95, p. 1.

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2. Consideration of System Performance

It would appear the ultimate evaluation of any complete lightning protection system would be the performance of the systems as installed on buildings. The submitted materials included one reference to the failure of a conventional system with Franklin rods (328) and there was one newspaper account of a Franklin rod system failure resulting in personnel injuries. (252) There were several studies of failures of ESE lightning protection systems. (146) (220).

The failure of the Franklin rod system resulting in the eleven personnel injuries occurred at the Robert F. Kennedy stadium in Washington, D.C. on June 13, 1998. (252) Richardson reported on the failure of a Franklin rod air terminal located approximately four feet from an externally mounted camera on the building which was damaged by a lightning strike. (328)

Makerras *et al.*, (220) have reported on four cases of lightning striking buildings in Singapore from the late 1960's until the 1980's. Hartono and Robiah (146) have reported on ten cases of failures on buildings protected with ESE lightning protection systems. This study utilized photographs of the building conditions both before and after the reported lightning strikes on the damaged areas of the buildings. It was found from this photographic study the damage appeared to be dependent on the number of strokes received, the strength of the lightning stroke and

the shape of the structure at the point of the stroke. Although not specified in the study Hartono and Robiah have indicated lightning strike damage was found on buildings protected with Franklin air terminals as indicated in the following statement:

> Studies conducted on the buildings equipped with the standard lightning air terminals (Franklin rod type) also exhibited similar lightning damage locations on or near the rooftop. Based on this comparison, we conclude that no advantage can be obtained by using the ESE device in protecting the building against direct lightning strikes.[21]

It should be noted that all of the incidents of system failure submitted to the panel lacked the necessary detailed documentation to enable a valid analysis as to the effectiveness.of the system. Even the most detailed photo study lacked the necessary documentation consisting of the following: The manufacture and model of the air terminal. The date the installation was completed, thus establishing the age of the system when the lightning strike occurred. The maintenance and condition of the system when the strike occurred, including the condition of the down conductors and the grounding system. It would appear that detailed documentation of lightning protection system operations or failures is a needed component for the evaluation of the effectiveness of lightning protection systems of all types on various buildings of differing heights and configurations.

[21]Hartono, Zainal Abidin and Ibrahim Robiah, A Long Term Study on The Performance of Early Streamer Emission Air Terminals in a highly Isokeraunic Region. 2-19-99, p. 2.

Van Brunt *et al.*, (369) has referenced this problem of adequate data on lightning protection system performance in the following manner:

> There are reports of incidents where ESE devices failed to provide the protection specified by the manufacturer [156,158,165,215]. Statistics on the failure of conventional systems have also been documented [109]. When examining reports of "failures", one can always raise questions about their cause, e.g., whether they are primarily a consequence of exaggerated claims made by the manufacturer or a consequence of misuse (faulty installation) of the device. Reports of isolated failures raise legitimate concerns, but are seldom accompanied by enough supporting data about the event to enable a determination of why the failure occurred. Generally it is difficult to draw significant conclusions from single events that can be used to improve system design or evaluate system performance.[22]

Thus, given the present situation of lightning protection system performance not being a priority of the proponents of the systems, the manufacturers, the insurance companies or public officials it would appear little valid information or data relative to a validation of the theoretical basis of the systems will be obtained.

III. RECOMMENDATIONS TO STANDARDS COUNCIL

Based on a thorough and complete evaluation of the 377 items submitted to the third-party independent panel the members of the panel have agreed in a complete consensus on the following recommendations to the National Fire Protection Association Standards Council. It should be

[22] Van Brunt, Richard J., Thomas L. Nelson, Samar L. Firebaugh, Early Streamer Emission Air Terminals Lightning Protection Systems: Literature Review and Technical Analysis, Quincy, MA, National Fire protection Research Foundation, 1-31-95, p. 25.

recognized the Standards Council is the official designated authority on any action to be taken relative to the NFPA lightning protection documents.

A. Scientific and Technical Basis of ESE

The initial question posed to the third-party independent evaluation panel was stated as: "whether the ESE lightning protection technology is scientifically and technically sound." The panel's review of the submitted materials resulted in the following determinations:

1. The ESE air terminals appear to be technically sound since they are generally equivalent to the conventional Franklin air terminal in laboratory experiments.

2. However, neither the ESE air terminals nor the conventional Franklin rod appear to be scientifically or technically sound when evaluated in field tests under natural lightning conditions.

3. The ESE lightning protection technology as currently developed in the installation of complete systems does not appear to be scientifically and technically sound in relation to the claimed areas of protection or the essentials of the grounding system.

B. Adequacy of Theoretical Basis and Lab Tests

The second specific question posed to the third-party independent review panel was stated as: "whether the ESE lightning protection technology is supported by adequate scientific-theoretical basis and

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laboratory testing." The panel's review of the submitted materials resulted in the following determinations:

1. There does appear to be an adequate theoretical basis for the early streamer emission lightning protection air terminal concept and design from a physical viewpoint.

2. There does not appear to be an adequate theoretical basis for the claimed enhanced areas of protection with limited down conductors and grounding system.

3. The high voltage laboratory tests of the ESE air terminals appear to be adequate in scope and quantity, but they are limited in that they are not equivalent to an evaluation of the complete ESE lightning protection system under natural thunderstorm conditions.

C. NFPA Lightning Protection Documents

The third-party independent evaluation panel was also directed in the Settlement Agreement as follows: "This panel, in issuing its report, shall address the following issues, and any other issues it deems relevant:" The panel considered the issues of the existing NFPA 780 document titled: Standard for The Installation of Lightning Protection Systems 1997 edition. (294) and the proposed NFPA 781 document titled: Standard for Lightning Protection Systems Using Early Streamer Emission Air Terminals. (277) The panel considered the need for each document and each committee's membership and balance in accordance with NFPA

procedures. The panel's review of the submitted materials resulted in the following determinations:

1. The current NFPA 780 Committee should be discharged and the Committee should be completely restructured. The committee needs new and additional memberships in the membership categories of enforcer, consumer, user, insurance, labor, special expert and research/testing..

2. The Council should solicit memberships from prominent users such as: FAA, DOE, DOD, NASA, IBM, Reedy Creek Improvement District, phone, radio, television organizations and electric power utilities.

3. The NFPA 780 document should be reformulated as a Guide or Recommended Practice. It appears to the panel the NFPA 780 document does not meet the NFPA criteria for a standard since the recommended lightning protection system has never been scientifically or technically validated and the Franklin rod air terminals have not been validated in field tests under thunderstorm conditions. The NFPA criteria for a standard as stated in the NFPA 99 Directory (298) is as follows:

> Standard --A document, the main text of which contains only mandatory provisions using the word "shall" to indicate requirements and which is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions shall be located in an appendix, footnote, or fineprintnote and are not to be consider as part of the requirements of a standard.[23]

[23]NFPA, National Fire Protection Association 1999 Directory, Quincy, MA, 11-98, p. 52.

EXHIBIT G

EARLY STREAMER EMISSION AIR TERMINALS LIGHTNING PROTECTION SYSTEMS

LITERATURE REVIEW AND TECHNICAL ANALYSIS

Prepared by

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development has been established from laboratory investigations [113], considerably less is known about the dynamics and interactions of these species in a discharge compared to what is known about ions. In particular, very little is known about how they contribute to lightning discharge initiation or propagation under relevant atmospheric conditions. As with negative ions, the metastable content of the air around a lightning terminal will be affected by relative humidity and general air contamination. The influence of metastable species should not extend significantly beyond the end of a lightning rod. Their role, if anything, will be to enhance initial development of a streamer at the rod tip.

In summary, it would appear that enhancement of upward streamer initiation from an ESE terminal (compared to a conventional terminal) has a plausible physical basis. However, it would also appear that a complete and universally accepted understanding of how all ESE devices work has not yet been achieved, and it can be argued that a better understanding is needed to make meaningful quantitative comparisons between the performances of ESE and conventional devices. To reach such an understanding it will undoubtedly be necessary to address numerous basic questions such as:

1. What are the predominant streamer initiation mechanisms under different conditions of polarity, atmospheric humidity, air contamination, and terminal geometry?

2. What are the relative roles of ions, electrons, and metastable species on the development and propagation of a streamer discharge from a terminal for different conditions?

3. What is the likelihood of corona formation around a terminal and how will the presence of corona affect the ability of the terminal to launch a streamer upon approach of a lightning stroke?

4. In the case of radioactive terminals, what is the dependence of the streamer initiation probability on the intensity and type of radiation source?

5. In the case of electrically triggered devices, how does the streamer initiation probability depend on the timing and magnitude of the electrically triggered spark?

6. Also for electrically triggered devices, how reliable is the field sensor that controls the triggering, and can its performance be affected by local space charge?

Attempts to find answers to questions like these are the focus of much ongoing experimental and theoretical research, not only on lightning, but on electrical discharge phenomena in general.

D. Validation of ESE System Performance

Three general methods have been used to evaluate and test the performance of lightning protection systems, namely: 1) small-scale laboratory or outdoor tests in which lightning, or the effects of lightning are simulated by applying high-voltage impulses

lightning seldom hits a terminal regardless of whether or not it is equipped with an ESE device [182,183,215]. Although a few isolated strikes to the mountain were reported to have occurred within the supposed zones of protection of ESE terminals [183,215], it would appear that the overwelming majority of strikes to the mountain were at considerable distance from any terminal. In any case, the failure of air terminals to attract lightning on mountain tops at elevations of 3000 m (9843 feet) or more is obviously disturbing and raises questions about the interpretation of such observations. Before any serious conclusions are drawn about the performance of lightning attractors from tests performed on mountain tops; it may be necessary to consider the perturbing effect of the mountain itself on such parameters as the surface charge distribution and electric-field profile under a thundercloud, as well as the extent that lightning strokes at such high elevations differ from those that normally occur in lower, flatter locations. It would appear that the answers to some of these questions might already be found in the literature.

It is noted in some papers that lightning that occurs at high elevations generally differs on average from that which occurs at sea level, if in no other respect than that it has less distance to cover in going from the cloud to ground [36]. At an elevation of 3000 m, the ground can be quite close to or even engulfed by the base of a storm cloud. Certainly the results from high mountain tests cannot be dismissed, and such tests should continue, as should similar tests underway at other locations [107]. The problem is how to interpret the results of these tests and infer what they might imply about air terminal performance at lower elevations, and what they indicate about the influence of mountainous or rocky terrain on the effective zone of protection of an air terminal.

The unfavorable statistical odds associated with natural lightning can be partially overcome by using artificially triggered lightning. Tests have shown that lightning can be triggered with reasonably high probability by a rocket launched into a thundercloud [124,160,190,193]. A long trailing wire is usually attached to the rocket which provides a low resistance path to guide the initial discharge and define its direction of propagation [45,120,193]. Transportable facilities have been developed for rocket triggering of lightning that can be used for testing at nearly any location [231]. Although tests of air terminals are being made using triggered lightning, there are questions that can be raised about the meaning of such tests. There is evidence that triggered lightning is unlike natural lightning both in its intensity and propagation characteristics. In particular, it has been noted that triggered lightning is of lower current than natural lightning and exhibits characteristics more like those of return strokes observed in natural lightning [78,161]. It has also been argued that triggered lightning does not satisfactorily mimic the primary stroke and is therefore unsuited for investigation of the attachment to a grounded lightning conductors, i.e. its use in evaluating air terminals would appear to be questionable [78]. The extent to which rocket-triggered lightning behaves like natural lightning seems to depend on the length of the trailing wire and the distance of the bottom end of the wire above

3. Radiation hazards

In the case of ESE devices that employ radioactive materials, issues have been raised in the literature about the possible radiation hazards to humans that the use of these devices present [24,25,39,81,180,196,278]. As noted above, radioactive air terminals are banned in some countries, presumably because of perceived health hazards. It has been noted that ^{241}Am sources used in lightning protection devices are not any more hazardous than similar sources approved for use in smoke detectors or static eliminators [109,167,180]. Nevertheless, there are those who argue that the public may be placed at risk from a proliferation of radioactive materials in devices that can enter the environment without adequate controls [25,81,180]. An evaluation of the health and safety aspects of radioactive sources used in air terminals lies outside the scope of this report. However, we have identified this as a serious issue that the manufacturers and users of radioactive terminals must be prepared to address.

4. Damage and maintenance

Given that ESE devices likely have a structure and associated instrumentation that are more complex than conventional air terminals, questions can be raised about their susceptibility to damage during a lightning strike. The electric current and energy deposited by a lightning stroke can be sufficiently high to actually melt metallic structures and destroy electronic components. There are numerous reports of damage inflicted by the primary lightning stroke to metal parts on aircraft, etc. [70,79,138,209,237,269]. The possibility of damage means that a lightning protection device may require periodic inspection and/or maintenance that is generally not required for conventional terminals. Although this problem is pointed out [155], there seems to be very little discussion about it in the open literature.

IV. CONCLUSIONS

The possible conclusions that can be drawn from an examination of the literature included in the bibliography are discussed in this section. The main conclusions of this report are briefly summarized in Section VI.

Because of the sparsity of information that can be found in the peer-reviewed literature from tests of early streamer emission air terminals, either in the laboratory or in the natural environment, it is nearly impossible to make quantitatively meaningful statements or judgements about the performance of ESE devices in comparison to conventional Franklin rods. In fact, insufficient reliable quantitative data seem to exist about the performance of conventional rods, and there seems to be an ongoing debate about the best geometrical design for conventional terminals required to achieve optimum lightning attraction efficiency.

Nearly all of the information or data that could found on ESE device performance resulted either from tests performed by manufacturers of lightning protection sys-

tems or by those directly or indirectly employed by such manufacturers. Although abundant criticism is published by non-manufacturers about the performance of ESE devices, especially radioactive air terminals, it is seldom based on actual test data. Those on both sides of the issue invoke lack of evidence in making their case about the performance of ESE terminals. Proponents of these devices claim that a lack of credible statistical data on failure of ESE terminals proves their effectiveness; while critics of these terminals argue that a lack of evidence about the improved performance of ESE terminals over conventional terminals proves their ineffectiveness. In either case, one must beware of faulty logic, in as much as a lack of evidence never proves the lack of something.

There are reports of incidents where ESE devices failed to provide the protection specified by the manufacturer [156,158,165,215]. Statistics on the failure of conventional systems have also been documented [109]. When examining reports of "failures", one can always raise questions about their cause, e.g., whether they are primarily a consequence of exaggerated claims made by the manufacturer or a consequence of misuse (faulty installation) of the device. Reports of isolated failures raise legitimate concerns, but are seldom accompanied by enough supporting data about the event to enable a determination of why the failure occurred. Generally it is difficult to draw significant conclusions from single events that can be used to improve system design or evaluate system performance. There is no reason to believe that an air terminal is 100% efficient in attracting lightning, regardless of what kind of ESE device it uses, if any. Considering the wide range of possible atmospheric conditions and types of lightning behavior that have been recorded, it is not surprising that air terminals of all types will sometimes fail [37,201,271]. Tall structures are reported to be struck occasionally by lightning at points far below the top, i.e., outside of the "protection zone" [173,185,186]. Any claims of 100% efficiency in the performance of a lightning attractor should be viewed with skepticism. In any case, the meaning of the term "efficiency", when specified for an air terminal, should be clearly defined and understood.

A reasonable physical basis for the operation of an ESE device appears to exist in the sense that there is good evidence from laboratory investigations that the probability of initiating a streamer discharge from an electrode can be increased significantly by irradiation or electrical triggering. However, the precise amount by which this enhancement in streamer initiation improves the lightning attraction efficiency of an air terminal remains questionable. There is reason to doubt that it significantly extends the maximum range of protection. A lightning stroke that would not hit a conventional terminal because of the fact that it does not enhance the field at the terminal tip enough to allow streamer formation will also not likely hit a terminal equipped with an ESE device. (The exception would be an ESE device that significantly increases the terminal potential during the approach of a lightning stroke.) In our view, the possible advantage offered by an ESE device, if operated properly, is that it helps to insure that a streamer will be initiated if the field produced by the

SP7637

Date Submitted	12/2/2018	**Section**	464	**Proponent**	James gregory
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Approved as Submitted
Commission Action Pending Review

Comments

General Comments **Yes** **Alternate Language** **Yes**

Related Modifications

Summary of Modification

Revises the section reference to coordinate with the 2018 edition of the Guidelines. Specifies which section of the Florida Accessibility Code will be applied to an ALF.

Rationale

4.6.3.1 Corrects the reference to the latest published edition of the 2018 edition of the Guidelines.

4.64.3.2 Clarifies that an Assisted Living Facility (ALF) is a “residential facility” not a “Long-Term Care” facility as described in the Accessibility Code.
Because the ALF provides only personal care services and is not defined as a health care facility or long-term care facility by Florida rule or statue, it must be consistently reviewed as a residential facility for accessibility purposes, not a medical facility or a long-term care facility. However, some building officials insist that an ALF is a long-term care facility even though the state Agency For Health Care Administration states an ALF is NOT a long-term care facility. This added information will help to clarify the code in this one area and direct the building officials to the correct section of the Florida Building Code, Accessibility.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

There is no fiscal impact on the local entity relative to enforcement.

Impact to building and property owners relative to cost of compliance with code

There is no fiscal impact to building and property owners relative to the cost of compliance.

Impact to industry relative to the cost of compliance with code

There is no fiscal impact to industry relative to the cost of compliance.

Impact to small business relative to the cost of compliance with code

There is no fiscal impact to small business relative to the cost of compliance.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Has a reasonable and substantial connection with the health and safety an welfare of the general public.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Strengthens or improves the code by making the code requirements clearer to the user.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

Does not degrade the effectiveness of the code.

2nd Comment Period

7637-A2

Proponent James gregory **Submitted** 5/10/2019 **Attachments** Yes

Rationale

Editorial revision only. The paragraph number was incorrect. It should be 464.3.1 and not 4.6.3.1.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No Impact. Numbering only.

Impact to building and property owners relative to cost of compliance with code

No Impact. Numbering only.

Impact to industry relative to the cost of compliance with code

No Impact. Numbering only.

Impact to Small Business relative to the cost of compliance with code

There is no fiscal impact to small business relative to the cost of compliance.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

No Impact. Numbering only.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

No Impact. Numbering only.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No Impact. Numbering only.

Does not degrade the effectiveness of the code

No Impact. Numbering only.

2nd Comment Period

SP7637-G1

Proponent James gregory **Submitted** 5/9/2019 **Attachments** No

Comment:

This is an editorial comment. The second paragraph should read as 464.3.1 instead of 4.63.1.

~~4.6.3.1~~ 464.3.1 Except as modified and required by this section of the code, Chapter 58A-5, Florida Administrative Code or Chapter 429 Part III, Florida Statutes, all new assisted living facilities and all additions, alterations, or renovations to existing assisted living facilities with more than 16 licensed beds shall also be in compliance with *The Guidelines for the Design and Construction of Residential Health, Care and Support Facilities* (The Guidelines) Part I General, and Chapter 4.~~2~~1SpecialRequirements forAssisted Living Facilities as referenced in Chapter 35 of this code.

464.3 Codes and standards for the design and construction of assisted living facilities.

4.6.3.1 Except as modified and required by this section of the code, Chapter 58A-5, Florida Administrative Code or Chapter 429 Part III, Florida Statutes, all new assisted living facilities and all additions, alterations, or renovations to existing assisted living facilities with more than 16 licensed beds shall also be in compliance with The Guidelines for the Design and Construction of Residential Health, Care and Support Facilities (The Guidelines) Part I General, and Chapter 4.~~2~~1 Special Requirements for Assisted Living Facilities as referenced in Chapter 35 of this code.

464.3.2 Assisted Living Facilities shall meet the accessibility requirements for Residential Facilities as described section 233 of the Florida Building Code, Accessibility.

Date Submitted	12/3/2018	**Section**	469	**Proponent**	James gregory
Chapter	4	**Affects HVHZ**	No	**Attachments**	No
TAC Recommendation	Approved as Submitted				
Commission Action	Pending Review				

Comments

General Comments **No** **Alternate Language** **Yes**

Related Modifications

Summary of Modification

Reference update.

Rationale

Updates the reference to the correct book of the FGI Guidelines.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

There is no fiscal impact on the local entity relative to enforcement.

Impact to building and property owners relative to cost of compliance with code

There is no fiscal impact to building and property owners relative to the cost of compliance.

Impact to industry relative to the cost of compliance with code

There is no fiscal impact to industry relative to the cost of compliance.

Impact to small business relative to the cost of compliance with code

There is no fiscal impact to small business relative to the cost of compliance.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Has a reasonable and substantial connection with the health and safety an welfare of the general public.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Strengthens or improves the code by making the code requirements clearer to the user.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

Does not degrade the effectiveness of the code.

Alternate Language

2nd Comment Period

7640-A1

Proponent James gregory **Submitted** 5/10/2019 **Attachments** Yes

Rationale

Adds general information common to all outpatient facilities that will be useful in the design of these facilities.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Has no impact to local entity to enforcement.

Impact to building and property owners relative to cost of compliance with code

Has no impact on building and property owners relative to cost.

Impact to industry relative to the cost of compliance with code

Has no impact on the industry relative to cost.

Impact to Small Business relative to the cost of compliance with code

There is no fiscal impact to small business relative to the cost of compliance.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Provides more information for the design.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by referencing information on design.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate against materials or products or methods.

Does not degrade the effectiveness of the code

Improves the effectiveness of the code.

469.2.1.2 Part I and Part 2: Outpatient Facility Types, Chapter 2.1, Common Elements for Outpatient Facilities of T*he Guidelines for Design and Construction of* ~~Health Care~~ *Outpatient Facilities* (The Guidelines), as referenced in Chapter 35 of this code.

469.2.1.2 Part I of The Guidelines for Design and Construction of ~~Health Care~~ Outpatient Facilities (The Guidelines), as referenced in Chapter 35 of this code.

SP8212

Date Submitted 12/14/2018
Chapter 4
Section 450.4.1.3
Affects HVHZ No
Proponent scott waltz
Attachments Yes

TAC Recommendation Approved as Submitted
Commission Action Pending Review

Comments

General Comments **No**

Alternate Language **Yes**

Related Modifications

Modification # 8198

Summary of Modification

Proposed revision aligns the Florida Building Code with 59A-4.1265, F.A.C. Emergency Environmental Control for Nursing Homes.

Rationale

Following the tragic loss of life at a nursing home due to heat related illness in the aftermath of Hurricane Irma, the Agency for Health Care Administration developed a rule requiring facilities to provide an alternate power source for equipment necessary to maintain safe indoor air temperatures for not less 96 hours following the loss of normal power. This rule exceeds the current requirements for a standby power system for a nursing home. This proposed modification is part of a series of proposals intended to align the Florida Building Code with the Rule and eliminate conflicting requirements. This revision aligns the requirement for the facility to be self-supporting with the requirements of the rule.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None.

Impact to building and property owners relative to cost of compliance with code

The proposal aligns the code with requirements in an existing rule and will not result in any additional costs.

Impact to industry relative to the cost of compliance with code

The proposal aligns the code with requirements in an existing rule and will not result in any additional costs.

Impact to small business relative to the cost of compliance with code

The proposal aligns the code with requirements in an existing rule and will not result in any additional costs.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The modification does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

No.

2nd Comment Period

8212-A1

Proponent scott waltz **Submitted** 5/23/2019 **Attachments** Yes

Rationale

Modifies text for clarification.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Impact to Small Business relative to the cost of compliance with code

The proposal aligns the code with requirements in an existing rule and will not result in any additional costs.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

It does not.

Does not degrade the effectiveness of the code

It does not.

450.4.1.3 DURING AND IMMEDIATELY FOLLOWING.

A period of ~~72~~ 96 hours following the loss of normal support utilities to the facility that are necessary to support the health, safety, and welfare of the residents and staff. These support utilities include but are not limited to normal electrical power, potable water supply, sewer, and telecommunications.

450.4.1.3 DURING AND IMMEDIATELY FOLLOWING.

A period of ~~72~~ 96 hours following the loss of normal critical support utilities to the facility necessary to support the health, safety, and welfare of the residents and staff. Critical support utilities include normal electrical power, potable water supply, sewer, and telecommunications.

59A-4.1265 Emergency Environmental Control for Nursing Homes.

(1) DETAILED NURSING HOME EMERGENCY POWER PLAN. Each nursing home shall prepare a detailed plan ("plan"), to serve as a supplement to its Comprehensive Emergency Management Plan, to address emergency power in the event of the loss of primary electrical power in that nursing home, which includes the following information:

(a) The acquisition of a sufficient alternate power source such as a generator(s), maintained at the nursing home, to ensure that current licensees of nursing homes will be equipped to ensure the protection of resident health, safety, welfare, and comfort for a minimum of ninety-six (96) hours in the event of the loss of primary electrical power. Safe indoor air temperatures in resident occupied areas shall be determined by the licensee to meet the clinical needs of residents, but shall not exceed eighty-one (81) degrees Fahrenheit.

1. The required temperature must be maintained in an area or areas determined by the nursing home of sufficient size to maintain all residents safely at all times and is appropriate for the care needs and life safety requirements. For planning purposes, no less than thirty (30) net square feet per resident must be provided. This may include areas that are less than the entire nursing home if the nursing home's comprehensive emergency management plan includes relocating residents to portions of the building where the health, safety, welfare, and comfort of the residents will be maintained as required by this rule. The plan shall include information regarding the area(s) within the nursing home where the required temperature will be maintained.

2. The alternate power source for the equipment necessary to maintain the safe indoor air temperature required by this rule may be provided by the essential electrical system required by the Florida Building Code for Nursing Home design and construction or onsite optional standby system as defined by NFPA 70 National Electrical Code supplying normal power to the nursing home maintained onsite at all times when the building is occupied. If an optional standby system is used, it must be connected and maintained in accordance with the manufacturer's recommendations. The alternate power source and fuel supply shall be located in an area(s) in accordance with local zoning and the Florida Building Code.

3. Each nursing home is unique in size; the types of care provided; the physical and mental capabilities and needs of residents; the type, frequency, and amount of services and care offered; and staffing characteristics. Accordingly, this rule does not limit the types of systems or equipment that may be used to maintain the safe indoor air temperature required by this rule for a minimum of ninety-six (96) hours in the event of the loss of primary electrical power. The plan shall include information regarding the systems and equipment that will be used by the nursing home required to operate the systems and equipment.

a. A nursing home in an evacuation zone pursuant to Chapter 252, F.S., must maintain an alternative power source and fuel as required by this subsection at all times when the facility is occupied but is permitted to utilize a mobile generator(s) to enable portability if evacuation is necessary.

b. Facilities located on a single campus with other facilities licensed by the Agency under common ownership, may share fuel, alternative power resources, and resident space available on the campus if such resources are sufficient to support the requirements of each facility's residents, as specified in this rule. Details regarding how resources will be shared and any necessary movement of residents must be clearly described in the emergency power plan.

c. A multistory facility, whose comprehensive emergency management plan is to move residents to a higher floor during a flood or surge event, must place its alternative power source and all necessary additional equipment so it can safely operate in a location protected from flooding or storm surge damage.

(b) The acquisition of sufficient fuel, and safe maintenance of that fuel onsite at the facility, to ensure that in the event of the loss of primary electrical power there is sufficient fuel available for the alternate power source required in paragraph (1)(a), to power life safety systems, critical systems, and equipment necessary to maintain safe indoor air temperatures as described in this rule for ninety-six (96) hours after the loss of electrical power during a declared state of emergency. The plan shall include information regarding fuel source and fuel storage.

1. A nursing home located in an area in a declared state of emergency area pursuant to Section 252.36, F.S., that may impact primary power delivery must secure ninety-six (96) hours of fuel. The nursing home may utilize portable fuel storage containers for the remaining fuel necessary for ninety-six (96) hours during the period of a declared state of emergency.

2. A nursing home must store a minimum of seventy-two (72) hours of fuel onsite.

3. Piped natural gas is an allowable fuel source and meets the onsite fuel requirement under this rule.

4. If local ordinances or other regulations that limit the amount of onsite fuel storage for the nursing home's location and the nursing home does not have access to piped natural gas, then the nursing home must develop a plan that includes maximum onsite fuel storage allowable by the ordinance or regulation and a reliable method to obtain the maximum additional fuel at least 24 hours

prior to depletion of onsite fuel.

(c) The acquisition of services necessary to install, maintain, and test the equipment and its functions to ensure the safe and sufficient operation of the alternate power source installed in the nursing home.

(2) SUBMISSION OF THE PLAN.

(a) Each nursing home licensed prior to the effective date of this rule shall submit its plan to the local emergency management agency for review and approval within thirty (30) days of the effective date of the rule. Nursing Home plans previously received and approved under Emergency Rule 59AER17-1, F.A.C., will require resubmission only if changes are made.

(b) Each new nursing home shall submit the plan required under this rule prior to obtaining a license.

(c) Each existing nursing home that undergoes additions, modifications, alterations, refurbishment, reconstruction or renovations that require modification of the systems or equipment affecting the nursing home's compliance with this rule shall amend its plan and submit it to the local emergency management agency for review and approval.

(3) PLAN REVIEW. Architectural and engineering plans are subject to review by the Agency's Office of Plans and Construction. The local emergency management agency shall review the emergency power plan for compliance with the subsection and may rely on the technical review of the Office of Plans and Construction. Once the review is complete, the local emergency management agency shall:

(a) Report deficiencies in the plan to the nursing home for resolution. The nursing home must resubmit the plan within ten (10) business days.

(b) Report approval or denial of the plan to the Agency and the nursing home.

(4) APPROVED PLANS.

(a) Each nursing home must maintain a copy of its plan in a manner that makes the plan readily available at the licensee's physical address for review by the authority having jurisdiction. If the plan is maintained in an electronic format, nursing home staff must be readily available to access and produce the plan. For purposes of this section, "readily available" means the ability to immediately produce the plan, either in electronic or paper format, upon request.

(b) Within two (2) business days of the approval of the plan from the local emergency management agency, the nursing home shall submit in writing proof of the approval to the Agency for Health Care Administration.

(c) The nursing home shall submit a consumer friendly summary of the emergency power plan to the Agency. The Agency shall post the summary and notice of the approval and implementation of the nursing home emergency power plans on its website within ten (10) business days of the plan's approval by the local emergency management agency and update within ten (10) business days of implementation.

(5) IMPLEMENTATION OF THE PLAN.

(a) Each nursing home licensed prior to the effective date of this rule shall, no later than June 1, 2018 have implemented the plan required under this rule.

(b) The Agency shall grant an extension up to January 1, 2019 to providers in compliance with paragraph (c), below, and who can show delays caused by necessary construction, delivery of ordered equipment, zoning or other regulatory approval processes. Nursing homes granted an extension must keep the Agency apprised of progress on a monthly basis to ensure there are no unnecessary delays.

(c) During the extension period, a nursing home must make arrangements pending full implementation of its plan that the residents are housed in an area that meets the safe indoor air temperature requirements of paragraph (1)(a), for a minimum of ninety-six (96) hours.

1. A nursing home not located in an evacuation zone must either have an alternative power source onsite or have a contract in place for delivery of an alternative power source and fuel when requested. Within twenty-four (24) hours of the issuance of a state of emergency for an event that may impact primary power delivery for the area of the nursing home, it must have the alternative power source and no less than ninety-six (96) hours of fuel stored onsite.

2. A nursing home located in an evacuation zone pursuant to Chapter 252, F.S., must either:

a. Fully and safely evacuate its residents prior to the arrival of the event, or

b. Have an alternative power source and no less than ninety-six (96) hours of fuel stored onsite, within twenty-four (24) hours of the issuance of a state of emergency for the area of the nursing home,

(d) Each new nursing home shall implement the plan prior to obtaining a license.

(e) Each nursing home that undergoes any additions, modifications, alterations, refurbishment, reconstruction or renovations that require modification of the systems or equipment affecting the nursing home's compliance with this rule shall implement its amended plan subsequent with the completion of construction.

(f) The Agency may request cooperation from the State Fire Marshal to conduct inspections to ensure implementation of the plan in compliance with this rule.

(6) POLICIES AND PROCEDURES.

(a) Each nursing home shall develop and implement written policies and procedures to ensure that each nursing home can effectively and immediately activate, operate and maintain the alternate power source and any fuel required for the operation of the alternate power source. The procedures shall be resident-focused to ensure that residents do not experience complications from heat exposure, and shall include a contingency plan to transport residents to a safe facility if the current nursing home's plan to keep the residents in a safe and comfortable location within the nursing home at or below the indoor air temperature required by this rule becomes compromised.

(b) Each nursing home shall maintain its written policies and procedures in a manner that makes them readily available at the licensee's physical address for review by the authority having jurisdiction. If the policies and procedures are maintained in an electronic format, nursing home staff must be readily available to access the policies and procedures and produce the requested information.

(c) The written policies and procedures must be readily available for inspection by each resident; each resident's legal representative, designee, surrogate, guardian, attorney in fact, or case manager; each resident's estate; and all parties authorized in writing or by law.

(7) REVOCATION OF LICENSE, FINES OR SANCTIONS. For a violation of any part of this rule, the Agency may seek any remedy authorized by Chapter 400, Part II, or Chapter 408, Part II, F.S., including but not limited to, license revocation, license suspension, and the imposition of administrative fines.

(8) COMPREHENSIVE EMERGENCY MANAGEMENT PLAN.

(a) Nursing homes whose comprehensive emergency management plan is to evacuate must comply with this rule.

(b) Once the plan has been approved, the nursing home shall submit the plan as an addendum with any future submissions for approval of its Comprehensive Emergency Management Plan.

(9) NOTIFICATION.

(a) Within three (3) business days, each nursing home must notify in writing, unless permission for electronic communication has been granted, each resident and the resident's legal representative:

1. Upon submission of the plan to the local emergency management agency that the plan has been submitted for review and approval;

2. Upon final implementation of the plan by the nursing home following review by the State Fire Marshal or the Agency's Office of Plans and Construction.

(b) The nursing home shall keep a copy of each written or electronic notification sent by the nursing home to the resident and resident's representative on file.

Rulemaking Authority 400.23 FS. Law Implemented 400.23 FS. History–New 3-26-18.

Date Submitted	12/14/2018	**Section**	450.4.2.9.6	**Proponent**	scott waltz
Chapter	4	**Affects HVHZ**	No	**Attachments**	Yes
TAC Recommendation	Approved as Submitted				
Commission Action	Pending Review				

Comments

General Comments **No** **Alternate Language** **Yes**

Related Modifications

Modification # 8198

Summary of Modification

Proposed revision aligns the Florida Building Code with 59A-4.1265, F.A.C. Emergency Environmental Control for Nursing Homes.

Rationale

Following the tragic loss of life at a nursing home due to heat related illness in the aftermath of Hurricane Irma, the Agency for Health Care Administration developed a rule requiring facilities to provide an alternate power source for equipment necessary to maintain safe indoor air temperatures for not less 96 hours following the loss of normal power. This rule exceeds the current requirements for a standby power system for a nursing home. This proposed modification is part of a series of proposals intended to align the Florida Building Code with the Rule and eliminate conflicting requirements. This revises the fuel requirements to align with the rule and clarifies the method for calculating the required fuel storage.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None.

Impact to building and property owners relative to cost of compliance with code

The proposal aligns the code with an existing rule and enhances the survivability of standby power systems when used to backup critical cooling systems. This will result in a small cost increase, but reduce the risk of losing power needed to maintain resident safety.

Impact to industry relative to the cost of compliance with code

The proposal aligns the code with an existing rule and enhances the survivability of standby power systems when used to backup critical cooling systems. This will result in a small cost increase, but reduce the risk of losing power needed to maintain resident safety.

Impact to small business relative to the cost of compliance with code

The proposal aligns the code with an existing rule and enhances the survivability of standby power systems when used to backup critical cooling systems. This will result in a small cost increase, but reduce the risk of losing power needed to maintain resident safety.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The modification does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

No.

Alternate Language

2nd Comment Period

8221-A1

Proponent scott waltz **Submitted** 5/24/2019 **Attachments** Yes

Rationale

This alternate modifies the original proposal to include provisions proposed by Skip Gregory in a separate modification.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Impact to Small Business relative to the cost of compliance with code

The proposal aligns the code with an existing rule and enhances the survivability of standby power systems when used to backup critical cooling systems. This will result in a small cost increase, but reduce the risk of losing power needed to maintain resident safety.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

It doe not

Does not degrade the effectiveness of the code

It does not

1st Comment Period History

SP8221-G1

Proponent Deborah Franklin **Submitted** 2/18/2019 **Attachments** No

Comment:

We oppose this requirement to require facilities to meet the Level 1 Generator requirements as some facilities may prefer to have Level 1 Generator to meet Life Safety Code requirements and an optional standby generator to meet the temperature requirements as this would allow the skilled nursing facility to use natural gas for the optional standby generator.

450.4.2.9.6 A new facility shall be equipped with either a permanent on-site optional stand-by ~~generator~~system to operate at least the nonessential loads of the electrical system or the entire normal branch of the electrical system, for a period of 96 hours for the demand load of the generator~~or there shall be a permanently installed predesigned electrical service entry for the electrical system that will allow a quick connection to a temporary electrical generator to operate at least the nonessential loads of the electrical system or the entire normal branch of the electrical system~~. ~~This quick connection shall be installed inside of a permanent metal enclosure rated for this purpose and may be located on the exterior of the building~~.

Exception: An optional stand-by system shall not be required where the essential electrical system provided in accordance with Section 450.3.18.1 is designed to operate the facility's entire electrical system and sufficient onsite fuel storage is provided to maintain resident occupied areas for a minimum of 96 hours for the demand load on the system.

450.4.2.9.6.1 The fuel for this generator may be natural gas, diesel, or propane. Gasoline shall not be permitted as a fuel source. Onsite fuel reserves shall not be required for the optional stand-by system if the generator is fueled by piped natural gas.

450.4.2.9.6.2 The generator, panel boards, switchgear, fuel lines, and other vulnerable system components shall be protected from debris impact in accordance with Section 450.4.2.5.4.

450.4.2.9.6.3 The system shall be protected from flooding in accordance with Section 450.2.2.1.

450.4.2.9.6.4 This system shall meet the requirements of NFPA 70 Article 702 and it shall be tested and maintained in accordance with the manufacturer’s instructions.

450.4.2.9.6.5 See 59A-4.1265 Emergency Environmental Control for Nursing Homes, F.A.C. for additional operational requirements.

450.4.2.9.6 A new facility shall be equipped with either a permanent on-site optional stand-by generator to operate at least the nonessential loads of the electrical system or the entire normal branch of the electrical system, or there shall be a permanently installed predesigned electrical service entry for the electrical system that will allow a quick connection to a temporary electrical generator to operate at least the nonessential loads of the electrical system or the entire normal branch of the electrical system. This quick connection shall be installed inside of a permanent metal enclosure rated for this purpose and may be located on the exterior of the building. Where used to meet the requirements of Section 450.4.2.6.2, the system shall comply with all of the following:

450.4.2.9.6.1 The generator, panel boards, switchgear, fuel lines, and other vulnerable system components shall be protected from debris impact in accordance with Section 450.4.2.5.4.

450.4.2.9.6.2 The system shall be connected to an onsite fuel supply sized to fuel the generator for 96 hours of actual demand load of the occupied resident area(s) and systems necessary to support resident care following the loss of normal electrical service.

450.4.2.9.6.3 The system shall be protected from flooding in accordance with Section 450.2.2.1.

59A-4.1265 Emergency Environmental Control for Nursing Homes.

(1) DETAILED NURSING HOME EMERGENCY POWER PLAN. Each nursing home shall prepare a detailed plan ("plan"), to serve as a supplement to its Comprehensive Emergency Management Plan, to address emergency power in the event of the loss of primary electrical power in that nursing home, which includes the following information:

(a) The acquisition of a sufficient alternate power source such as a generator(s), maintained at the nursing home, to ensure that current licensees of nursing homes will be equipped to ensure the protection of resident health, safety, welfare, and comfort for a minimum of ninety-six (96) hours in the event of the loss of primary electrical power. Safe indoor air temperatures in resident occupied areas shall be determined by the licensee to meet the clinical needs of residents, but shall not exceed eighty-one (81) degrees Fahrenheit.

1. The required temperature must be maintained in an area or areas determined by the nursing home of sufficient size to maintain all residents safely at all times and is appropriate for the care needs and life safety requirements. For planning purposes, no less than thirty (30) net square feet per resident must be provided. This may include areas that are less than the entire nursing home if the nursing home's comprehensive emergency management plan includes relocating residents to portions of the building where the health, safety, welfare, and comfort of the residents will be maintained as required by this rule. The plan shall include information regarding the area(s) within the nursing home where the required temperature will be maintained.

2. The alternate power source for the equipment necessary to maintain the safe indoor air temperature required by this rule may be provided by the essential electrical system required by the Florida Building Code for Nursing Home design and construction or onsite optional standby system as defined by NFPA 70 National Electrical Code supplying normal power to the nursing home maintained onsite at all times when the building is occupied. If an optional standby system is used, it must be connected and maintained in accordance with the manufacturer's recommendations. The alternate power source and fuel supply shall be located in an area(s) in accordance with local zoning and the Florida Building Code.

3. Each nursing home is unique in size; the types of care provided; the physical and mental capabilities and needs of residents; the type, frequency, and amount of services and care offered; and staffing characteristics. Accordingly, this rule does not limit the types of systems or equipment that may be used to maintain the safe indoor air temperature required by this rule for a minimum of ninety-six (96) hours in the event of the loss of primary electrical power. The plan shall include information regarding the systems and equipment that will be used by the nursing home required to operate the systems and equipment.

a. A nursing home in an evacuation zone pursuant to Chapter 252, F.S., must maintain an alternative power source and fuel as required by this subsection at all times when the facility is occupied but is permitted to utilize a mobile generator(s) to enable portability if evacuation is necessary.

b. Facilities located on a single campus with other facilities licensed by the Agency under common ownership, may share fuel, alternative power resources, and resident space available on the campus if such resources are sufficient to support the requirements of each facility's residents, as specified in this rule. Details regarding how resources will be shared and any necessary movement of residents must be clearly described in the emergency power plan.

c. A multistory facility, whose comprehensive emergency management plan is to move residents to a higher floor during a flood or surge event, must place its alternative power source and all necessary additional equipment so it can safely operate in a location protected from flooding or storm surge damage.

(b) The acquisition of sufficient fuel, and safe maintenance of that fuel onsite at the facility, to ensure that in the event of the loss of primary electrical power there is sufficient fuel available for the alternate power source required in paragraph (1)(a), to power life safety systems, critical systems, and equipment necessary to maintain safe indoor air temperatures as described in this rule for ninety-six (96) hours after the loss of electrical power during a declared state of emergency. The plan shall include information regarding fuel source and fuel storage.

1. A nursing home located in an area in a declared state of emergency area pursuant to Section 252.36, F.S., that may impact primary power delivery must secure ninety-six (96) hours of fuel. The nursing home may utilize portable fuel storage containers for the remaining fuel necessary for ninety-six (96) hours during the period of a declared state of emergency.

2. A nursing home must store a minimum of seventy-two (72) hours of fuel onsite.

3. Piped natural gas is an allowable fuel source and meets the onsite fuel requirement under this rule.

4. If local ordinances or other regulations that limit the amount of onsite fuel storage for the nursing home's location and the nursing home does not have access to piped natural gas, then the nursing home must develop a plan that includes maximum onsite fuel storage allowable by the ordinance or regulation and a reliable method to obtain the maximum additional fuel at least 24 hours

prior to depletion of onsite fuel.

(c) The acquisition of services necessary to install, maintain, and test the equipment and its functions to ensure the safe and sufficient operation of the alternate power source installed in the nursing home.

(2) SUBMISSION OF THE PLAN.

(a) Each nursing home licensed prior to the effective date of this rule shall submit its plan to the local emergency management agency for review and approval within thirty (30) days of the effective date of the rule. Nursing Home plans previously received and approved under Emergency Rule 59AER17-1, F.A.C., will require resubmission only if changes are made.

(b) Each new nursing home shall submit the plan required under this rule prior to obtaining a license.

(c) Each existing nursing home that undergoes additions, modifications, alterations, refurbishment, reconstruction or renovations that require modification of the systems or equipment affecting the nursing home's compliance with this rule shall amend its plan and submit it to the local emergency management agency for review and approval.

(3) PLAN REVIEW. Architectural and engineering plans are subject to review by the Agency's Office of Plans and Construction. The local emergency management agency shall review the emergency power plan for compliance with the subsection and may rely on the technical review of the Office of Plans and Construction. Once the review is complete, the local emergency management agency shall:

(a) Report deficiencies in the plan to the nursing home for resolution. The nursing home must resubmit the plan within ten (10) business days.

(b) Report approval or denial of the plan to the Agency and the nursing home.

(4) APPROVED PLANS.

(a) Each nursing home must maintain a copy of its plan in a manner that makes the plan readily available at the licensee's physical address for review by the authority having jurisdiction. If the plan is maintained in an electronic format, nursing home staff must be readily available to access and produce the plan. For purposes of this section, "readily available" means the ability to immediately produce the plan, either in electronic or paper format, upon request.

(b) Within two (2) business days of the approval of the plan from the local emergency management agency, the nursing home shall submit in writing proof of the approval to the Agency for Health Care Administration.

(c) The nursing home shall submit a consumer friendly summary of the emergency power plan to the Agency. The Agency shall post the summary and notice of the approval and implementation of the nursing home emergency power plans on its website within ten (10) business days of the plan's approval by the local emergency management agency and update within ten (10) business days of implementation.

(5) IMPLEMENTATION OF THE PLAN.

(a) Each nursing home licensed prior to the effective date of this rule shall, no later than June 1, 2018 have implemented the plan required under this rule.

(b) The Agency shall grant an extension up to January 1, 2019 to providers in compliance with paragraph (c), below, and who can show delays caused by necessary construction, delivery of ordered equipment, zoning or other regulatory approval processes. Nursing homes granted an extension must keep the Agency apprised of progress on a monthly basis to ensure there are no unnecessary delays.

(c) During the extension period, a nursing home must make arrangements pending full implementation of its plan that the residents are housed in an area that meets the safe indoor air temperature requirements of paragraph (1)(a), for a minimum of ninety-six (96) hours.

1. A nursing home not located in an evacuation zone must either have an alternative power source onsite or have a contract in place for delivery of an alternative power source and fuel when requested. Within twenty-four (24) hours of the issuance of a state of emergency for an event that may impact primary power delivery for the area of the nursing home, it must have the alternative power source and no less than ninety-six (96) hours of fuel stored onsite.

2. A nursing home located in an evacuation zone pursuant to Chapter 252, F.S., must either:

a. Fully and safely evacuate its residents prior to the arrival of the event, or

b. Have an alternative power source and no less than ninety-six (96) hours of fuel stored onsite, within twenty-four (24) hours of the issuance of a state of emergency for the area of the nursing home,

(d) Each new nursing home shall implement the plan prior to obtaining a license.

(e) Each nursing home that undergoes any additions, modifications, alterations, refurbishment, reconstruction or renovations that require modification of the systems or equipment affecting the nursing home's compliance with this rule shall implement its amended plan subsequent with the completion of construction.

(f) The Agency may request cooperation from the State Fire Marshal to conduct inspections to ensure implementation of the plan in compliance with this rule.

(6) POLICIES AND PROCEDURES.

(a) Each nursing home shall develop and implement written policies and procedures to ensure that each nursing home can effectively and immediately activate, operate and maintain the alternate power source and any fuel required for the operation of the alternate power source. The procedures shall be resident-focused to ensure that residents do not experience complications from heat exposure, and shall include a contingency plan to transport residents to a safe facility if the current nursing home's plan to keep the residents in a safe and comfortable location within the nursing home at or below the indoor air temperature required by this rule becomes compromised.

(b) Each nursing home shall maintain its written policies and procedures in a manner that makes them readily available at the licensee's physical address for review by the authority having jurisdiction. If the policies and procedures are maintained in an electronic format, nursing home staff must be readily available to access the policies and procedures and produce the requested information.

(c) The written policies and procedures must be readily available for inspection by each resident; each resident's legal representative, designee, surrogate, guardian, attorney in fact, or case manager; each resident's estate; and all parties authorized in writing or by law.

(7) REVOCATION OF LICENSE, FINES OR SANCTIONS. For a violation of any part of this rule, the Agency may seek any remedy authorized by Chapter 400, Part II, or Chapter 408, Part II, F.S., including but not limited to, license revocation, license suspension, and the imposition of administrative fines.

(8) COMPREHENSIVE EMERGENCY MANAGEMENT PLAN.

(a) Nursing homes whose comprehensive emergency management plan is to evacuate must comply with this rule.

(b) Once the plan has been approved, the nursing home shall submit the plan as an addendum with any future submissions for approval of its Comprehensive Emergency Management Plan.

(9) NOTIFICATION.

(a) Within three (3) business days, each nursing home must notify in writing, unless permission for electronic communication has been granted, each resident and the resident's legal representative:

1. Upon submission of the plan to the local emergency management agency that the plan has been submitted for review and approval;

2. Upon final implementation of the plan by the nursing home following review by the State Fire Marshal or the Agency's Office of Plans and Construction.

(b) The nursing home shall keep a copy of each written or electronic notification sent by the nursing home to the resident and resident's representative on file.

Rulemaking Authority 400.23 FS. Law Implemented 400.23 FS. History–New 3-26-18.

SP8242

Date Submitted	12/14/2018	**Section**	449.3.3	**Proponent**	scott waltz
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation Approved as Submitted
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **Yes**

Related Modifications

Summary of Modification

Modification provides coordination with updated reference standard and eliminates redundant and/or conflicting requirements.

Rationale

Updates in the reference standard eliminate the need for some of the requirements currently in the Florida Building Code related to mobile medical units. The modification also clarifies that mobile units are not intended to be used on a permeant basis.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None.

Impact to building and property owners relative to cost of compliance with code

None.

Impact to industry relative to the cost of compliance with code

None.

Impact to small business relative to the cost of compliance with code

None.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Provides coordination with an updated standard that strengthens the code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The modification does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not degrade the effectiveness of the code

It does not.

Alternate Language

2nd Comment Period

8242-A3

Proponent scott waltz **Submitted** 5/26/2019 **Attachments** Yes

Rationale

Clarification.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Impact to Small Business relative to the cost of compliance with code

None.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

It does not

Does not degrade the effectiveness of the code

It does not

Alternate Language

2nd Comment Period

8242-A2

Proponent James gregory **Submitted** 5/11/2019 **Attachments** Yes

Rationale

This alternate language clarifies that the mobile units must meet the requirements of the Guidelines and deletes redundant language already detailed in the Guidelines.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Has no impact on local enforcement of the code.

Impact to building and property owners relative to cost of compliance with code

Has no impact on building owners relative to cost.

Impact to industry relative to the cost of compliance with code

Has no impact on cost of compliance. Reduces the code.

Impact to Small Business relative to the cost of compliance with code

None.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Improves the code by deleting redundant language.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by deleting redundant language.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate against materials products methods or systems.

Does not degrade the effectiveness of the code

Improves the code by deleting redundant language.

449.3.3 Mobile/Transportable Medical Units~~testing and treatment facilities~~. Reference *The Guidelines* for other requirements.

449.3.3.1 In addition to any other state of Florida required permits, mobile ~~facilities~~and transportable units shall be approved in advance by the Agency for Health Care Administration (Agency) before they may be utilized for patient services. Except as approved by the Agency, use of these units shall be limited to 6 months during a 12 month period. Usage may include temporary facilities during repair/replacement of equipment or intermittent use as needed in underserved communities or due to seasonal fluctuation.

449.3.3.2 The mobile facility shall comply with the applicable requirements of the Florida Building Code, Building, The Guidelines, including Part 1 General and Part 2 Chapter 2.8~~Part 3 Outpatient Facilities, Chapter 3.13 Specific Requirements for Mobile, Transportable, and Relocatable Units,~~ Specific Requirements for Mobile/Transportable Medical Units. ~~and with Section 449 of this code for the type of service to be provided.~~

~~449.3.3.3 Mobile or transportable units that are limited to providing noninvasive, diagnostic and treatment services without the use of anesthetics shall not be required to comply with other sections of The Guidelines as described in The Guidelines, Part 3 Outpatient Facilities, Chapters 3.13 -8.2.1.2.~~

~~449.3.3.43Electrical connection to the hospital electrical system shall be permitted only when the mobile facility complies with appropriate requirements of the Florida Building Code, Building.~~

~~449.3.3.54When units provide critical care procedures, there shall be a “code blue” code call station in the unit connected to an attended location to summon assistance from the hospital emergency resuscitation response team.~~

449.3.3.2 The mobile facility shall comply with the applicable requirements of the Florida Building Code, Building, The Guidelines, including Part 1 General and Part 2 Chapter 2.8 ~~Part 3 Outpatient Facilities, Chapter 3.13 Specific Requirements for Mobile, Transportable, and Relocatable Units,~~ Specific Requirements for Mobile/Transportable Medical Units. ~~and with Section 449 of this code for the type of service to be provided.~~

~~449.3.3.3 Mobile or transportable units that are limited to providing noninvasive, diagnostic and treatment services without the use of anesthetics shall not be required to comply with other sections of The Guidelines as described in The Guidelines, Part 3 Outpatient Facilities, Chapters 3.13 -8.2.1.2.~~

~~449.3.3.4~~3~~Electrical connection to the hospital electrical system shall be permitted only when the mobile facility complies with appropriate requirements of the Florida Building Code, Building.~~

~~449.3.3.5~~4~~When units provide critical care procedures, there shall be a “code blue” code call station in the unit connected to an attended location to summon assistance from the hospital emergency resuscitation response team.~~

449.3.3 Mobile/Transportable Medical Units ~~testing and treatment facilities~~. Reference *The Guidelines* for other requirements.

449.3.3.1 In addition to any other state of Florida required permits, mobile ~~facilities~~ and transportable units shall be approved in advance by the Agency for Health Care Administration (Agency) before they may be utilized for patient services. Except as approved by the Agency, use of these units shall be limited to 6 months during a 12 month period. Usage may include temporary facilities during repair/replacement of equipment or intermittent use as needed in underserved communities or due to seasonal fluctuation.

449.3.3.2 The mobile facility shall comply with the applicable requirements of the Florida Building Code, Building~~, The Guidelines, Part 3 Outpatient Facilities, Chapter 3.13 Specific Requirements for Mobile, Transportable, and Relocatable Units, and with Section 449 of this code for the type of service to be provided~~.

~~**449.3.3.3** Mobile or transportable units that are limited to providing noninvasive, diagnostic and treatment services without the use of anesthetics shall not be required to comply with other sections of The Guidelines as described in The Guidelines, Part 3 Outpatient Facilities, Chapters 3.13 - 8.2.1.2.~~

449.3.3.43 Electrical connection to the hospital electrical system shall be permitted only when the mobile facility complies with appropriate requirements of the Florida Building Code, Building.

449.3.3.~~5~~4 When units provide critical care procedures, there shall be a “code blue” code call station in the unit connected to an attended location to summon assistance from the hospital emergency resuscitation response team.

SP8280

Date Submitted	12/15/2018	**Section**	464	**Proponent**	scott waltz
Chapter	4	**Affects HVHZ**	No	**Attachments**	Yes

TAC Recommendation Approved as Submitted
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **Yes**

Related Modifications

Summary of Modification

Proposed revision aligns the Florida Building Code with 58A-5.036, F.A.C. Emergency Environmental Control for Assisted Living Facilities.

Rationale

Following the tragic loss of life at a nursing home due to heat related illness in the aftermath of Hurricane Irma, the Department of Elder Affairs developed a rule requiring assisted living facilities to provide an alternate power source for equipment necessary to maintain safe indoor air temperatures for not less 96 hours following the loss of normal power. The modification provides a reference to the rule and a safe and reliable method for connecting the alternate power source. This proposal also simplifies the complicated requirements for maintaining indoor air temperatures by replacing the previous requirements with a temperature range that is used for nursing homes.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

The proposal aligns the code with requirements in an existing rule and will not result in any additional costs.

Impact to industry relative to the cost of compliance with code

The proposal aligns the code with requirements in an existing rule and will not result in any additional costs.

Impact to small business relative to the cost of compliance with code

None

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

The proposal aligns the code with requirements in an existing rule and will not result in any additional costs.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No.

Does not degrade the effectiveness of the code

No.

2nd Comment Period

8280-A2

Proponent scott waltz **Submitted** 5/15/2019 **Attachments** Yes

Rationale

A modification is needed to coordinate the requirements of Rule 58A-5.036 with the physical plant requirements for ALFs. This alternate combines language for three versions submitted as mods or alternate language.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Impact to Small Business relative to the cost of compliance with code

None

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

No.

Does not degrade the effectiveness of the code

It does not.

1st Comment Period History

SP8280-G1

Proponent Susan Anderson **Submitted** 2/15/2019 **Attachments** Yes

Comment:

See attached file.

464.4.2.1~~When outside temperatures are 65°F (18°C) or below, an indoor temperature of at least 72°F (22°C) shall be maintained in all areas used by residents during hours when residents are normally awake. During night hours when residents are asleep, an indoor temperature of at least 68°F (20°C) shall be maintained.~~ Mechanical systems shall be designed to maintaindry-bulb temperatures between 70°F (18°C) and 81°F (27°C) in resident occupied areas and between 70°F (18°C) and 85°F (29°C) in areas not intended for resident occupancy. This shall not preclude heating or cooling as necessary to maintain temperatures beyond this range for personal comfort. Residents who have individually controlled thermostats in their bedrooms or apartments shall be permitted to control temperatures in those areas.

~~**464.4.2.2** During hours when residents are normally awake, mechanical cooling devices, such as electric fans, must be used in those as are of buildings used by residents when inside temperatures exceed 85°F (29°C) provided outside temperatures remain below 90°F (32°C). No residents shall be in any inside area that exceeds 90°F (32°C). However, during daytime hours when outside temperatures exceed 90°F (32°C), and at night, an indoor temperature of no more than 81°F (27°C) must be maintained in all areas used by residents.~~

464.4.2.3~~2~~ Residents who have individually controlled thermostats in their bedrooms or apartments shall be permitted to control temperatures in those areas.

464.4.2.3 A new facility shall be equipped with either a permanent on-site alternate power source to operate at least the equipment necessary to maintain safe indoor air temperatures, life safety systems, and equipment for resident care needs, or there shall be a permanently installed predesigned electrical service entry for the electrical system that will allow a quick connection to a temporary alternate power source to operate at least the equipment necessary to maintain safe indoor air temperatures, life safety systems, and equipment for resident care needs. This quick connection shall be installed inside of a permanent metal enclosure rated for this purpose and may be located on the exterior of the building. See 58A-5.036 F.A.C. Environmental Controls for Assisted Living Facilities for additional requirements.

464.4.2.3.1 If the alternate power source is a generator, it shall comply with the requirements of NFPA 70 for either an optional standby system or a legally required system.

464.4.2.3.1 If the alternate power source is a generator, gasoline shall not be permitted as a fuel source.

464.4.2.1~~When outside temperatures are 65°F (18°C) or below, an indoor temperature of at least 72°F (22°C) shall be maintained in all areas used by residents during hours when residents are normally awake. During night hours when residents are asleep, an indoor temperature of at least 68°F (20°C) shall be maintained.~~During normal conditions, mechanical systems shall be capable of maintaining indoor air temperatures between 70°F (18°C) and 75°F (24°C). This shall not preclude heating or cooling as necessary to maintain temperatures beyond this range for personal comfort.

~~**464.4.2.2** During hours when residents are normally awake, mechanical cooling devices, such as electric fans, must be used in those as are of buildings used by residents when inside temperatures exceed 85°F (29°C) provided outside temperatures remain below 90°F (32°C). No residents shall be in any inside area that exceeds 90°F (32°C). However, during daytime hours when outside temperatures exceed 90°F (32°C), and at night, an indoor temperature of no more than 81°F (27°C) must be maintained in all areas used by residents.~~

464.4.2.32 Residents who have individually controlled thermostats in their bedrooms or apartments shall be permitted to control temperatures in those areas.

464.4.2.3 A new facility shall be equipped with either a permanent on-site alternate power source to operate at least the equipment necessary to maintain safe indoor air temperatures, life safety systems, and equipment for resident care needs, or there shall be a permanently installed predesigned electrical service entry for the electrical system that will allow a quick connection to a temporary alternate power source to operate at least the equipment necessary to maintain safe indoor air temperatures, life safety systems, and equipment for resident care needs. This quick connection shall be installed inside of a permanent metal enclosure rated for this purpose and may be located on the exterior of the building. See 58A-5.036 F.A.C. Environmental Controls for Assisted Living Facilities for additional requirements.

464.4.2.1 ~~When outside temperatures are 65°F (18°C) or below, an indoor temperature of at least 72°F (22°C) shall be maintained in all areas used by residents during hours when residents are normally awake. During night hours when residents are asleep, an indoor temperature of at least 68°F (20°C) shall be maintained.~~ Indoor air temperatures must be maintained between 70°F (21°C) and 85°F (29°C). Residents who have individually controlled thermostats in their bedrooms or apartments shall be permitted to control temperatures in those areas.

464.4.2.2 A new facility shall be equipped with either a permanent on-site alternate power source to operate at least the equipment necessary to maintain safe indoor air temperatures, life safety systems, and equipment for resident care needs, or there shall be a permanently installed predesigned electrical service entry for the electrical system that will allow a quick connection to a temporary alternate power source to operate at least the equipment necessary to maintain safe indoor air temperatures, life safety systems, and equipment for resident care needs. This quick connection shall be installed inside of a permanent metal enclosure rated for this purpose and may be located on the exterior of the building. See 58A-5.036 F.A.C. Environmental Controls for Assisted Living Facilities for additional requirements.
~~During hours when residents are normally awake, mechanical cooling devices, such as electric fans, must be used in those as are of buildings used by residents when inside temperatures exceed 85°F (29°C) provided outside temperatures remain below 90°F (32°C). No residents shall be in any inside area that exceeds 90°F (32°C). However, during daytime hours when outside temperatures exceed 90°F (32°C), and at night, an indoor temperature of no more than 81°F (27°C) must be maintained in all areas used by residents.~~
~~**464.4.2.3** Residents who have individually controlled thermostats in their bedrooms or apartments shall be permitted to control temperatures in those areas.~~

58A-5.036 Emergency Environmental Control for Assisted Living Facilities.

(1) DETAILED EMERGENCY ENVIRONMENTAL CONTROL PLAN. Each assisted living facility shall prepare a detailed plan ("plan") to serve as a supplement to its Comprehensive Emergency Management Plan, to address emergency environmental control in the event of the loss of primary electrical power in that assisted living facility which includes the following information:

(a) The acquisition of a sufficient alternate power source such as a generator(s), maintained at the assisted living facility, to ensure that current licensees of assisted living facilities will be equipped to ensure ambient air temperatures will be maintained at or below 81 degrees Fahrenheit for a minimum of ninety-six (96) hours in the event of the loss of primary electrical power.

1. The required temperature must be maintained in an area or areas, determined by the assisted living facility, of sufficient size to maintain residents safely at all times and that is appropriate for resident care needs and life safety requirements. For planning purposes, no less than twenty (20) net square feet per resident must be provided. The assisted living facility may use eighty percent (80%) of its licensed bed capacity as the number of residents to be used in the calculation to determine the required square footage. This may include areas that are less than the entire assisted living facility if the assisted living facility's comprehensive emergency management plan includes allowing a resident to congregate when he or she desires in portions of the building where temperatures will be maintained and includes procedures for monitoring residents for signs of heat related injury as required by this rule. This rule does not prohibit a facility from acting as a receiving provider for evacuees when the conditions stated in Section 408.821, F.S., and subsection 58A-5.026(5), F.A.C., are met. The plan shall include information regarding the area(s) within the assisted living facility where the required temperature will be maintained.

2. The alternate power source and fuel supply shall be located in an area(s) in accordance with local zoning and the Florida Building Code.

3. Each assisted living facility is unique in size; the types of care provided; the physical and mental capabilities and needs of residents; the type, frequency, and amount of services and care offered; and staffing characteristics. Accordingly, this rule does not limit the types of systems or equipment that may be used to achieve ambient temperatures at or below 81 degrees Fahrenheit for a minimum of ninety-six (96) hours in the event of the loss of primary electrical power. The plan shall include information regarding the systems and equipment that will be used by the assisted living facility and the fuel required to operate the systems and equipment.

a. An assisted living facility in an evacuation zone pursuant to Chapter 252, F.S., must maintain an alternative power source and fuel as required by this subsection at all times when the assisted living facility is occupied but is permitted to utilize a mobile generator(s) to enable portability if evacuation is necessary.

b. Assisted living facilities located on a single campus with other facilities under common ownership, may share fuel, alternative power resources, and resident space available on the campus if such resources are sufficient to support the requirements of each facility's residents, as specified in this rule. Details regarding how resources will be shared and any necessary movement of residents must be clearly described in the emergency power plan.

c. A multistory facility, whose comprehensive emergency management plan is to move residents to a higher floor during a flood or surge event, must place its alternative power source and all necessary additional equipment so it can safely operate in a location protected from flooding or storm surge damage.

(b) The acquisition of sufficient fuel, and safe maintenance of that fuel at the facility, to ensure that in the event of the loss of primary electrical power there is sufficient fuel available for the alternate power source to maintain ambient temperatures at or below 81 degrees Fahrenheit for a minimum of ninety-six (96) hours after the loss of primary electrical power during a declared state of emergency. The plan must include information regarding fuel source and fuel storage.

1. Facilities must store minimum amounts of fuel onsite as follows:

a. A facility with a licensed capacity of 16 beds or less must store 48 hours of fuel onsite.

b. A facility with a licensed capacity of 17 or more beds must store 72 hours of fuel onsite.

2. An assisted living facility located in an area in a declared state of emergency area pursuant to Section 252.36, F.S., that may impact primary power delivery must secure ninety-six (96) hours of fuel. The assisted living facility may utilize portable fuel storage containers for the remaining fuel necessary for ninety-six (96) hours during the period of a declared state of emergency.

3. Piped natural gas is an allowable fuel source and meets the onsite fuel supply requirements under this rule.

4. If local ordinances or other regulations limit the amount of onsite fuel storage for the assisted living facility's location, then the assisted living facility must develop a plan that includes maximum onsite fuel storage allowable by the ordinance or regulation and a reliable method to obtain the maximum additional fuel at least 24 hours prior to depletion of onsite fuel.

(c) The acquisition of services necessary to maintain, and test the equipment and its functions to ensure the safe and sufficient operation of the alternate power source maintained at the assisted living facility.

(d) The acquisition and maintenance of a carbon monoxide alarm.

(2) SUBMISSION OF THE PLAN.

(a) Each assisted living facility licensed prior to the effective date of this rule shall submit its plan to the local emergency management agency for review within 30 days of the effective date of this rule. Assisted living facility plans previously submitted and approved pursuant to Emergency Rule 58AER17-1, F.A.C., will require resubmission only if changes are made to the plan.

(b) Each new assisted living facility shall submit the plan required under this rule prior to obtaining a license.

(c) Each existing assisted living facility that undergoes any additions, modifications, alterations, refurbishment, renovations or reconstruction that require modification of its systems or equipment affecting the facility's compliance with this rule shall amend its plan and submit it to the local emergency management agency for review and approval.

(3) APPROVED PLANS.

(a) Each assisted living facility must maintain a copy of its approved plan in a manner that makes the plan readily available at the licensee's physical address for review by a legally authorized entity. If the plan is maintained in an electronic format, assisted living facility staff must be readily available to access and produce the plan. For purposes of this section, "readily available" means the ability to immediately produce the plan, either in electronic or paper format, upon request.

(b) Within two (2) business days of the approval of the plan from the local emergency management agency, the assisted living facility shall submit in writing proof of the approval to the Agency for Health Care Administration.

(c) The assisted living facility shall submit a consumer-friendly summary of the emergency power plan to the Agency. The Agency shall post the summary and notice of the approval and implementation of the assisted living facility emergency power plans on its website within ten (10) business days of the plan's approval by the local emergency management agency and update within ten (10) business days of implementation.

(4) IMPLEMENTATION OF THE PLAN.

(a) Each assisted living facility licensed prior to the effective date of this rule shall, no later than June 1, 2018, have implemented the plan required under this rule.

(b) The Agency shall allow an extension up to January 1, 2019 to providers in compliance with subsection (c), below, and who can show delays caused by necessary construction, delivery of ordered equipment, zoning or other regulatory approval processes. Assisted living facilities shall notify the Agency that they will utilize the extension and keep the Agency apprised of progress on a quarterly basis to ensure there are no unnecessary delays. If an assisted living facility can show in its quarterly progress reports that unavoidable delays caused by necessary construction, delivery of ordered equipment, zoning or other regulatory approval processes will occur beyond the initial extension date, the assisted living facility may request a waiver pursuant to Section 120.542, F.S.

(c) During the extension period, an assisted living facility must make arrangements pending full implementation of its plan that provides the residents with an area or areas to congregate that meets the safe indoor air temperature requirements of paragraph (1)(a), for a minimum of ninety-six (96) hours.

1. An assisted living facility not located in an evacuation zone must either have an alternative power source onsite or have a contract in place for delivery of an alternative power source and fuel when requested. Within twenty-four (24) hours of the issuance of a state of emergency for an event that may impact primary power delivery for the area of the assisted living facility, it must have the alternative power source and no less than ninety-six (96) hours of fuel stored onsite.

2. An assisted living facility located in an evacuation zone pursuant to Chapter 252, F.S., must either:

a. Fully and safely evacuate its residents prior to the arrival of the event, or

b. Have an alternative power source and no less than ninety-six (96) hours of fuel stored onsite, within twenty-four (24) hours of the issuance of a state of emergency for the area of the assisted living facility.

(d) Each new assisted living facility shall implement the plan required under this rule prior to obtaining a license.

(e) Existing assisted living facilities that undergo any additions, modifications, alterations, refurbishment, renovations or reconstruction that require modification of the systems or equipment affecting the assisted living facility's compliance with this rule shall implement its amended plan concurrent with any such additions, modifications, alterations, refurbishment, renovations or reconstruction.

(f) The Agency for Health Care Administration may request cooperation from the State Fire Marshal to conduct inspections to ensure implementation of the plan in compliance with this rule.

(5) POLICIES AND PROCEDURES.

(a) Each assisted living facility shall develop and implement written policies and procedures to ensure that the assisted living facility can effectively and immediately activate, operate and maintain the alternate power source and any fuel required for the operation of the alternate power source. The procedures shall ensure that residents do not experience complications from fluctuations in ambient air temperatures inside the facility. Procedures must address the care of residents occupying the facility during a declared state of emergency, specifically, a description of the methods to be used to mitigate the potential for heat related injury including:

1. The use of cooling devices and equipment;

2. The use of refrigeration and freezers to produce ice and appropriate temperatures for the maintenance of medicines requiring refrigeration;

3. Wellness checks by assisted living facility staff to monitor for signs of dehydration and heat injury; and,

4. A provision for obtaining medical intervention from emergency services for residents whose life safety is in jeopardy.

(b) Each assisted living facility shall maintain the written policies and procedures in a manner that makes them readily available at the licensee's physical address for review by a legally authorized entity. If the policies and procedures are maintained in an electronic format, assisted living facility staff must be readily available to access the policies and procedures and produce the requested information. For purposes of this section, "readily available" means the ability to immediately produce the policies and procedures, either in electronic or paper format, upon request.

(c) The written policies and procedures must be readily available for inspection by each resident; each resident's legal representative, designee, surrogate, guardian, attorney in fact, or case manager; each resident's estate; and such additional parties as authorized in writing or by law.

(6) REVOCATION OF LICENSE, FINES OR SANCTIONS. For a violation of any part of this rule, the Agency for Health Care Administration may seek any remedy authorized by Chapter 429, Part I, F.S., or Chapter 408, Part II, F.S., including, but not limited to, license revocation, license suspension, and the imposition of administrative fines.

(7) COMPREHENSIVE EMERGENCY MANAGEMENT PLAN.

(a) Assisted living facilities whose comprehensive emergency management plan is to evacuate must comply with this rule.

(b) Each facility whose plan has been approved shall submit the plan as an addendum with any future submissions for approval of its comprehensive emergency management plan.

(8) NOTIFICATION.

(a) Within five (5) business days, each assisted living facility must notify in writing, unless permission for electronic communication has been granted, each resident and the resident's legal representative:

1. Upon submission of the plan to the local emergency management agency that the plan has been submitted for review and approval;

2. Upon final implementation of the plan by the assisted living facility.

(b) Each assisted living facility must maintain a copy of each notification set forth in paragraph (a), above, in a manner that makes each notification readily available at the licensee's physical address for review by a legally authorized entity. If the notifications are maintained in an electronic format, facility staff must be readily available to access and produce the notifications. For purposes of this section, "readily available" means the ability to immediately produce the notifications, either in electronic or paper format, upon request.

Rulemaking Authority 429.41 FS. Law Implemented 429.19, 429.41 FS. History–New 3-26-18.

FLORIDA SENIOR LIVING ASSOCIATION

February 15, 2019

Comment to Proposed Code Modification #8280

This proposed modification states,

> **464.4.2** ~~When outside temperatures are 65°F (18°C) or below, an indoor temperature of at least 72°F (22°C) shall be maintained in all areas used by residents during hours when residents are normally awake. During night hours when residents are asleep, an indoor temperature of at least 68°F (20°C) shall be maintained.~~ During normal conditions, mechanical systems shall be capable of maintaining indoor air temperatures between 70°F (18°C) and 75°F (24°C). This shall not preclude heating or cooling as necessary to maintain temperatures beyond this range for personal comfort.

The rationale for the proposed modification states that the temperature range reflects current requirements for nursing homes. This is incorrect; the proposed temperature range of 70°F (18°C[i]) to 75°F (24°C) does not reflect the current temperature range for nursing homes.

Rule 59A-4.122, Florida Administrative Code, states that temperatures in nursing homes must be comfortable and safe and meet the temperature ranges for nursing homes as stated in the code of federal regulations. Rule 59A-4.122 has not been updated to reflect the correct federal citation which is 42 CFR 483.10(i)(6). This federal regulation states that nursing homes "must maintain a temperature range of 71 to 81 °F". A maximum temperature limited to 75°F as suggested in the modification is unduly burdensome for operators of assisted living facilities in Florida.

Further, these temperatures are supposed to consider the comfort of the resident. A recent peer-reviewed article, Towards establishing evidence-based guidelines on maximum indoor temperatures during hot weather in temperate continental climates, by Glen P. Kenny, Andreas D. Flouris, Abderrahmane Yagouti & Sean R. Notley (2018); Temperature, https://doi.org/10.1080/23328940.2018.1456257, reviews the relationship between indoor and outdoor temperatures, and the thermal comfort of humans. The article notes that "there is very little research available on links between thermal comfort and health, particularly in vulnerable population groups." [ii]

Thermal comfort is highly subjective and each individual experiences sensations differently based on a myriad of factors including age, sex, level of adaptation or acclimatization, hydration status, and others.[iii] However, it is generally understood that older individuals prefer higher air temperatures for comfort than do younger, more active individuals. This is certainly the experience of assisted living providers operating in Florida.

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FLORIDA SENIOR LIVING ASSOCIATION

Latitude variations and the concomitant effect of temperature on health has been found throughout the United States. Individuals living in lower latitudes, such as the southern states, have higher thresholds for ambient temperature and are at lesser risk than their northern counterparts for heat related injuries.[iv] Simply put, individuals who live in areas with frequent high heat and humidity are better able to tolerate such conditions than those who do not.[v]

In addition, there are many differences in the population of residents of assisted living facilities and patients of nursing homes. Individuals residing in assisted living facilities do not meet the threshold level of acuity or the level of care required for admittance to a nursing home. An assisted living resident may not be bedridden[vi] , must not require 24-hour nursing care, and resides in a building intended to be used as a Residential Board and Care Occupancy instead of a Health Care Occupancy for purposed of firesafety.

Thus, considering thermal comfort, the southern latitude of Florida, and the characteristics of residents of assisted living facilities, a generic national standard based on federal nursing home law is not supported for indoor thermal comfort and safe temperature ranges in Florida's assisted living facilities. A better baseline standard may be found in ANSI/ASHRAE Thermal Environmental Conditions for Human Occupancy Standard 55. Standard 55-2004 suggests a summer thermal comfort range of 73.4°F (23°C) to 82.4°F (28°C). Adding to that range for Florida's southern latitude to account for higher heat tolerance, and considering the lack of heat-related injuries experienced by residents of Florida's assisted living facilities at the current summer building code temperature of up to 85°F, it appears that current standards protect the health of assisted living residents and provide appropriate thermal comfort.

I agree that the current language in Section 464.4.2 is confusing and needs clarification,[vii] but I suggest that a more workable seasonable temperature range tracks current language; 68°F - 85°F.

Sincerely,

Susan Anderson
V.P. of Public Policy & Legal Affairs
Florida Senior Living Association

[i] The Celsius equivalent of 70°F is 21°C and not 18°C.
[ii] See *Temperature* at page 12.
[iii] Ibid.
[iv] Curriero FC, Heiner KS, Samet JM, et al., Temperature and mortality in eleven cities of the eastern United States, Am J Epidemiol 2002; 155:80-7.
[v] See Temperature at page 12.
[vi] An exception exists for up to 7 – 14 days depending on specialty license type.
[vii] See proposed code modification #8413.

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FLORIDA SENIOR LIVING ASSOCIATION

February 15, 2019

Comment to Proposed Code Modification #8280

This proposed modification states,

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The rationale for the proposed modification states that the temperature range reflects current requirements for nursing homes. This is incorrect; the proposed temperature range of 70°F (18°C[i]) to 75°F (24°C) does not reflect the current temperature range for nursing homes.

Rule 59A-4.122, Florida Administrative Code, states that temperatures in nursing homes must be comfortable and safe and meet the temperature ranges for nursing homes as stated in the code of federal regulations. Rule 59A-4.122 has not been updated to reflect the correct federal citation which is 42 CFR 483.10(i)(6). This federal regulation states that nursing homes "must maintain a temperature range of 71 to 81 °F". A maximum temperature limited to 75°F as suggested in the modification is unduly burdensome for operators of assisted living facilities in Florida.

Further, these temperatures are supposed to consider the comfort of the resident. A recent peer-reviewed article, Towards establishing evidence-based guidelines on maximum indoor temperatures during hot weather in temperate continental climates, by Glen P. Kenny, Andreas D. Flouris, Abderrahmane Yagouti & Sean R. Notley (2018); Temperature, https://doi.org/10.1080/23328940.2018.1456257, reviews the relationship between indoor and outdoor temperatures, and the thermal comfort of humans. The article notes that "there is very little research available on links between thermal comfort and health, particularly in vulnerable population groups." [ii]

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In addition, there are many differences in the population of residents of assisted living facilities and patients of nursing homes. Individuals residing in assisted living facilities do not meet the threshold level of acuity or the level of care required for admittance to a nursing home. An assisted living resident may not be bedridden[vi] , must not require 24-hour nursing care, and resides in a building intended to be used as a Residential Board and Care Occupancy instead of a Health Care Occupancy for purposed of firesafety.

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TAC: Special Occupancy

Total Mods for **Special Occupancy** in **No Affirmative Recommendation: 7**

Total Mods for report: 17

Sub Code: Building

SP7211

11

Date Submitted	11/7/2018	**Section**	464.4.7	**Proponent**	Bryan Holland
Chapter	4	**Affects HVHZ**	No	**Attachments**	Yes

TAC Recommendation No Affirmative Recommendation

Commission Action Pending Review

Comments

General Comments Yes **Alternate Language** Yes

Related Modifications

7209, 7210, and 7212

Summary of Modification

This proposed modification adds requirements for lightning and surge protection in ALFs identical to the current and proposed requirements for nursing homes.

Rationale

This proposed modification adds requirements for lightning and surge protection in ALFs identical to the current and proposed requirements for nursing homes in Section 450.3.19. These two occupancy types have very similar uses, occupant loads, construction types, and exposure to the hazards of lightning and transient surges. Currently, ALFs are not afforded the same level of protection as nursing homes are against these hazards. There have been several reported fires as a result of lightning strikes to ALFs all across the state of Florida. These incidents have resulted in significant loss of property and extensive cost to the owners and residents of these properties.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposed modification will require the local entity to enforce additional criteria on ALFs similar to nursing homes. This includes additional permitting, plan review, inspection, commissioning, and record-keeping.

Impact to building and property owners relative to cost of compliance with code

This proposal will increase the cost of construction to building and property owners of ALFs. See the attached cost study.

Impact to industry relative to the cost of compliance with code

This proposed modification will increase the cost of compliance to industry. See the attached cost study.

Impact to small business relative to the cost of compliance with code

This proposed modification will likely not impact small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed modification is directly connected to the health, safety, and welfare of the general public and those working, living, and visiting ALFs in the state of Florida.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposed modification strengthens the code by expanding lightning and surge protection into ALFs identical to what is currently required for nursing homes.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This proposed modification enhances the effectiveness of the code by harmonized the hazard mitigation of lightning and transient surges at both nursing homes and ALFs.

Alternate Language

2nd Comment Period

7211-A2

Proponent Bryan Holland **Submitted** 5/21/2019 **Attachments** Yes

Rationale

This alternative language comment adds an exception to the rule based on the concerns addressed in the public comments submitted and the comments shared by the members of the TAC. This will exempt those assisted living facilities that may not benefit from having a lightning protection system installed. This includes the low-occupancy type facilities that have limited exposure to the hazards of lightning. Only those facilities where the NFPA 780 risk assessment guide indicates a lightning protection systems is needed will be required to install one.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Approval of tis alternative language comment will have little to no impact on the local entity.

Impact to building and property owners relative to cost of compliance with code

This alternative language comment will increase the cost of compliance with the code for those facilities that will be required to install a lightning protection system. Please see the cost analysis attached.

Impact to industry relative to the cost of compliance with code

This alternative language comment will only impact those large, high-occupancy, high risk assisted living facilities where the hazards of lightning damage exceed the cost of installation a protection system.

Impact to Small Business relative to the cost of compliance with code

This proposed modification will likely not impact small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This alternative language comment enhances the health, safety, and welfare of some of the most vulnerable citizens in the state of Florida that live in assisted living facilities with a high risk of exposure to lightning.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This alternative language comment improves the code and system of construction at assisted living facilities.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This alternative language comment does not discriminate against any materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This alternative language comment enhances the effectiveness of the code by adding lightning resiliency to certain assisted living facilities.

Alternate Language

1st Comment Period History

7211-A1

Proponent Bryan Holland **Submitted** 1/8/2019 **Attachments** Yes

Rationale

The only alternative language being proposed is under Section 464.4.7.5 where "low voltage system main or branch circuits" is being replaced with "communication systems". No other changes being recommended for this proposed modification. This will match the language in SP7255, SP7218, and a SP7209 comment.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This comment has no impact on the local enforcement entity as it only provides clarity and no new requirements

Impact to building and property owners relative to cost of compliance with code

This comment has no impact on building or property owners.

Impact to industry relative to the cost of compliance with code

This comment has no impact on industry.

Impact to Small Business relative to the cost of compliance with code

This proposed modification will likely not impact small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This comment provides clarification of the rule which directly relates to health, safety, and welfare of the general public.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This comment improves the use and clarity of the code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This comment does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This comment enhances the effectiveness of the code.

2nd Comment Period

SP7211-G5

Proponent Douglas Adkins **Submitted** 5/23/2019 **Attachments** No

Comment:

The Florida Statutes 429.01(2) states that Assisted Living facilities "should be operated and regulated as residential environments with supportive services and NOT as medical or nursing facilities". THe statute also describes the ALF as "homelike environment". The petitioner seeking this rule change stand to financially gain from such mandate and seeks a standard or requirement that contravenes the statute in forcing ALFs to be regulated to a standard similar to a skilled nursing home or medical facility. The statute is clear that the regulation should be at the residential level. If adopted then the next extension would be to seek a similar standard be imposed on all new residential construction which would not be practical or logical. This proposed change violates the ban on rules that contravene Florida Statute and would be challenged accordingly. There is an argument that can be made that whatever is required in the ALF setting arguably could be required in all residential settings as these are similar settings each defined as residential. In my opinion the equal protection clause of the US Constitution would require the Building Commission to treat all such structures the same and to impose this same requirement on residential home builders as well. This is an illogical proposal that would adversely affect the cost of care and provide marginal benefit to the facilities and would offer no additional protection or safety for the residents t6o warrant the change and new costs.

2nd Comment Period

SP7211-G6

Proponent Michael Riley **Submitted** 5/23/2019 **Attachments** Yes

Comment:

Proposed code modification 7211 does not meet the statutory standards of Chapter 553. See attached comments.

2nd Comment Period

SP7211-G7

Proponent Gail Matillo **Submitted** 5/24/2019 **Attachments** No

Comment:

Comment from one of our members:

I would let them know that major changes like this, and the generators, greatly affect our ability to operate at a price point that is beneficial to our residents. I would also let them know that the cost associated with these changes must be passed on to our residents. We have never experienced an incident where this change would've helped us or been beneficial to the residents. So their desire to help the residents in case an occurrence that has never happened before actually happens is outweighed by the additional financial burden they're forcing us to put on our residents on a daily basis. In other words, their desire to help is offset by the real world pain these changes inflict.

2nd Comment Period

SP7211-G8

Proponent Gail Matillo **Submitted** 5/24/2019 **Attachments** Yes

Comment:

see attached letter

2nd Comment Period

SP7211-G9

Proponent Shaddrick Haston **Submitted** 5/26/2019 **Attachments** Yes

Comment:

The Florida Assisted Living Association objects to the proposed amendment. See attached document.

2nd Comment Period

SP7211-G10

Proponent	Bryan Holland	**Submitted**	5/26/2019	**Attachments**	Yes

Comment:

Please see the attached for my rebuttal statements to the General Comments submitted (G5-G9). I urge the TAC to disregard these general comments and vote to recommend approval of the alternative language comment (SP7211-A2).

2nd Comment Period

SP7211-G11

Proponent	Joe Bigelow	**Submitted**	5/28/2019	**Attachments**	Yes

Comment:

Submitted by Shroder Joseph & Associates via FedEX

1st Comment Period History

SP7211-G1

Proponent	Vincent Della Croce	**Submitted**	1/8/2019	**Attachments**	No

Comment:

I support the proposed modification as it will ensure the Code includes the most current requirements for electrical installations that provide for the health, safety and general welfare of the public.

1st Comment Period History

SP7211-G2

Proponent	James gregory	**Submitted**	2/16/2019	**Attachments**	No

Comment:

I do not support adding this requirement to Assisted Living Facilities for the following reasons:
1. ALFs are not health care facilities. They are residential facilities reviewed as either R4 or I-1 of the FBC and Board and Care in the Life Safety Code.
2. Only limited nursing services are provided. All residents must be ambulatory.
3. ALFs do not have any life support or Type I EES unlike nursing homes and hospitals.
4. The large majority of ALFs constructed in the state are small homes from 5 to 7 residents. This is will be a heavy economic impact of those small homes.
5. All new ALFs must be fully sprinklered so there is already ample fire protection.

1st Comment Period History

SP7211-G3

Proponent	Deborah Franklin	**Submitted**	2/18/2019	**Attachments**	No

Comment:

FHCA does not support adding this requirement to Assisted Living Facilities for the following reasons:
1. ALFs are not health care facilities. They are residential facilities reviewed as either R4 or I-1 of the FBC and Board and Care in the Life Safety Code.
2. Only limited nursing services are provided. All residents must be ambulatory.
3. ALFs do not have any life support or Type I EES unlike nursing homes and hospitals.
4. The large majority of ALFs constructed in the state are small homes from 5 to 7 residents. This is will be a heavy economic impact of those small homes.
5. All new ALFs must be fully sprinklered so there is already ample fire protection.

1st Comment Period History

SP7211-G4

Proponent	Susan Anderson	Submitted	2/18/2019	Attachments	No

Comment:

The Florida Senior Living Association (FSLA) disagrees that placing institutional, nursing homes style regulations on assisted living facilities to protect the building from fire damage is necessary. Further, a review of NFPA records of fire incidents in assisted living facilities in the state of Florida indicates a lack of physical harm to residents over at least, the past two decades, that also informs against the proposed code modification. The intent of the Legislature in Part I of Chapter 429, Florida Statutes, specifically states that assisted living facilities "should be operated and regulated as residential environments with supportive services and not as medical or nursing facilities." S. 429.01(2), Fla. Stat. Section 429.41(1) goes further to state that regulations should "ensure a safe and sanitary environment that is residential and noninstitutional in design or nature." Danger to residents from fire in assisted living facilities in Florida has been successfully addressed by current regulations and the proposed modification is unnecessary and burdensome. In addition, FSLA adopts and incorporates the comments submitted by James Gregory and Debbie Franklin.

464.4.7 Lightning protection.

464.4.7.1

A lightning protection system shall be provided for all new buildings and additions in accordance with NFPA 780, Standard for the Installation of Lightning Protection Systems.

Exception:

Lightning protection shall not be required for any building or addition where determined to be unnecessary by evaluation using the Risk Assessment Guide in NFPA 780, Standard for the Installation of Lightning Protection Systems or an alternative method approved by the authority having jurisdiction.

464.4.7.2

Where additions are constructed to existing buildings, the existing building's lightning protection system, if present, shall be interconnected to the new lightning protection system.

464.4.7.3

Surge protective devices (SPDs) shall be installed in accordance with NFPA 70, National Electrical Code, as required by NFPA 780, Standard for the Installation of Lightning Protection Systems for all normal and emergency electrical services.

464.4.7.4

Additional surge protection shall be provided for all low voltage and power connections to all electronic equipment in critical care areas and life safety systems and equipment such as fire alarm, emergency call and other critical systems. Protection shall be in accordance with NFPA 70, National Electrical Code and the appropriate IEEE Standards for the type of equipment protected.

464.4.7.5

All communication systems entering or exiting the structure shall have surge protectors installed for each pair of conductors and shall have visual indication for protector failure to the maximum extent feasible.

464.4.7 Lightning protection.

464.4.7.1

A lightning protection system shall be provided for all new buildings and additions in accordance with NFPA 780, Standard for the Installation of Lightning Protection Systems.

464.4.7.2

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464.4.7.5

All low-voltage system main or branch circuits entering or exiting the structure shall have surge protectors installed for each pair of conductors and shall have visual indication for protector failure to the maximum extent feasible.

Rebuttal Statements to General Comments (SP7211)

SP7211-G5: Neither the alternative language comment nor the original proposed modification are in conflict with F.S. 429 or any other Florida Statute. There is no law or rule in the state of Florida limiting the requirements for lightning protection systems to health care facilities or prohibiting them from residential-type occupancies. The Florida Building Commission is charged with the responsibility of protecting the health, safety, and welfare of the general public. This code modification satisfies that public duty doctrine. As stated by the Florida Assisted Living Association (FALA) in General Comment SP7211-G9, “residents living in these assisted living facilities are becoming frailer, requiring higher levels of care…” This higher level of care needed for these frail residents would likely include assisted evacuation in the case of fire as a result of a lightning strike. This statement by FALA alone is perfect evidence that the residents of an assisted living facility deserve to live in facilities protected from the hazards of lightning. You could even say it is their US Constitutional right to do so. It should also be noted that I have absolutely no financial interest in lightning protection or any other requirement of the Florida Building Code.

SP7211-G6: Florida continues to lead the nation in the number of deaths as result of lightning. More buildings are struck by lightning in Florida than any other state in the nation. Florida ranks #1 in total lightning-related insurance claims, average losses in dollars per insurance claim, total losses in dollars for all insurance claims, and largest total losses in dollars for all insured and uninsured property. Claiming that lightning protection requirements in the state of Florida is not accommodating a specific need of this state or not connected with the safety and welfare of the general public is simply ludicrous. The pointer to the NFPA 780 for installation compliance has been included in the Florida Building Code since the very first, 2001 edition and has been the referenced standard for lightning protection in every edition since then. Section 104.11 addresses alternative materials, design, and methods of construction for this and every other provision of the code. There is no conflict between the NFPA 70 and NFPA 780 when it comes to surge protection requirements. It should be noted that the Chair of the NFPA 780 Technical Committee is also a member of the NFPA 70 Correlating Committee. The cost associated with the installation of a lightning protection system is substantially less than the potential loss of life and property as a result of lightning.

SP7211-G7: Every building that was struck by lightning for the first time had never had that occurrence happen before. There are literally hundreds of requirements in the Florida Building Code with the purpose to protect against events that may never happen. However, when the devastating outcome of those events exceeds the “cost” or “burden” or “pain” the code requirement initially caused, the overall long-term benefit of these code requirements can be understood. I wish we lived in a world where buildings are immune to events such as hurricanes, floods, lightning, fire, sinkholes, termites, mold, and all the other hazards associated with the built environment. Since that world is not our reality, there will be a cost and societal burden to protect buildings from these hazards to at least a minimum standard of performance. Lightning protection is a form of insurance. You purchase that insurance policy when you install the lightning protection system and hope you never need it. Every person that has ever lost a loved one to fire will tell you after experiencing that loss that they would have paid ANY price to have prevented that loss.

SP7211-G8: As noted above, neither the alternative language comment nor the original proposed modification are in conflict with F.S. 429 or any other Florida Statute. Lightning doesn’t care if a building is being used for medical care, residential purposes, or any other purpose. Lightning protection is about risk. The residents of an assisted living facility are at a much greater risk to the hazards of lightning as compared to those living in other residential-type occupancies due to the vulnerable nature of persons that need “assisted” living. The Florida Building Commission is under no obligation to limit rules and requirements based on the profitability of an industry or the inadequacies of the nation’s health care system. I happen to live in the community where the Village Place ALF is located. According the facility’s website, one of the living options includes memory care for persons with Alzheimer’s or dementia. Don’t we owe persons with these unfortunate conditions every possible protection that is available to prevent the unnecessary trauma of experiencing a catastrophic event and displacement that fire from lightning can result in? Shouldn’t the Florida Building Code contain rules and requirements to protect the residents of an assisted living facility from hazards they otherwise cannot protect themselves from on their own? Anything less should be considered negligence and nonfeasance.

SP7211-G9: While I appreciate the challenges faced by the assisted living facility industry by what appears to be a host of economic issues, these matters need to be addressed in another forum and have no direct correlation with the Florida Building Code. It seems very inappropriate to me that Florida Medicaid program policies should be considered when determining what building protection features an assisted living facility should have or not have. The emergency power rule has reduced the potential hazards to the residents of an assisted living facility as a result of a power outage to prevent the unfortunate loss of life like we had following Hurricane Irma. This is our opportunity to close another protection gap in these facilities without having to get the state Legislature or Governor involved. This gives the ALF industry the opportunity to self-regulate and be an active participant in the process. By continuing to pursue rejection of this proposed modification and the reasonable alternative language comment, you are further reminding the policy-makers and citizens of this state the profit comes before safety. The exception that I have added to the alternative language comment ensures only those facilities that have sufficient enough risk exposure to the hazard of lightning will be required to install one. It will not apply to every ALF across the board like the emergency generator rule does.

I urge all five parties to withdraw their opposition and support the alternative language comment (SP7211-A2) as a practical and reasonable compromise to the original proposed modification. THANK YOU.

Schröder Joseph & Associates LLP
ATTORNEYS AT LAW

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May 23, 2019

Via Federal Express

Florida Building Commission
Special Occupancy Technical Advisory Committee
2601 Blair Stone Road
Tallahassee, Florida 32399

Via Email (rsbrowdy@aol.com)

Richard S. Browdy
Chairman, Florida Building Commission
2601 Blair Stone Road
Tallahassee, Florida 32399

Re: Comments on Proposed Code Modification 7211, Florida Building Code

Gentlemen:

Our law firm represents Heary Bros. Lightning Protection Co., Inc. ("Heary Bros.") and its division, Lightning Preventor of America®. Heary Bros. offers both NFPA 780 compliant systems as well as its Preventor® system which is an early streamer emission system ("ESE system") that is installed in compliance with its manufacturer's standard, HBP 21. This letter is submitted to comment on proposed Modification 7211 to require that assisted living facilities ("ALFs") install lightning protection systems in accordance with National Fire Protection Association ("NFPA") 780. The modification should not be accepted and instead there should continue to be the ability for the owner, architect and engineer on such projects for ALFs to select the type of lightning protection system that best fits the needs of the project.

Under the rules governing modification of the Florida Building Code, a prerequisite to accepting a proposed modification such as E6460 is that it "DOES NOT DISCRIMINATE AGAINST MATERIALS, PRODUCTS, METHODS, OR SYSTEMS OF CONSTRUCTION OF DEMONSTRATED CAPABILITIES." (553.73 (9) (a) 3 F.S.). It is respectfully submitted, for the reasons discussed in detail below, that Modification 7211 cannot be accepted because it will violate this fundamental prerequisite under Florida State law (553.73 (9) (a) 3 F.S.) by discriminating against manufacturers and installers of Early Streamer Emission ("ESE") lightning protection systems which constitute a competing alternative of "demonstrated

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capabilities." Indeed, there is no reasonable justification for favoring Faraday lightning protection systems installed under NFPA 780 over ESE lightning protection systems installed under HBP 21 or other equivalent standards which have been approved, specified by architects and engineers and successfully used for many decades throughout the United States and the world.

THE NEED TO REJECT THE PROPOSED MODIFICATION

While most if not all companies in the lightning protection industry either exclusively provide either Faraday Systems or ESE Systems, Heary Bros. manufactures both types of lightning protection systems available in the marketplace today: (1) the traditional Faraday lightning protection systems governed by NFPA 780; and (2) its ESE lightning protection systems which have been successfully installed under HBP 21 for over 30 years under its $11 Million Guaranty backed by Travelers Insurance Company without a single documented lost. Proposed Code Modification 7211—as proposed--would eliminate for Florida Building owners the ESE option.

Importantly, Heary Bros. does not seek to exclude other ESE manufacturers or installers by offering its proven standard known as HBP 21, a copy of which is attached as Exhibit A, as one proven alternative standard. **Instead, the Florida Building Commission should accept other alternative equivalent standards and not limit the standard to NFPA 780.** The point is that architects, engineers and owners should be free to make a choice and should not be limited to one option, particularly since modification 7211 was propounded by a representative of the Faraday Industry which stands to obtain an exclusive monopoly under the proposal. Notably, these types of restrictive changes to the Florida Building Code to require that lightning protection systems comply with NFPA 780 have been proposed by the Florida Industry previously and rejected by the Florida Building Commission for sound reasons in 2017. *See, e.g.*, Modification E6460 rejected by the Florida Building Commission in 2017.

There is no reason to adopt Proposed Modification 7211 and limit the lightning protection systems for ALFs to compliance with NFPA 780. Not only does Heary Bros.' HBP 21 have a proven track record, but it also has the support of Traveler's insurance which provides $11 million in coverage to support Heary Bros.' guaranty of its ESE system. This support is documented by Exhibit B. The reason that Heary Bros. offers both options to its customers is because its ESE system offers a much less expensive option while its NFPA 780 Faraday alternative is more expensive with no technical or scientific basis of superior performance to justify the added cost. Heary Bros. believes the consumer should have the option to decide. Modification 7211—which Heary Bros. learned about for the first time in this week—should be rejected or modified so as not to eliminate that choice for Florida owners, architects and engineers.

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As explained below, not only has it been established in the lightning protection industry that there is no scientific basis for preferring the method of installation of the Faraday system whose installations are governed by NFPA 780 over ESE lightning protection systems, but also the installation approach of the Faraday systems (which uses more cable and more terminals) renders the Faraday System more costly with no added benefit to owners and consumers.

Heary Bros. readily concedes that its profit margins with respect to the sale of the components of Faraday systems exceeds the profit margins on ESE systems because the installation design for Faraday systems requires more cables, more down runs and more terminals and connections despite the lack of any scientific basis for claiming a difference in performance of the two systems. It should come as no surprise that the proponent of this change in the Florida Code is the Faraday Industry and those companies that exclusively install only Faraday Systems under the NFPA 780 standards. These entities consistently promote codes based on NFPA 780 and dominate the NFPA 780 committee.

There is no difference between the quality of the components of ESE systems and Faraday systems. Notably, the components of both the Faraday System and the ESE systems have been listed by Underwriters' Laboratories, Inc. pursuant to UL 96 which provides the "quality control" for component parts of lightning protection systems. In contrast, NFPA 780 ONLY governs the method of installation and requires more cabling, terminals, connectors and more grounding because of differences in the terminals used by each of these two competing systems.

Other factors to consider are that NFPA itself discloses that NFPA 780 has no scientific basis and has never recommended that this standard be adopted as "code." Further, the author of this letter made presentations to New York State when it considered adopting a similar code change more than two decades ago and New York State ultimately rejected the very code change now being considered— a change virtually identical to that being proposed here—and ruled that there was "no technical justification" for its adoption. Again, the proposed change in law simply imposes more costs on building owners with no scientific or practical justification.

If there is an argument being made regarding "insurance savings" by the proponents of this change in law, their evidence merely confirms that lightning protection—may in some few instances—results in insurance rebates, but the documentation does not show that only NFPA 780 systems are eligible for such rebates or whether these rebates are applicable solely to surge protection which is a separate and distinct product.. Moreover, what is indisputable is that the Faraday systems governed by NFPA 780 systems are NOT eligible for Heary Bros. $11 million guaranty backed by Travelers Insurance Company which Travelers offers only for ESE systems installed in compliance with Heary Bros.' manufacturer's standard—coverage which is provided based on Heary Bros.' decades of field experience with this type of system that exceeds thirty

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years. Copies of documentation demonstrating this insurance coverage are attached hereto as Exhibit B.

Perhaps the best illustration of burden that Proposed Modification 7211 would impose on building owners is the fact that so many building owners have in the past chosen the ESE system in preference to the Faraday system governed by NFPA 780. I have attached as Exhibit C a list of just a small sampling of Florida projects now enjoying the benefits of Heary Bros.' ESE system and $11 Million Guaranty which include numerous government and municipal buildings, resort and recreational centers, churches and corporate buildings. This constitutes a small sampling of Heary Bros.' ESE installations throughout the State of Florida—all of which have been installed in compliance with Heary Bros.' manufacturer's standard and have NOT been the subject of a single documented failure. Similarly, Federal and State governments have preferred the option of Heary Bros. ESE system with its $11 million guaranty over Faraday systems governed by NFPA 780. A list of a sampling of these projects is attached as Exhibit D which included, by way of illustration, such buildings as the Huntsville Alabama Public Safety Complex, the Los Angeles Federal Building, San Diego V. A. Medical Center, the Cape Canaveral Air Force Station, the Council Building for City of Coconut Creek, Florida, the Tampa Gateway Post Office Building, the Holmes Beach Florida Baseball Field and the U.S. Naval Air Station in Milton Florida. Again, these are just a very few examples of government installations in various States from all over the United States.

NFPA ITSELF MAKES CLEAR THAT NFPA 780 IS NOT SCIENTIFICALLY BASED

The proponents of the Faraday systems governed by NFPA 780 often argue that the existence of "national standards" for Faraday Systems (such as NFPA 780 and its parallel standard UL96A) somehow demonstrates that Faraday Systems are "scientific" and "proven." These types of statements are inconsistent with the very nature of national standards in the United States. NFPA 780 itself makes it very clear in its disclosures that NFPA 780 is NOT based on science, research, records of testing or even field experience. Instead, the NFPA specifically includes in the preamble to NFPA 780 (and in all NFPA consensus standards) the following disclaimers as to the efficacy of such standards:

> "While **the NFPA** administers the process and establishes rules to promote fairness in the development of consensus, it **does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgments contained in its codes and standards. The NFPA disclaims liability for any personal injury, property or other damages** of any nature whatsoever….directly or indirectly resulting from the …use of, or reliance on this document. **The NFPA also makes no guaranty or warranty as to the accuracy or completeness of any information published herein.**"

This excerpt from the preface to NFPA 780 is enclosed as Exhibit E. (Emphasis added.)

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THE LEADING INDUSTRY LITERATURE REJECTS ANY SUPERIORTY OF FARADAY SYSTEMS OVER ESE LIGHTNING PROTECTION SYSTEMS

We have attached the most recognized studies comparing ESE systems to Faraday Systems governed by NFPA 780, including a report generated by the NFPA itself in 1999. Specifically, attached as Exhibits F and G, respectively, are pertinent excerpts from the Report of the National Institute of Standards and Technology, entitled "Literature Review and Technical Analysis of Early Streamer Emission Systems of Lightning Protection" (1995) (hereinafter "NIST Report") and the Report of the NFPA's Third-Party Independent Evaluation Panel entitled "Early Streamer Emission Lightning Protection Technology" (1999) (hereafter "Bryan Report").

Both the NIST and the Bryan Report concluded that ESE systems have both an adequate theoretical basis and laboratory testing. NIST Report at page 25; Bryan Report at page 26. However, the authors of both reports found that there is insufficient field testing of either ESE systems or traditional (also known as "Faraday") systems of lightning protection under natural thunderstorm conditions. NIST Report at page. 16. Bryan Report at page 26. These findings of inadequate field testing of both traditional Faraday systems and ESE systems of lightning protection were based in part on the fact that there have been reported failures of both types of systems, and there was virtually no documentation to determine the cause of the failure.[1] As a result, both reports concluded that no meaningful conclusions regarding the performance of either type of system could be drawn based on either reported failures or lack of failures of either type of system under natural thunderstorm conditions. NIST Report at page 25; Bryan Report pages.23-24.

Based on this lack of field testing---or even laboratory testing—for traditional (Faraday) systems of lightning protection, the NIST Report concluded that "insufficient quantitative data see to exist about the performance of traditional rods…." NIST at page 24. Dr. Bryan, a former member of the NFPA Standards Council, went so far as to conclude that because of a lack of field or laboratory testing, NFPA 780 systems had insufficient scientific validation to warrant an NFPA standard and recommended that NFPA 780 be "downgraded" to a recommended practice. Bryan Report at pages 27-28.

It also is worth noting that both the NIST and Bryan Reports were highly critical of studies, funded by the Faraday industry, conducted by Professor Moore and Dr. Rison of the

[1] Both Faraday and ESE Systems—like other products—sometimes experience failures due to failure to maintain the systems properly or due to installation errors. Faraday Systems rely on their "track record" in field to support their efficacy. ESE Systems, like Faraday System, also have similar field experience. For example, in over twenty years and with thousands of systems installed in the United States, Heary Bros. have had no documented failures and their insurance carriers have paid no claims. Of course, Heary Bros.' ESE systems are installed in compliance with its manufacturer's standard to ensure adequate installation.

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New Mexico Institute of Mining and Technology. The NIST Report questioned whether any meaningful conclusions could be drawn based on tests conducted at elevations of 3000 m, and that the testing at this altitude "raise questions about the interpretation of such observations" NIST Report at 21.

Similarly, the Bryan Report identified several significant problems with the methodology employed by Professor Moore and Dr. Rison. The Bryan Report noted that despite reporting a "failure" of an ESE system, the ESE terminal had been damaged and--as a result--the study failed to document that the ESE terminal was even working at the time of the alleged strike within the zone of protection. Bryan Report at 17. The Bryan Report also noted that Dr. Rison's and Professor Moore's research questioned the efficacy of terminals used in NFPA 780 systems (Faraday Systems), noting that in four years not a single sharp pointed Franklin rod was struck. *Id.* at 18.

The lack of a scientific basis for NFPA 780 and UL 96A also has been confirmed in an article by written by Professor Martin Uman (a leading lightning protection expert who is often quoted by Faraday manufacturers) and published in the December 2002 issue of *American Meteorological Society*. The article states "[t]he theoretical justification of the traditional [Faraday] approach is fairly crude, in part due to our incomplete understanding of lightning's attachment to ground-based objects. Hence, the fact that traditional [Faraday lightning protection] systems have a history of success in preventing or minimizing damage to structures is the primary justification for their use." December 2002 Edition of *American Meteorological Society* at page 1809. Of course, as noted above, Heary Bros.' ESE systems have the same history of success based on field experience now exceeding thirty years—success which has been acknowledged by Heary Bros.' insurance carriers who provide insurance coverage for its ESE systems through Travelers Insurance Company.

CONCLUSION

For all the foregoing reasons, we respectfully request that you reject Proposed Code Modification 7211. Importantly, as explained above, Proposed Code Modification 7211 clearly cannot be adopted under Florida law because it discriminates against manufacturers and installers of ESE lightning protection systems which constitute a competing alternative of "demonstrated capabilities." Florida State law (553.73 (9) (a) 3 F.S.). Moreover, the Proposed Code Modification 7211 should be accepted since it simply is the right thing to do to preserve an option that architects, engineers and owners have chosen for decades with success and—to do otherwise—would provide the Faraday industry with an unfair and unlawful monopoly. Thus, the action proposed by this letter is in the interests of retaining the owners' ability to choose and will avoid the creation of state law that conflicts with federal antitrust laws and imposes

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anticompetitive restraints on the marketplace.

Sincerely,

SCHRODER, JOSEPH & ASSOCIATES, LLP

Linda H. Joseph

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EXHIBIT A

Manufacturer's Installation Standard
For
Lightning Protection Systems Using
Early Streamer Emission Air Terminals

HBP-21

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CONTENTS

INTRODUCTION

1. Scope

1.1 The requirements of this standard cover the design of systems using Early Streamer Emission ("ESE") air terminals for strikes. The Standard is divided into Three Levels of Protection. Electrical transmission lines and equipment are not within the scope of this standard.

1.2 These requirements apply to lightning protection systems that are complete and cover all parts of a structure. Partial systems are not covered by this standard.

1.3 Where fittings, devices or other components required by this standard are available as listed or labeled, such components shall be used. Otherwise the components shall be approved by the authority having jurisdiction (i.e. Engineer of Record, Architect, Owner, Applied Research Laboratories or Underwriter's Laboratories).

1.4 This Manufacturer's standard is based upon Heary Bros.' 30 years experience in designing lightning protection systems. Because of the lack of a complete understanding of the interaction between lightning and ground based objects and the lightning attachment process, the number and placement of air terminals set forth in this Manufacturer's Standard is based solely on Heary Bros.' experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection, NFPA 780, states that the NFPA "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgments contained in its codes and standards."

2. Glossary

2.1 For the purpose of this standard the following definitions apply:

Lightning Protection System is complete system of air terminals(s), conductors, ground terminals, bonding conductors, transient voltage surge suppression devices and other components required to complete a system.

2.2 AIR TERMINAL:

Is the component of the system that is intended to intercept the lightning strokes.

2.3 APPROVED:

Acceptable to the "authority having jurisdiction".

2.4 AUTHORITY HAVING JURISTICTION:

Is the organization, office or individual responsible for "approving" the equipment, and installation or a procedure.

2.5 BONDING:

An electrical connection between an electrically conductive object and a component of a lightning protection system that is intended to significantly reduce potential differences created by lightning currents.

2.6 CABLE: A conductor formed of a number of wires stranded together.

2.7 CHIMNEY:

A smoke or vent stack having a flue with cross sectional area less than 500 sq in (.3 sq m) and a total height of less than 75 feet (23m).

2.8 CONDUCTOR:

The portion of a lightning protection system that is intended to carry the lightning discharge to the ground.

2.8.1 MAIN CONDUCTOR:

A conductor that interconnects air terminals and serves as a down lead to ground.

2.8.2 BONDING CONDUCTOR:

A conductor intended to be used for potential equalization between metal bodies and the lightning protection system. Bonding conductors are not designed or intended to carry main lightning current.

2.9 FASTENER:

An attachment to secure the conductor to the structure.

2.10 GROUNDED:

Connected to earth or to some conducting body that is connected to earth.

2.10.1 GROUND GRID:

A system of grounding electrodes consisting of interconnected bare cables buried in the earth.

2.10.2 GROUND TERMINAL (ELECTRODE):

The portion of a lightning protection system that is installed for the purpose of providing electrical contact with earth.

2.11 LIGHTNING STRIKE:

The entire lightning event that can consist of one or more lightning strokes.

2.12 LOOP CONDUCTOR:

A conductor that encircles a structure that is used to interconnect ground terminals, main conductors or other grounded bodies.

2.13 METAL FRAME STRUCTURE:

A structure with electrically continuous structure members of sufficient size to provide electrical path equivalent to that of the lightning conductors in this standard.

2.14 SHALL:

Indicates a mandatory requirement of this Standard.

2.15 SHOULD:

Indicates a recommendation or that which is advised but not required.

2.16 SURGE ARRESTORS:

Are devices designed to limit damaging surge voltages by discharging or bypassing the current while maintaining the ability of repeating these functions. Heary Brothers Lightning Protection Co., Inc. and its Division Lightning Preventor of America do not manufacture Surge Arrestors nor do they warranty the equipment.

3. GENERAL REQUIREMENTS

3.1 GENERAL DESIGN REQUIREMENTS:

A lightning protection system using an Early Streamer Emission Air Terminal (s) shall be designed with provisions for inspection and maintenance.

3.2 Every installation shall be reviewed by a prior study to determine the level of protection required (See Figure 3.5.1).

3.3 The position of the E.S.E. air terminal, including height of above structure shall be determined in accordance with the level of protection required. (See Figure 3.5.1)

3.4 The number of terminals will depend on the system design under the Manufacturer's Standard based upon the dimensions of the area to be protected. (See Figure 3.5.1)

3.5 There are multiple styles of E.S.E. air terminals and systems available. For purposes of this standard they have been divided into separate levels of protection, with each level having its own installation requirements. A chart is provided (See Figure 3.5.1) as a general guideline in determining which level of protection best fits the requirements of the project.

3.6 All bolts on bolt pressure connectors require to be torqued at 150 pound-inches (17N-m).

3.7 This Manufacturer's standard is based upon Heary Bros.' 30 years experience in designing lightning protection systems. Because of the lack of a complete understanding of the interaction between lightning and ground based objects and the lightning attachment process, the number and placement of air terminals set forth in this Manufacturer's Standard is based solely on Heary Bros.' experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection, NFPA 780, states that the NFPA "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgments contained in its codes and standards."

Figure 3.5.1 Levels of Protection for ESE Lightning Protection Systems

FEATURES	LEVEL 1	LEVEL 2	LEVEL 3
Number of ESE Terminals Required Pursuant to System Design	1 Air Terminal (See Note: A)	1 Air Terminal (See Note: A)	1 Air Terminal (See Note: B)
Grounding Resistance Requirements	10Ω (ohms) or less	10 Ω (ohms) or less	25Ω (ohms) or less
Warranty	15 year material workmanship	15 year material workmanship	5 year material workmanship
Air Terminal height above all roof top projections	20' (6.1m)	20' (6.1 m)	7' (2 m)
Transient Voltage Surge Suppression	Shall be installed on all service entrances of electric, telephone, cable, and antenna lead-in.	Shall be installed on all service entrances of electric, telephone, cable, antenna lead-in.	Shall be installed on all service entrances of electric, telephone, cable, antenna lead-in.
ARL Listing and UL Listing mark on applicable components	Required	Required	Required
Building Height	Unlimited	Unlimited	Under 75' (23m)
Building Types	All	All	Residential, Farm, Agricultural, Small commercial.

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(Note: A)

Manufacturer's Installation Standard HBP-21Level 1 and Level 2 require one (1) ESE Air Terminal to be installed on the roof for every circular area of 337,810 feet. Structures may be on any height and the ESE lightning protection system must comply with all other requirements within this Manufacturer's Installation Standard HBP-21. This Manufacturer's standard is based upon Heary Bros.' 30 years experience in designing lightning protection systems. Because of the lack of a complete understanding of the interaction between lightning and ground based objects and the lightning attachment process, the number and placement of air terminals set forth in this Manufacturer's standard is based solely on Heary Bros.' experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lightning protection NFPA 780, states that the NFPA, "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

(Note: B)

Manufacturer's Installation Standard HBP-21 Level 3 requires one (1) ESE Air Terminal to be installed on the roof for every circular area of 70,650 feet. Structures may be of any height and the ESE lightning protection system must comply with all other requirements within this Manufacturer's Installation Standard HBP-21. The recommended number and placement of air terminals is based solely on Heary Bros.' 30 years of experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lighting protection, NFPA 780, states that the NFPA, "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

LEVEL 1

MANUFACTURER'S INSTALLATION STANDARD

FOR

EARLY STREAMER EMISSION LIGHTNING PROTECTION SYSTEMS

4. Level 1 General Installation and Component Requirements

4.1 An ESE lightning protection system installation consists of the following interconnected parts

(a) One or more ESE air terminals
(b) Mast and mounting systems - as required based on level of protection desired.
(c) Bonding conductors - as required based on level of protection.
(d) Ground system – Single grid to loop conductor system.
(e) Equipotential Bonding.
(f) Transient Voltage Surge Suppression.

4.1.1 The number of ESE air terminals will depend on the system design under the Manufacturer's Standard based upon the area indicated in Figure 3.5.1 for Level 1 type systems. The recommended number and placement of air terminals is based solely on Heary Bros.' 30 years of experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lightning protection, NFPA 780, states that the NFPA, "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

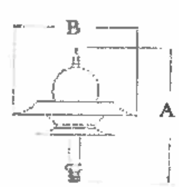
4.1.2 Components Tables 4.1.1.1 and Figure 4.1.1.2 provides minimum sizes and weights for use in ESE lightning protection system installation.

Figure 4.1.1.1

Type of conductor	Minimum Diameter	Copper Standard/ Metric	Aluminum Standard/ Metric
ESE Air Terminal	½" /12.7mm	½"/ 12.7 mm	½"/ 12.7 mm
Main Conductor Cable	Min Size each strand Weight Per Length Cross Sectional area	14AWG 375lbs /1000' or 558 g/m 115,000 CM / 58 mm ^{2}	13AWG 190lbs/1000' 283 g/m 192000 CM/ 97 mm ^{2}
Ground Terminals	Ground Rod / Ground Plate	¾" x 10' (20mm x 3000mm)/ 24" x 24"x 20 gauge (600mm x 600mm) pure Copper plate minimum of 2 contact points each 8 sq inch contact to plate	NA

Figure 4.1.1.2 Early Streamer Emission Air Terminal

A= 12"
B= 9"



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4.2 ESE Air terminals shall be sufficiently rigid to withstand mechanical damage. They shall be constructed of copper, copper alloy, aluminum or stainless steel. The main conductive parts of the ESE air terminal shall have the minimum dimensions in accordance with table 4.1.1.1 and Figure 4.1.1.2 for minimum dimensions of ESE Air Terminal.

4.2.1 Installation: Air terminals and their supports shall be mounted in such a way as to withstand the lightning currents, electromotive force, corrosion and effects of weather, heat, humidity, snow and wind.

NOTE: Wind design requirements should be consistent with local building code requirements.

4.2.2 Where an air terminal or mast is supported by conductive guys, the guys shall be connected from their points of anchorage to the closest down conductor(s) by a conductor equivalent in size to that of the down conductor(s).

4.2.3 The tip of any ESE air terminal or mast shall not be less than 20' (6.1m) above the protected structures, including antennas, cooling towers, tanks, roofs and masts.

4.2.4 The ESE air terminal shall be mounted on structures such as flagpoles, the top of pylons, light standards or on dedicated supports for structures at certain facilities, such as, sports facilities and stadiums, golf courses, public parks, camping sites and racetracks. The ESE unit shall be mounted at an elevation indicated in Section 4.2.3.

4.3 Storage areas for Flammable and Combustible Liquids or Flammable Gases. Structures containing these materials shall be grounded, but grounding alone does not constitute sufficient protection against atmospheric discharges.

4.4 Surge Suppression devices shall be installed on electric and telephone service entrances, antenna lead-ins, and electrical and electronic cables/ conductors entering or exiting the building.

4.4.1 Electrical Surge Suppression device shall be internally redundant and modular, in both surge suppression elements and fusing in construction for ease of field reparability. Manufacturers shall warranty the modules and fuse for the lifetime of the unit, with a minimum 10-year full unit warranty. Units shall be mounted as to minimize inductance installation. (i.e. As close to equipment to be protected or by use of documented low inductance cabling).

4.5 General, In determining the necessity of bonding a metal body to a lightning protection system, the following factors shall be considered:

A. Bonding is required only if there is a likely to be a side flash between the lightning protection system and other grounded medium.

B. The influence of a non-grounded metal body, such as metal window frame in a non-conductive medium, is limited to its effectiveness as a short circuit conductor if a side flash occurs therefore, does not necessarily require bonding to the lightning protection system.

C. Bonding distance requirements depend on the technical evaluation of the number of down conductors and their location, the interconnection of other grounded systems, the proximity of grounded metal bodies to the down conductors and the flashover medium (Air or solid materials).

D. Metal bodies located in a steel frame structure shall be permitted to be inherently bonded through construction and further bonding shall not be required.

E. Metal antenna masts or supports located on a protected structure shall be bonded to the lightning protection system using main size conductors and listed fittings. The height of the air terminal shall maintain the minimum protection above these objects as specified in Section 4.2.3

NOTE: For additional bonding requirements see Section 5.2 and 5.3.

4.6 Components

4.6.1 A lightning protection system shall be made of components that are resistant to corrosion or shall be acceptably protected against corrosion. The following materials are acceptable:

A. Copper of the grade required for commercial electrical work. Or a copper alloy with similar characteristics. Usually of 98 percent conductivity when annealed.

B. Aluminum conductors as acceptable as electrical grade aluminum.

4.6.2 Components shall be protected against deterioration due to local conditions. Any part of a copper system that is exposed to direct action of chimney gasses or other similar corrosive gases shall be protected. Aluminum components are not required to be protected.

4.6.3 Metals shall be used in combinations that are galvanically compatible.

A. Copper components shall not be installed directly on aluminum roofing, siding or other aluminum surfaces.

B. Aluminum lightning protection components shall not be installed directly on copper roofing material or other copper surfaces or below the run off of a copper surface.

C. Aluminum conductors and components shall not be:

a. Embedded in concrete or masonry.

b. In direct contact with a surface coated with alkaline base paint, or

c. Installed in wet locations, for example eave troughs or downspouts.

d. Installed in direct contact with earth.

D. Components used for connection of aluminum down conductors to copper or copper-clad grounding equipment shall provide separation between aluminum and copper materials. These fittings may be a Stainless steel sleeve with internal separation or other connector that provides proper separation of aluminum and copper components.

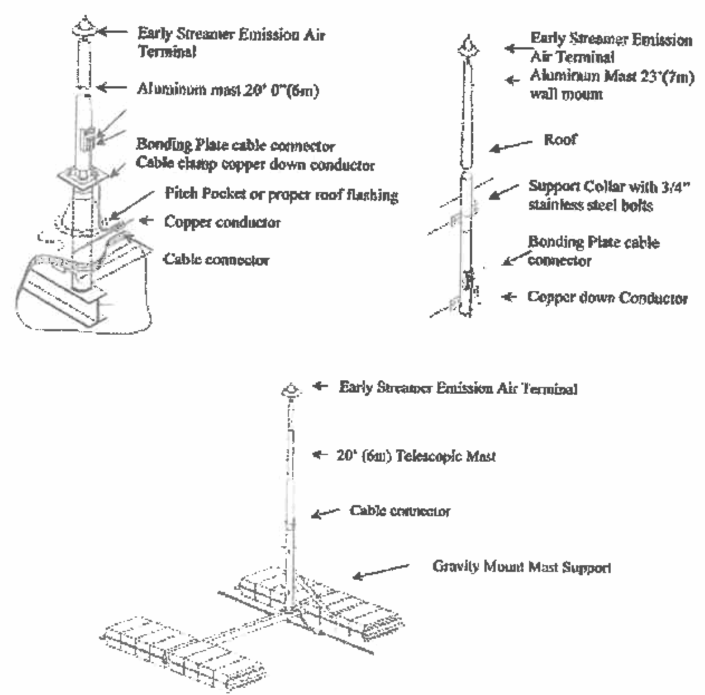
4.6.4 Unless otherwise indicated in this standard, an air terminal shall be provided for each part of a structure that is likely to be damaged by lightning. Based on the individual design requirements of the level of protection required.

5. Level 1 Air Terminal Installation Requirements

5.1 Early Streamer Emission Air Terminals

A. ESE Air Terminals shall be mounted at a height consistent with the requirements of Section 4.2.3 or a minimum of 20' above all projections on the roof.
See Figure 5.1.1 for sample mast mounting details.

Figure 5.1.1



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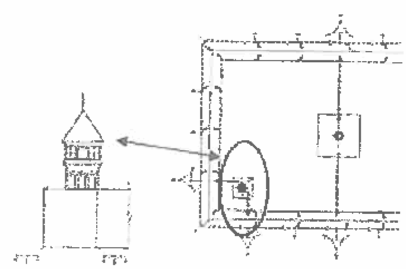
B. ESE Air Terminals shall be provided in proper quantity and location based on the system design under Manufacturer's Standard. See Figure 3.5.1 Level 1 requirements. The recommended number and placement of air terminals is based on Heary Bros.' experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lightning protection, NFPA 780, states that the NFPA "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

C. Additional ESE air terminals shall be provided in situations where steeples, cupolas, crosses, stacks, chimneys, etc. project above the protected roof area. This requirement applies to all projections which could provide a potential upward streamer release. The addition air terminals shall be provided regardless of whether or not the projection is within or outside the area covered by the system design under the Manufacturer's Standard. See Figure 5.1.2. The recommended number and placement of air terminals is based on Heary Bros.' experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lightning protection, NFPA 780, states that the NFPA "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

Figure 5.1.2



D. Conductors shall be securely fastened to roof or structure at intervals not exceeding 3'0" on center.

E. ESE Air Terminals shall be provided with a minimum of two paths to ground. Cables shall maintain a horizontal or downward path to ground to avoid "U" and "V" (down and up) pockets. See Figure 5.1.4

F. No Bend of a conductor shall form an included angle of less than 90 degrees or have a radius of bend less than 8 inches nor shall a conductor rise greater than 8". However conductors may raise a rate of 3" per 12" of run. See Figure 5.1.3 and Figure 5.1.4

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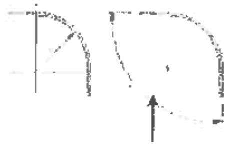
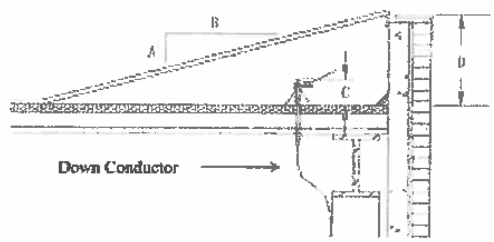
Figure 5.1.3



NOTE: Through roof, through wall and tee type connectors do not need to comply with this requirement

Figure 5.1.4

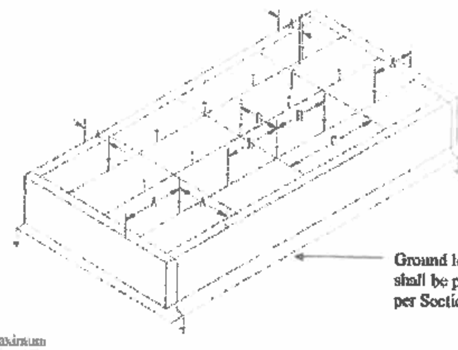


Note: Ramp may be constructed of wood, metal, fiberglass, plastic, PVC etc. provided the construction is such that it will be resistant to corrosion and rot. The conductor shall be attached or support on ramp as required in Section 5.1.D

5.1.1 In situations where multiple air terminals are required, the perimeter air terminals shall be positioned so that they are not more than 230' (70m) for the outside edge of the building nor shall the ESE Air Terminals be spaced more than 460' (140m) apart at any time. A cross run cable shall be provided at intervals of 1000' (305m) when building exceeds 2000' (610m) in length in any direction. See Fig 5.1.1.1. The recommended number and placement of air terminals is based solely on Heary Bros.' 30 years of experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed ho have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lightning protection, NFPA 780, states that the NFPA, "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

5.1.2 Down Conductors in situations where multiple ESE Air Terminals are required shall be spaced at intervals no more than 500' (152m) apart around the perimeter of the structure. The recommended number and placement of air terminals is based solely on Heary Bros.' 30 years of experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lightning protection, NFPA 780, states that the NFPA, "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

Figure 5.1.1.1



6. Level 1 Bonding Requirements

6.1 Roof top Interconnection loop

A. An interconnection loop around the perimeter of the roof structure shall be provided to which ESE Ground Conductors shall be bonded.

B. Loops shall be provided at all intermediate and lower roof levels and connected at a minimum of two (2) locations to the down conductors.

a. Bonding connections shall be made with main size conductor to all rebar, reinforcing rod, structural steel, interior wall wire mesh, nylon mesh in stucco walls, etc. whether exposed or not at all inside and outside corners of structure as a minimum. Additional bonding connections shall be made at intervals not exceeding 60' (18m) around the perimeter of the structure. Care shall be taken to assure that all rebar, reinforcing rod, structural steel, interior wall wire mesh, nylon mesh in stucco walls, et. Whether exposed or not is electrically continuous or made so. (See Fig. 6.2.4 and Fig 6.25).

b. Down Conductors shall be bonded to the structural steel, reinforcing rod or other structural support at the top and bottom of conductor run.

Figure 6.2.4

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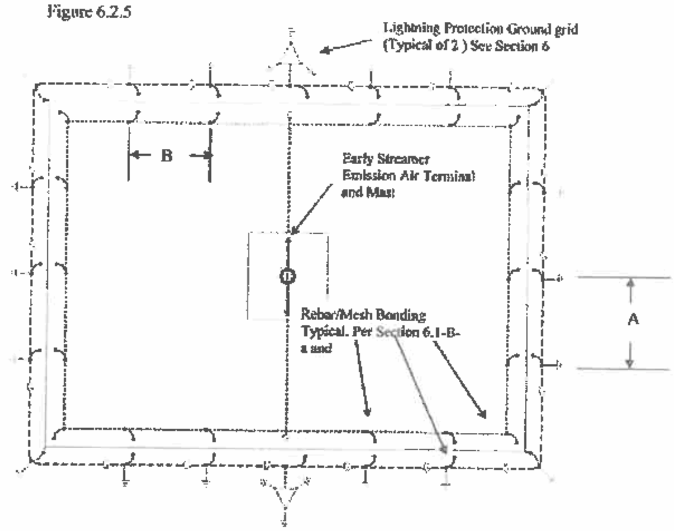
Figure 6.2.5



A= 60' (18m) Maximum
Spacing
B= 60' (18m) Maximum
Spacing

Note: For Base Grounding requirements see Section 7

6.2 Bonding Requirements

A. Roof top air handling units, equipment, or other roof top equipment shall be bonded to the system where the equipment is within 6' (1.8m) of a lightning protection conductor unless;

B. Inherently bonded to the lightning protection system.

C. Sanitary vents, roof drains, flashings, copings, etc. located within 6' (1.8m) of a lightning protection conductor, shall be bonded via secondary sized conductor to the lightning protection system.

7. Level 1 Grounding System Requirements

7.1 Down Conductors"

7.1.1 A minimum of Two (2) Down Conductors Shall be provided for each ESE Lightning Protection System. In cases where multiple ESE Air Terminals are used then additional down conductors shall be provided in accordance with Section 5.1.2

7.1.2 Down Conductors shall be spaced at least 10' (3m) apart.

7.1.3 Down conductors and other conductor where exposed to potential mechanical damage shall be protected against such damage by means of PVC, Fiberglass conduit sleeve, or metal conduit. (Metal conduit may be used provided the upper and lower portions are bonded to the down conductor). At ground level the bottom 8' (2.4m) of exposed down conductor shall be protected. See figure 7.2.1.1

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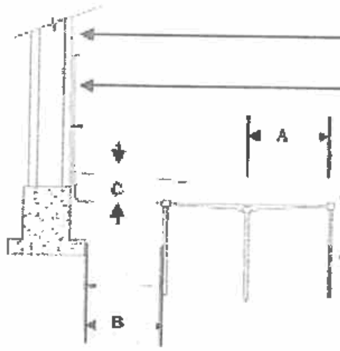
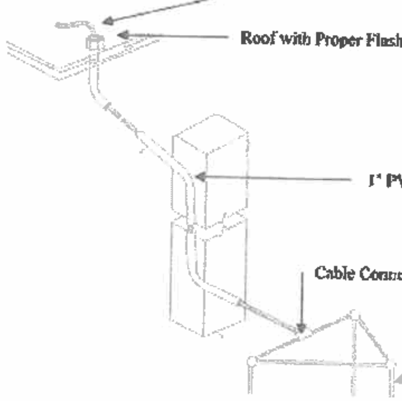
7.1.4 Down Conductors may be coursed within the construction of the building provided they are properly protected. See Figure 7.2.1.2

Figure 7.2.1.1



A= 10' (3 m) Minimum
B= 2' (0.6m) Minimum
C= 3' (0.3m) Minimum

Figure 7.2.1.2



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7.1.5 For masts that are electrically conductive then the mast shall be permitted to be used as a down conductor.

A. If electrically continuous, structural steel shall be permitted to be used as the down conductor.

B. Test joints shall be provided for each down conductor. They shall be accessible and located as near as practicable to the ground termination.

7.1.6 Masonry Anchors used to secure the lightning protection materials shall have a minimum outside diameter of ¼ in. (6.4mm) and shall be set with care. Holes made to receive the body of the anchor shall be of correct size, made with the proper tools and made in brick, stone or other masonry unit. Fasteners shall not be installed in mortar joints. When anchors are installed, the fit shall be tight against moisture, thus reducing the possibility of damage due to freezing.

7.1.7 Connector Fittings shall be used at all "end to end, "tee" or "Y" splices of lightning conductors. They shall be attached so as to withstand a pull test of 200 lbs. Fittings used for required connections shall be of bolted, welded or high compression type and bear the ARL Listing and UL Listing.

7.1.8 Conductors shall be fastened securely to the structure upon which they are placed at intervals not exceeding 3 ft (1m). The fasteners, attached by nails, screws, bolts or adhesives as necessary, shall not be subject to breakage and shall be of the same material as the conductor or of a material as resistant to corrosion as that of the conductor. No combination of materials shall be used that forms an electrolytic couple of such nature that, in the presence of moisture, corrosion is accelerated.

7.2 Grounding

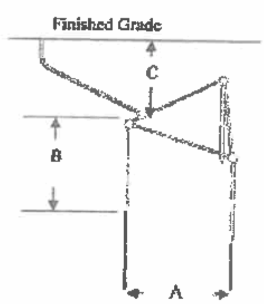
7.2.1 Ground Terminations: A study shall be conducted to engineer a grounding system to a maximum of 10 ohms resistance in accordance with IEEE fall of potential ANSI/IEEE 141, *Recommended Practice for Electric Power Distribution for Industrial Power Plants,* method. The components for the grounding system shall be selected to be suitable for the soil conditions and the other side factors such as cathodic protection.

7.2.2 Ground electrodes shall be of copper-bond steel in sufficient number as to achieve a 10-ohm maximum resistance to ground. Ground electrodes shall be installed so that the top of the electrode is a minimum 3' (1m) below finished grade minimum and 2' (0.6m) away from the foundation wall. See Figure 7.2.1.1

7.2.3 Ground rod terminations. The down conductor shall be attached to the ground rod by mechanical clamp, exothermic welding or brazing. Clamps shall be suitable for direct burial.

7.2.4 Each down conductor shall terminate at a ground terminal system. A minimum of 3 ground terminals shall be provided per down conductor location. Configured either in a straight line or in delta formation. Where the ground terminals are spaced a minimum of 10' (3m) apart. See Figures 7.2.3.1 and 7.2.3.2

Figure 7.2.3.1



A– 10' (3m) Minimum

B– 10' (3m) Minimum (Typical)

C– 3' (1m) Minimum

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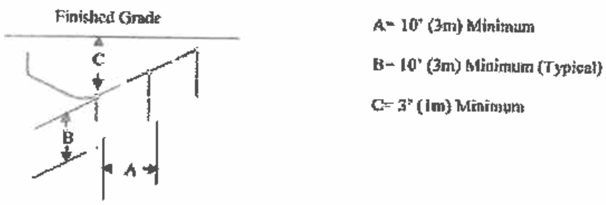
Figure 7.2.3.2



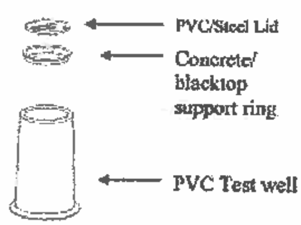
7.2.5 Ground terminals located under slabs or in crawl spaces shall be installed as near as practicable to the outside perimeter of the structure.

7.2.6 Electrical system grounding electrodes shall not be used in lieu of lightning ground rods. This provision shall not prohibit the required bonding together of grounding electrodes of different systems.

NOTE 1: For Further information, see NFPA 70 National Electric Code, which contains detailed information on the grounding of electrical systems.

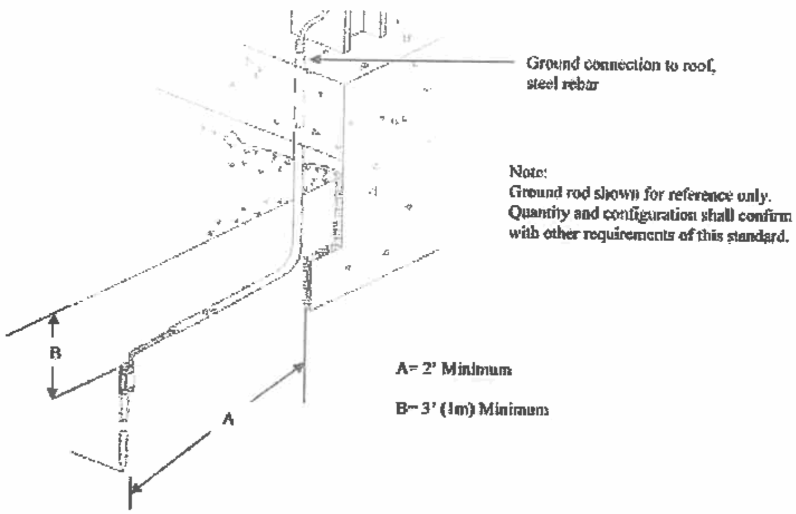
NOTE 2: Ground rod or ground ring/loop electrodes should be installed below the frost line where practicable and in accordance with Section 7.2.8

Figure 7.2.6.1



7.2.7 Grounding ring/loop Electrode encircling the structure shall be provided and in direct contact with the earth at a depth of not less than 2ft. The ground ring conductor shall be sized at a minimum of that of the main sized conductor. See Figure 7.2.8.1

Figure 7.2.8.1



7.2.8 Common Grounding. All grounding media in or on a structure shall be interconnected to provide a common ground potential. This shall include, but not be limited to lightning protection, electrical services, telephone and antenna system grounds as well as underground metallic piping systems. Such piping systems include water service, well casings located within 25ft (7.6m) of the structure, underground conduits (not already bonded) etc. Main size lightning conductors shall be used for interconnecting these grounding systems to the lightning protection system.

7.2.9 Common Ground Bonding. If electric telephone or other systems are bonded to metallic water pipe, only one connection from the lightning protection system to the water pipe system is necessary, provided that the water pipe is electrically continuous between all systems. In situations where there are separate services for domestic and fire water entering the building both systems shall be bonded to the lightning protection grounding system. This may be accomplished via direct connection or through the ground loop system.

8. Level 1 Structural Steel Systems

8.1 General. The steel framework of a structure shall be permitted to be utilized as the main conductor of a lightning protection system if it is electrically continuous or is made electrically continuous.

8.2 Steel Structure Terminals. Ground terminals shall be connected to approximately every other steel column around the perimeter of the structure at intervals averaging not more than 60ft (18m). Ground terminals shall be connected together via a main size conductor as indicated in sec 7.2. Connections shall be made near the base of the column, with a surface contact area not less than 8 sq inches (5200mm^2) or by exothermic welding. Bonding plates shall have bolt pressure cable connectors and shall be bolted securely to the structural steel framework so as to maintain electrical continuity.

8.3 Connections to Framework. Conductors shall be connected to cleaned areas of the structural steel framework by the bonding of plates having a surface contact area of not less than 8 sq in (5200mm^2). The area of attachment shall be free of paint, grease oil and debris. (See Figure 8.3.1)

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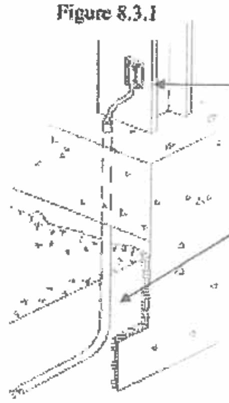
Figure 8.3.1



8.4 Early Streamer Emission Air terminals shall be permitted to be bonded directly to structural, by means of direct attachment through mast or by use of two interconnection wires routed through roof and bonded at the top of the structural steel in the manner described in Section 8.3

8.5 Metal Bodies. Certain Metal bodies located outside or inside the structure contribute to lightning hazards because they are grounded or assist in providing a path to ground for lightning currents. Such metal bodies shall be bonded to the lightning protection system in accordance with Section 4.5.

8.6 Concealment in Steel Reinforced Concrete. Conductors or other components of the lightning protection system concealed in steel reinforced concrete units shall be connected to the reinforcing steel. Concealed down conductors shall be connected to vertical reinforcing steel. Roof conductors or other concealed horizontal conductors runs shall be connected to reinforcing steel/structural steel at intervals not exceeding 60ft (18m) and at all corners. See Section 6.

8.7 Down Conductors coursed on or in reinforced concrete columns or on structural steel columns shall be connected to the reinforcing steel and/or structural steel member at its upper and lower extremities. In the case of long vertical members an additional connection shall be made at intervals not exceeding 200ft (60m). Such connections shall be made using listed clamps or listed bonding plates or by exothermic welding. The use of PVC conduit or other non-metallic chase does not negate the need for these interconnections.

LEVEL 2

MANUFACTURER'S INSTALLATION STANDARD FOR EARLY STREAMER EMISSION LIGHTNING PROTECTION SYSTEMS

9. Level 2 General Installations and Component Requirements

9.1 An ESE lightning protection system installation consists of the following interconnected parts
- (a) One or more ESE air terminals
- (b) Mast and mounting systems – as required based on level of protection desired
- (c) Bonding conductors – as required based on level of protection.
- (d) Ground system – Single grid to loop conductor system
- (e) Equipotential Bonding
- (f) Transient Voltage Surge Suppression

9.2 The number of ESE air terminals will depend on the system design under the manufacturer's Standard based on the area as indicated in Figure 3.5.1 for Level 2 Systems. The recommended number and placement of air terminals is based solely on Heary Bros.' 30 years of experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumer should be aware that the NFPA, in issuing its standard for lightning protection, NFPA 780, states that the NFPA, "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

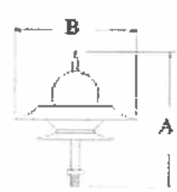
9.3 Components Tables Figure 9.3.1 and Figure 9.3.2 provide minimum sizes and weights for use in ESE lightning protection system installation.

Figure 9.3.1

Type of conductor	Minimum Diameter	Copper Standard/ Metric	Aluminum Standard/ Metric
ESE Air Terminal	1/2 "/ 12.7mm	1/2" / 12.7 mm	1/2" / 12.7 mm
Main Conductor Cable	Min Size each strand Weight Per Length Cross Sectional area	14AWG 375lbs /1000/ or 558 g/m 115,000 CM / 58 mm ^{2}	13AWG 190lbs/1000/ 283 g/m 192000 CM/ 97 mm ^{2}
Ground Terminals	Ground Rod / Ground Plate	¾" x 10' (20mm x 3000mm)/ 24" x 24"x 20 gauge (600mm x 600mm) pure Copper plate minimum of 2 contact points each 8 sq inch contact to plate	NA

Figure 9.3.2 Early Streamer Emission Air Terminal

A= 12"
B= 9"



9.4 ESE Air Terminals shall be sufficiently rigid to withstand mechanical damage. They shall be constructed of copper, copper alloy, aluminum or stainless steel. The main conductive parts of the ESE air terminals shall have the minimum dimensions in accordance with Figures 9.3.1 and Figure 9.3.2 for minimum dimensions of ESE Air Terminals Installation: Air terminals and their supports shall be mounted in such a way as to withstand the lightning currents, electromotive force, corrosion and effects of weather, heat, humidity, snow and wind

NOTE: Wind design requirements should be consistent with local building code requirements.

9.4.1 Where an air terminal or mast is supported by conductive guys, the guys shall be connected from their points of anchorage to the closest down conductor(s) by a conductor equivalent in size to that of the down conductor(s).

9.4.2 The tip of any ESE air terminal shall not be less than 20' (6.1m) above the protected structures, including antennas, cooling towers, tanks, roof and masts.

9.4.3 The ESE air terminals shall be mounted on structures such as flagpole, the top of pylons, light standards or on dedicated supports for structures at certain facilities, such as, sports facilities and stadiums, golf courses, public parks, camping sites and racetracks. The ESE unit shall be mounted at an elevation as indicated in Section 9.4.2.

9.5 Storage Areas for flammable and combustible liquids or flammable gases. Structures containing these materials shall be grounded, but grounding alone does not constitute sufficient protection against atmospheric discharges.

9.5.1 Electrical Surge Suppression device shall be internally redundant and modular, in both surge suppression elements and fusing in construction for ease of field reparability. Manufacturers shall warranty the modules and fuse for the lifetime of the unit, with a minimum 10-year full unit warranty. Units shall be mounted as to minimize inductance installation. (I.e. As close to equipment to be protected or by use of documented low inductance cabling.)

Note 1: Electrical systems and utilization equipment within the structure may require further surge suppression. Such protection is not part of this standard. NFPA 70, National Electric Code and ANSI/IEEE C62.41-1991 2nd Edition, shall be consulted for further information and installation requirements.

Note 2: Illustrations shown in this are those of Heary Brothers Lightning Protection Co., Inc. (HBLP) and its division Lightning Preventor of America (LPA). HBLP and LPA do not manufacture or warranty surge protection devices. Warranties required of this standard shall be the responsibility or the surge protection device manufacturer.

9.6 General. In determining the necessity of bonding a metal body to a lightning protection system, the following factors shall be considered:

A. Bonding is required only if there is a likely to be a side flash between the lightning protection system and other grounded medium.

B. The influence of a non-grounded metal body, such as a metal window frame in a non-conductive medium, is limited to its effectiveness as a short circuit conductor if a side flash occurs therefore, does not necessarily require bonding to the lightning protection system.

C. Bonding distance requirements depend on the technical evaluation of the number of down conductors and their location, the interconnection of other grounded systems, the proximity of grounded metal bodies to the down conductors and the flashover medium (air or solid materials).

(a) Metal bodies located in a steel frame structure shall be permitted to be inherently bonded through construction and further bonding shall not be required.

(b) Metal antenna masts or supports located on a protected structure shall be bonded to the lightning protection system using main size conductors and listed fittings. The height of the air terminal shall still maintain the minimum protection above these objects as specified in Section 9.4.2.

9.7 Components

9.7.1 A lightning protection system shall be made of components that are resistant to corrosion or shall be acceptably protected against corrosion. The following materials are acceptable:

A. Copper of the grade required for commercial electrical work. Or a copper alloy with similar characteristics. Usually of 98 percent conductivity when annealed.

B. Aluminum conductors as acceptable as electrical grade aluminum.

9.7.2 Components shall be protected against deterioration due to local conditions. Any part of a copper system that is exposed to direct action of chimney gases or other similar corrosive gases shall be protected. Aluminum components are not required to be protected.

9.7.3 Metals shall be used in combinations that are galvanically compatible.

A. Copper components shall not be installed directly on aluminum roofing, siding, or other aluminum surfaces.

B. Aluminum lightning protection components shall not be installed directly on copper roofing material or other copper surfaces or below the run off of a copper surface.

C. Aluminum Conductors and components shall not be:

a) Embedded in concrete or masonry;

b) In direct contact with a surface coated with alkaline base paint; or

c) Installed in wet locations, for example eave troughs or downspouts.

d) Installed in direct contact with earth

D. Components used for connection of aluminum down conductors to copper or copper-clad grounding equipment shall provide separation between aluminum and copper materials. These fittings may be a stainless steel sleeve with internal separation or other connector that provides proper separation of aluminum and copper materials.

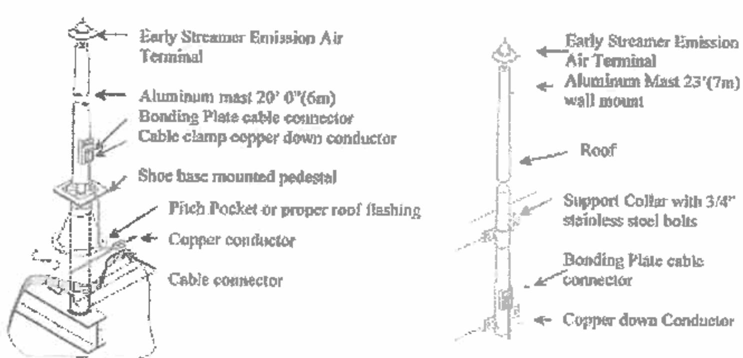
9.7.4 Unless otherwise indicated in this standard, an air terminal shall be provided for each part of a structure that is likely to be damaged by lightning. Based on the individual design requirements of the level of protection required.

10. Level 2 Air Terminals Installation Requirements

10.1 Early Streamer Emission Air Terminals

A. ESE Air Terminals shall be mounted at a height consist with the requirements of Section 9.4.2 or a minimum of 20' above all projections on the roof. See Figure 10.1.1 for sample mast mounting details.

Figure 10.1.1



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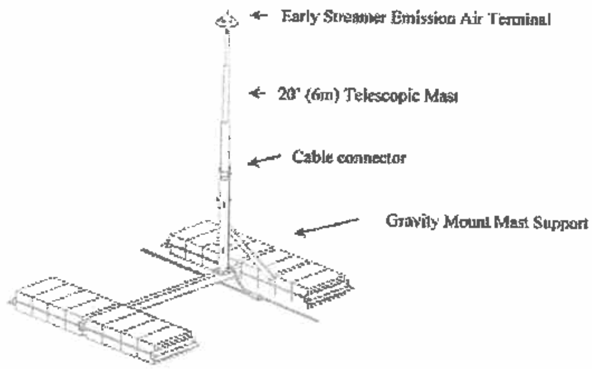
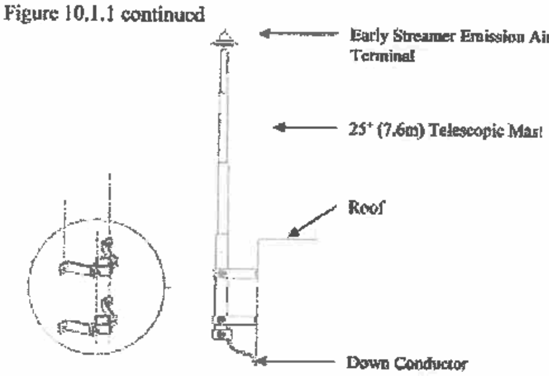


Figure 10.1.1 continued



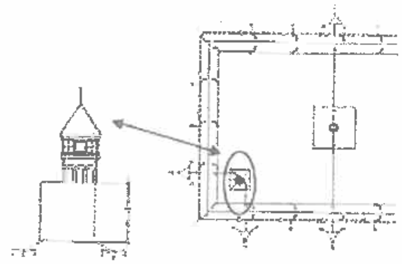
10.2 ESE Air Terminals shall be provided in proper quantity and location based on the system design under the Manufacturer's Standard. See Figure 3.5.1 for Level 2. The recommended number and placement of air terminals is based on Heary Bros.' experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lightning protection, NFPA 780, states that the NFPA "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

10.3 Conductors shall be securely fastened to roof or structure at intervals not exceeding 3'0" on center.

10.4 Additional ESE air terminals shall be provided in situations where steeples, cupolas, crosses, stacks, chimneys, etc project above a protected roof area. This requirement applies to all projections which could provide a potential upward streamer release. The addition air terminals shall be provided regardless of whether or not the projection is within or outside the area covered by the system design under the Manufacturer's Standard. See Figure 10.2.1. The recommended number and placement of air terminals is based on Heary Bros.' experience and its air terminals and the configuration of those

terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lightning protection, NFPA 780, states that the NFPA "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

Figure 10.2.1



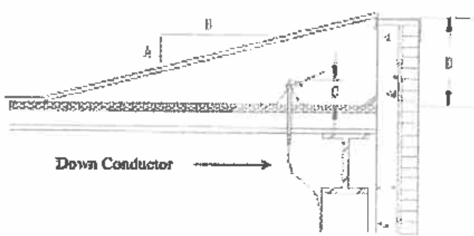
10.5 ESE Air Terminals shall be provided with a minimum of two paths to ground. Cables shall maintain a horizontal or downward path to ground to avoid "U" and "V" (down and up) pockets.

10.6 No Bend of a conductor shall form an included angle of less than 90 degrees or have a radius of bend less than 8 inches nor shall a conductor rise greater than 8". However Conductors may rise at a rate of 3" per 12" of run. See Figure 10.5.1 and Figure 10.6.1

Figure 10.5.1

NOTE: Through roof, through wall and tee type connectors do not need to comply with this requirement.

Figure 10.6.1



Note: Ramp may be constructed of wood, metal, fiberglass, plastic, PVC etc, provided the construction is such that it will be resistant to corrosion and rot. The conductor shall be attached or support on ramp as required in

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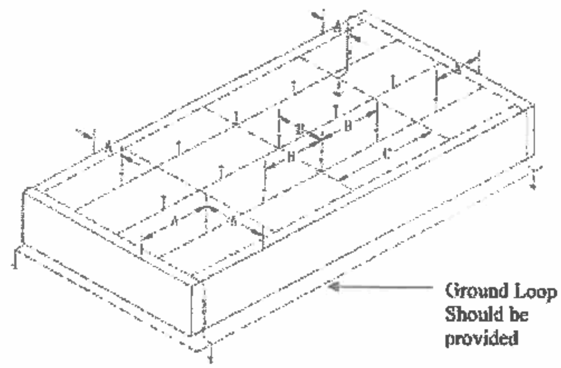
10.7 In situations where multiple air terminals are required, the perimeter air terminals shall be positioned so that they are no more than 230' (70m) from the outside edge of the building nor shall be ESE Air Terminals be spaced more than 460' (140m) apart at any time. A cross run cable shall be provided at intervals of 1000' (305m) When building exceed 200' (610m) in length in any direction. See Figure 10.8.1. The recommended number and placement of air terminals is based solely on Heary Bros.' 30 years of experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lightning protection, NFPA 780, states that the NFPA, "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

10.8 Down Conductors in situations where multiple ESE Air Terminals are required shall be spaced at intervals no more than 500' (152m) apart around the perimeter of the structure.

Figure 10.8.1



A– 230' (70m) maximum
B– 460' (140 m) maximum
C– 1000' (305m)

10.9 Bonding connections shall be made with main size conductor to all rebar, reinforcing rod, structural steel, interior wall wire mesh, nylon mesh in stucco walls, etc., whether exposed or not, at the upper and lower extremities of each down conductor. Care shall be taken to assure that all rebar, reinforcing rod, structural steel, interior wall mesh, nylon mesh in stucco walls etc, whether exposed or not is electrically continuous or made so. (See Fig. 10.9.1 and Fig 10.9.2).

Figure 10.9.1

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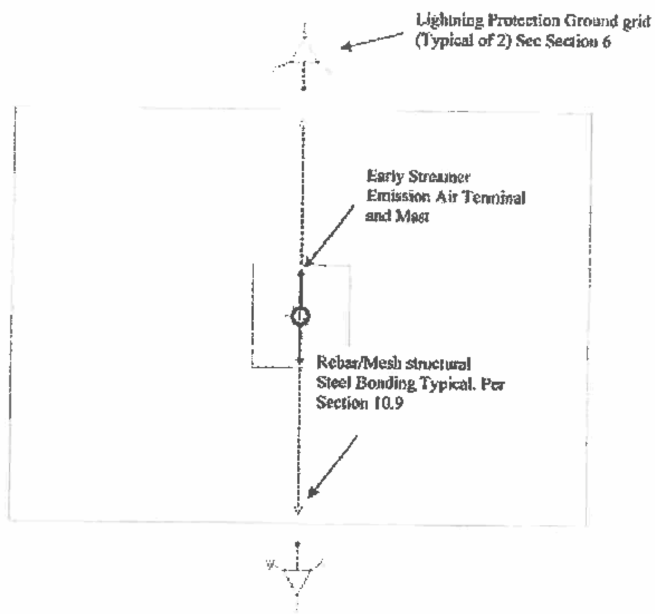
Figure 10.9.2



11. Level 2 Bonding Requirements

11.1 Roof top air handling units, equipment, or other roof top equipment shall be bonded to the system where the equipment is within 6' (1.8m) of a lightning protection conductor unless.

A. Inherently bonded to the lightning protection system.

11.2 Sanitary vents, roof drains, flashings, copings, etc located within 6' (1.8m) of a lightning protection conductor, shall be bonded via secondary sized conductor to the lightning protection system.

12. Level 2 Grounding System Requirements

12.1 Down Conductors and Grounding

12.2 A minimum of two (1) down conductors shall be provided for each ESE Lightning Protection System. In cases where multiple ESE Air Terminals are used then additional down conductors shall be provided in accordance with Section 10.8.

12.3 A single down conductor shall be permitted to be used where the length of run does not exceed 65ft (19m).

12.4 If the horizontal length is greater than the vertical length, two (2) down conductors shall be required and separated a minimum of 10' (3m).

12.4.1 For lengths greater than 65' (19m) two conductors shall be required.

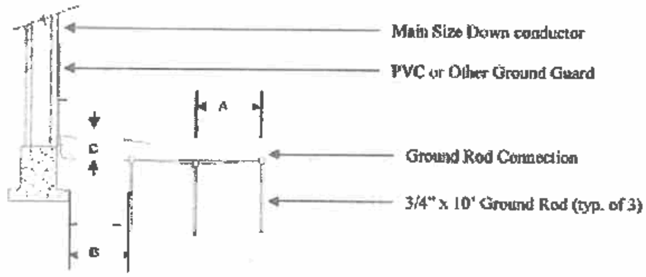
12.4.2 For masts, a single down conductor only shall be required.

12.4.3 If electrically conductive, the mast shall be permitted to be used as the down conductor.

12.5 Down Conductors and other conductor where exposed to potential mechanical damage shall be protected against such damage by means of PVC, Fiberglass conduit sleeve, or metal conduit. (Metal conduit may be used provided the upper and lower portions are bonded to the down conductor). At ground level the bottom 8' (2.4m) of exposed down conductor shall be protected. See figure 12.4.1.

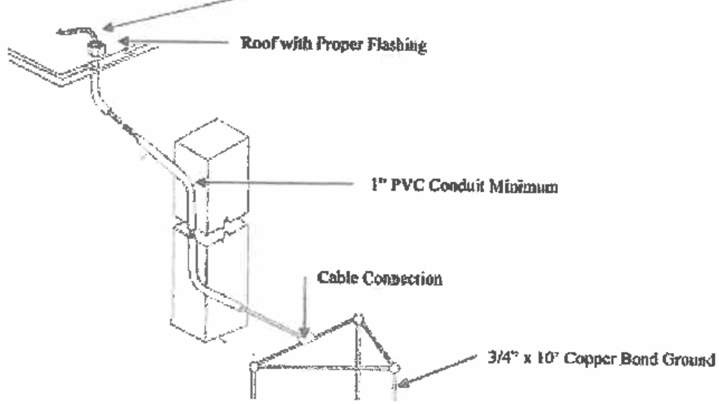
12.6 Down Conductors may be coursed within the construction of the building provided they are properly protected. See Figure 12.4.2.

Figure 12.4.1



A= 10' (3 m) Minimum
B= 2' (0.6m) Minimum
C= 1' (0.3m) Minimum

Figure 12.4.2



12.7 For masts that are electrically conductive then the mast shall be permitted to be used as a down conductor.

12.7.1 If electrically continuous, structural steel shall be permitted to be used as the down conductor.

12.8 Masonry Anchors used to secure the lightning protection components shall have a minimum outside diameter of ¼" (6.4mm) and shall be set with care. Holes made to receive the body of the anchor shall be of correct size, made with the proper tools and made in brick, stone or other masonry unit. Fasteners shall not be installed in mortar joints. When anchors are installed the fit shall be tight against moisture, thus reducing the possibility of damage due to freezing.

12.9 Connector Fittings shall be used at all "end to end", "tee" or "y" splices of lightning conductors. They shall be attached so as to withstand a pull test of 200 lbs. Fittings used for required connections shall be of bolted, welded, or high compression type and bear the ARL Listing and UL Listing.

12.10 Conductors shall be fastened securely to the structure upon which they are placed at intervals not exceeding 3 ft (1m). The fasteners, attached by nails, screws, bolts or adhesives as necessary, shall not be subject to breakage and shall be of the same material as the conductor or of a material as resistant to corrosion as that of the conductor. No combination of materials shall be used that forms an electrolytic couple of such nature that, in the presence of moisture, corrosion is accelerated.

12.11 Ground Terminations: A study shall be conducted to engineer a grounding system to a maximum of 10 ohms resistance in accordance with IEEE fall of potential ANSI/IEEE 141, *Recommended Practice for Electric Power Distribution for Industrial Power Plants,* method. The components for the grounding system shall be selected to be suitable for the soil conditions and the other side factors such as cathodic protection.

12.12 Ground electrodes shall be of copper-bond steel in sufficient number as to achieve a 10-ohm maximum resistance to ground. Ground electrodes shall be installed so that the top of the electrode is a minimum 1' (0.3m) below finished grade minimum and 2' (0.6m) away from the foundation wall. See Figure 12.4.1

12.13 Ground Rod terminations. The down conductor shall be attached to the ground rod by mechanical clamp, exothermic welding or brazing. Clamps shall be suitable for direct burial.

12.14 Each down conductor shall terminate at a ground terminal system. A minimum of 3 ground terminals shall be provided per down conductor location. Configured either in a straight line or in delta formation. Where the ground terminals are spaced a minimum of 10' (3m) apart. See Figures 12.4.1 and 12.4.2.

12.15 Ground terminals located under slabs or in crawl spaces shall be installed as near as practicable to the outside perimeter of the structure.

12.16 Electrical system grounding electrodes shall not be used in lieu of lightning ground rods. This provision shall not prohibit the required bonding together of grounding electrodes of different systems.

NOTE 1: For further information, see NFPA 70 National Electric Code, which contains detailed information on the grounding of electrical systems.

12.17 Ground ring/loop electrode encircling the structure should be provided and in direct contact with the earth at a depth of not less than 2 ft. The ground ring conductor shall be sized at a minimum of that of the main sized conductor.

12.18 Common Grounding. All grounding media in or on a structure shall be interconnected to provide a common ground potential. This shall include lightning protection, electric service, telephone and antenna system grounds as well as underground metallic piping systems. Such piping systems include water service, well casings located within 25ft (7.6m) of the structure, underground conduits (not already bonded) etc. Main size lightning conductors shall be used for interconnecting these grounding systems to the lightning protection system.

12.19 Common Ground Bonding. If electric, telephone or other systems are bonded to metallic water pipe; only on connection from the lightning protection system to the water pipe system is necessary, provided that the water pipe is electrically continuous between all systems. In situations where there are separate services for domestic and fire water entering the building both systems shall be bonded to the lightning protection grounding system. This may be accomplished via direct connection or through the ground loop system.

12.20 If the horizontal length is greater than the vertical length, two down conductors shall be required and separated a minimum of 10' (3m).

(a) For lengths greater than 65' (19m) two conductors shall be required.

(b) For masts, a single down conductor only shall be required.

(c) If electrically conductive, the mast shall be permitted to be used as the down conductor.

13. Level 2 Structural Steel Systems

13.1 General. The steel framework of a structure shall be permitted to be utilized as the main conductor of a lightning protection system if it is electrically continuous or is made electrically continuous.

13.2 Steel Structure Terminals. Ground terminals shall be connected to approximately every other steel column around the perimeter of the structure at intervals averaging not more than 60 ft (18m). Connections shall be made near the base of the column, with a surface contact area not less than 8 sq inches ($5200mm^2$) or by exothermic welding. Bonding plates shall have bolt pressure cable connectors and shall be bolted securely to the structural steel framework so as to maintain electrical continuity.

13.3 Connections to Framework. Conductors shall be connected to cleaned areas of the structural steel framework by the bonding of plates having a surface contact area of not less than 8 sq inches ($5200mm^2$). The area of attachment shall be free of paint, grease oil and debris.

13.4 Early Streamer Emission Air Terminals shall be permitted to be bonded directly to structural, by means of direct attachment through mast or by use of two interconnection wires routed through roof and bonded at the top of the structural steel in the manner described in Section 13.3.

13.5 Metal Bodies. Certain metal bodies located outside or inside the structure contribute to lightning hazards because they are grounded or assist in providing a path to ground for lightning currents. Such metal bodies shall be bonded to the lightning protection system in accordance with Section 11.

13.6 Concealment in Steel Reinforced Concrete. Conductors or other components of the lightning protection system concealed in steel reinforced concrete units shall be connected to the reinforcing steel. Concealed down conductors shall be connected to vertical reinforcing steel. Roof conductors or other concealed horizontal conductor runs shall be connected to reinforcing steel and structural steel at intervals not exceeding 60ft (18m) and at all corners. See Section 10.9.

13.7 Down Conductors coursed on or in reinforced concrete columns or on structural steel columns shall be connected to the reinforcing steel and/or structural steel member at its upper and lower extremities. In the case of long vertical members an additional connection shall be made at intervals not exceeding 200 ft (60m). Such connections shall be made using listed clamps or listed bonding plates or by exothermic welding. The use of PVC conduit or other non-metallic chase does not negate the need for the interconnections.

LEVEL 3

MANUFACTURER'S INSTALLATION STANDARD

FOR

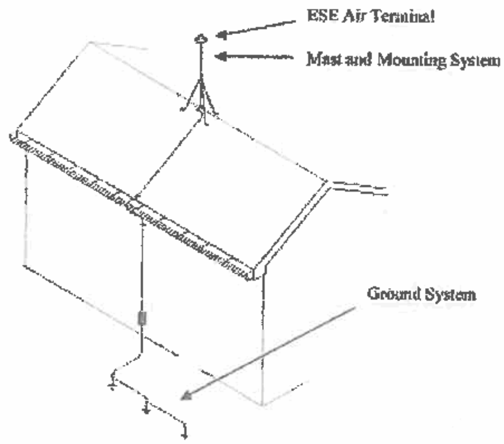
EARLY STREAMER EMISSION LIGHTNING PROTECTION SYSTEMS

14. Level 3 General Installation Requirements

14.1 An ESE lightning protection system installation consists of the following interconnected parts see figure 14.1.1.

a. One or more ESE air terminals.
b. Mast and mounting systems – as required based on level of protection.
c. Ground system – Single grid to loop conductor system.
d. Equipotential Bonding.
e. Transient Voltage Surge Suppression.

Figure 14.1.1



14.2 The number of ESE air terminals will depend on the system design under the Manufacturer's Standard based on the area as indicated in Figure 3.5.1 for Level 3 Systems. The recommended number and placement of air terminals is based solely on Heary Bros.' 30 years of experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lightning protection, NFPA 780, states that the NFPA, "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

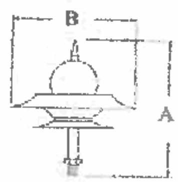
14.3 Components Tables Figure 14.3.1 and Figure 14.3.2 provide minimum sizes and weights for use in ESE lightning protection system installation.

Figure 14.3.1

Type of conductor	Minimum Diameter	Copper Standard/ Metric	Aluminum Standard/ Metric
ESE Air Terminal	1/2 "/ 12.7mm	1/2" / 12.7 mm	1/2" / 12.7 mm
Main Conductor Cable	Min Size each strand Weight Per Length Cross Sectional area	16AWG 190lbs /1000' or 278 g/m 61900 CM / 35 mm ^{2}	14AWG 110lbs/1000' 164 g/m 98600 CM/ 50 mm ^{2}
Ground Terminals	Ground Rod / Ground Plate	5/8" x 8' (16 mm x 2400mm)/ 18" x 18"x 20 gauge (460mm x 460mm) pure Copper plate minimum of 2 contact points each 8 sq inch contact to plate	NA

Figure 14.3.2 Early Streamer Emission Air Terminal

A= 12" (300mm)
B= 9" (230mm)



14.4 ESE Air Terminals shall be sufficiently rigid to withstand mechanical damage. They shall be constructed of aluminum, copper, copper alloy, or stainless steel. The main conductive parts of the ESE air terminal shall have the minimum dimensions in accordance with Figures 14.3.1 and Figure 14.3.2.

14.5 ESE Air Terminals Installation: Air terminals and their supports shall be mounted in such a way as to withstand the lightning currents, electromotive force, corrosion and effects of weather, heat, humidity, snow and wind.

14.5.1 Where an air terminals or mast is supported by conductive guys, the guys shall be connected from their points of anchorage to the closest down conductor(s) by a conductor equivalent in size to that of the down conductor(s).

14.5.2 The tip of any ESE air terminal shall not be less than 7' (2.1m) above the protected structures, including antennas, cooling towers, tanks, roof and masts.

14.5.3 The ESE air terminals shall be mounted on structures such as flagpole, the top of pylons, light standards or on dedicated supports for structures at certain facilities, such as sports facilities and stadium, golf courses, public parks, camping sites and racetracks. The ESE unit shall still be mounted at an elevation as indicated in Section 14.5.2

14.5.4 Storage areas for flammable and combustible liquids or flammable gases. Structures containing these materials shall be grounded, but grounding alone does not constitute sufficient protection against atmospheric discharges.

14.5.5 Electrical Surge Suppression devices shall be internally redundant and modular, in both surge suppression elements and fusing in construction for ease of field reparability. Manufacturers shall warranty the modules and fuse for the lifetime of the unit, with a minimum 10-year full unit warranty.

Units shall be mounted as to minimize inductance installation. (I.e. As close to equipment to be protected or by use of documented low inductance cabling).

NOTE 1: Electrical systems and utilization equipment within the structure may require further surge suppression. Such protection is not part of this standard. NFPA 70, National Electric Code and ANSI/IEEE C62.41-1991 2nd Edition, shall consulted for further information and installation requirements.

NOTE 2: Illustrations shown in this standard are those of Heary Brothers Lightning Protection Co., Inc. (HBLP) and its division Lightning Preventor of America (LPA). HBLP and LPA do not manufacture or warranty surge protection devices. Warranties required of this standard shall be the responsibility of the surge protection device manufacturer.

14.6 General. In determining the necessity of bonding a metal body to a lightning protection system, the following factors shall be considered:

A. Bonding is required only if there is a likely to be a side flash between the lightning protection system and other grounding medium.

B. The influence of a non-grounded metal body, such as metal window frame in a non-conductive medium, is limited to its effectiveness as a short circuit conductor if a side flash occurs therefore, does not necessarily require bonding to the lightning protection system.

C. Bonding distance requirements depend on the technical evaluation of the number of down conductors and their location, the interconnection of other grounded systems, the proximity of grounded metal bodies to the down conductors and the flashover medium, (Air or solid materials).

D. Metal bodies located in a steel frame structure shall be permitted to be inherently bonded through construction and further bonding shall not be required.

E. Metal antenna masts or supports located on a protected structure shall be bonded to the lightning protection system using main size conductors and listed fittings. The height of the air terminal shall still maintain the minimum projection above these objects as specified in section 14.5.2 and the object shall be bonded to the lightning protection system by means of main sized conductor.

15. Level 3 Components

15.1 A lightning protection system shall be made of components that are resistant to corrosion or shall be acceptably protected against corrosion. The following materials are acceptable:

A. Copper of the grade required for commercial electrical work. Or a copper alloy with similar characteristics. Usually of 98 percent conductivity when annealed.

B. Aluminum conductors as acceptable as electrical grade aluminum.

15.1.1 Components shall be protected against deterioration due to local conditions. Any part of a copper system that is exposed to direct action of chimney gases or other similar corrosive gases shall be protected. Aluminum components are not required to be protected.

15.2 Metals shall be used in combinations that are galvanically compatible.

A. Copper components shall not be installed directly on aluminum roofing, siding, or other aluminum.

B. Aluminum lightning protection components shall not be installed directly on copper roofing material or other copper surfaces or below the run off of a copper surface.

C. Aluminum conductors and components shall not be embedded in concrete or masonry;

a) In direct contact with a surface coated with alkaline base paint; or installed in wet locations, for example eave troughs or downspouts.

b) Installed in direct contact with earth.

c) Components used for connection of aluminum down conductors to copper or copper-bond grounding equipment shall provide separation between aluminum and copper materials. These fitting may be a stainless steel sleeve with internal separation or other connector that provides proper separation of aluminum and copper materials.

15.2.1 Unless otherwise indicated in this standard, an air terminals shall be provided for each part of a structure that is likely to be damaged by lightning. Based on the individual design requirements of the level of protection required.

16. Level 3 Air Terminal Installation Requirements

16.1 Early Streamer Emission Air Terminals

16.1.1 ESE Air Terminals shall be mounted at a height consistent with the requirements of Section 14.5.2 or a minimum of 7' (2.1m) above all projections on the roof. See Figure 16.1.1 for sample mast mounting details and figure 16.1.2 for installation diagram.

Figure 16.1.1

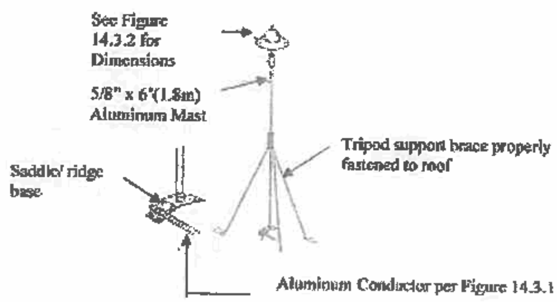
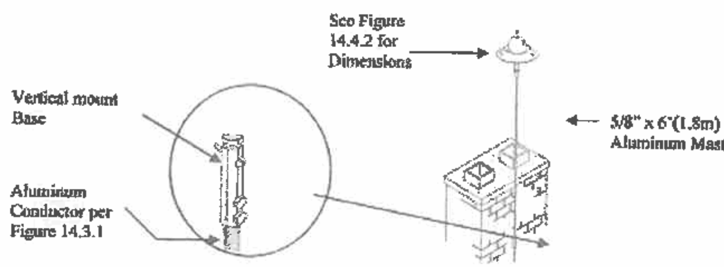
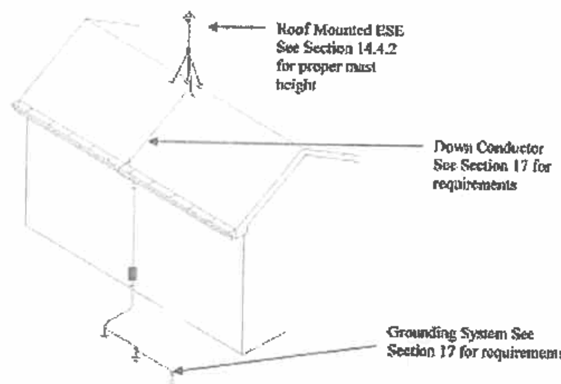


Figure 16.1.1 (Continued)



37

Figure 16.1.2



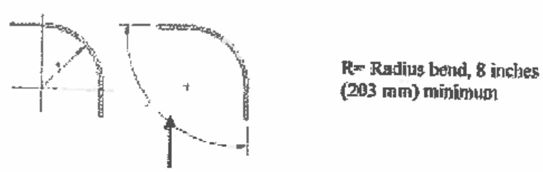
16.1.2 ESE Air Terminals shall be provided in proper quantity and location based on the system design under the Manufacturer's Standard. See Figure 3.5.1 and for Level 3 Systems. The recommended number and placement of air terminals is based on Heary Bros.' experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lightning protection, NFPA 780, states that the NFPA "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

16.1.3 Conductors shall be securely fastened to roof or structure at intervals not exceeding 3' (1m) on center.

16.1.4 The ESE Air Terminals shall be provided with a minimum of one path to ground. (See Section 17 for additional requirements) Cables shall maintain a horizontal or downward path to ground to avoid "U" and "V" (down and up) pockets. See Figure 16.1.4

16.1.5 No bend of a conductor shall form an included angle of less than 90 degrees or have a radius of bend less than 8 inches nor shall a conductor rise greater than 8". However Conductors may raise a rate of 3" per 12" of run. See Figure 16.1.3 and Figure 16.1.4

Figure 16.1.3



NOTE: Through roof, through wall and tee type connectors do not need to comply with this requirement.

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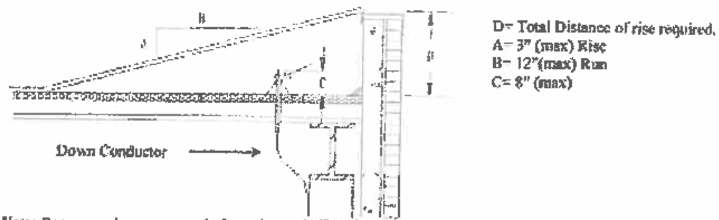
Figure 16.1.4



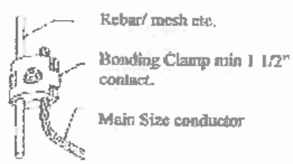
Note: Ramp may be constructed of wood, metal, fiberglass, plastic, PVC etc, provided the construction is such that it will be resistant to corrosion and rot. The conductor shall be attached or support on ramp as required in Section 16.1.3.

16.1.6 In situations where multiple air terminals are required, air terminals shall be positioned so that they are no more than 150' (45m) from the outside edge of the building nor shall they be more than 300' (90m) apart. The recommended number and placement of air terminals is based on Heary Bros.' experience and its air terminals and the configuration of those terminals have not been scientifically proven or guaranteed to have a measurable zone of protection. Consumers should be aware that the NFPA, in issuing its standard for lightning protection, NFPA 780, states that the NFPA "does not independently test, evaluate or verify the accuracy of any information or the soundness of any judgment contained in its codes and standards."

16.1.7 Down Conductors in situations where multiple ESE Air Terminals are required shall be installed in accordance with Section 17.

16.1.8 Bonding connections shall be made to all rebar, reinforcing rod, structural steel etc. at the upper on lower extremities of the down conductor. See Figure 16.18.

Figure 16.18



16.2 Roof Top Bonding Requirements;

16.2.1 Roof top air handling units, equipment, or other roof top equipment shall be bonded to the system where the equipment is within 6' (1.8m) of a lightning protection conductor unless the equipment is inherently connected to the ground system through direct bond or common bond.

16.2.2 Sanitary vents, roof drains, flashings, gutters, copings etc. Located within 6' (1.8m) of the lightning protection system, shall be bonded via a secondary sized conductor to the system unless the equipment is inherently bonded to the lightning protection system.

17. Level 3 Grounding System Requirements

17.1 A minimum of two (2) down conductors shall be provided for each ESE Lightning Protection System. In cases where multiple ESE Air Terminals are used then additional down conductors shall be provided in accordance with Section 16.1.7.

17.2 A single down conductor shall be permitted to be used where the length of run does not exceed 65ft (19m).

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17.3 If the horizontal length is greater than the vertical length, two down conductors shall be required and separated a minimum of 10' (3m).

17.4 For lengths greater than 65' (19m) two conductors shall be required.

17.5 For masts, a single down conductor only shall be required.

17.6 If electrically conductive, the mast shall be permitted to be used as the down conductor.

17.7 Down Conductors and other conductor where exposed to potential mechanical damage shall be protected against such damage by means of PVC, fiberglass conduit sleeve, or metal conduit. (Metal conduit may be used provided the upper and lower portions are bonded to the down conductor). At ground level the bottom 8' (2.4m) of exposed down conductor shall be protected. See Figure 17.8.1

17.8 Down Conductors may be coursed within the construction of the building provided they are properly protected. See Figure 17.8.3.

Figure 17.8.1

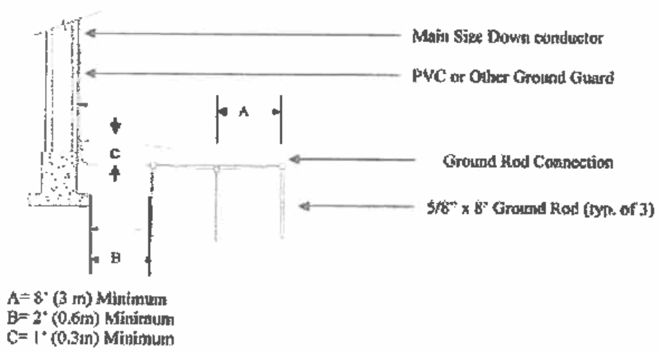
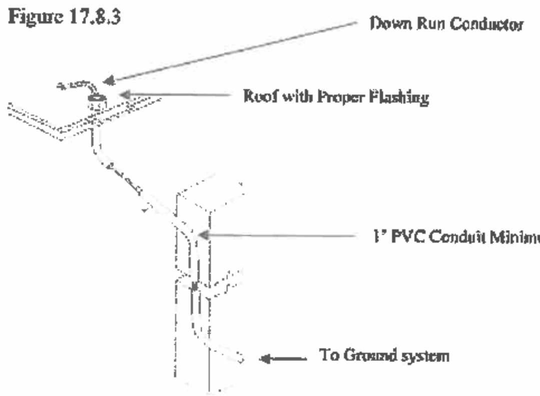


Figure 17.8.3



17.9 For masts that are electrically conductive then the mast shall be permitted to be used as a down conductor.

17.10 If electrically continuous, structural steel shall be permitted to be used as the down conductor.

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17.11 Masonry Anchors used to secure the lightning protection components shall have a minimum outside diameter of ¼ in. (6.4mm) and shall be set with care. Holes made to receive the body of the anchor shall be of correct size, made with the proper tools and made in brick, stone or other masonry unit. Fasteners shall not be installed in mortar joints. When anchors are installed, the fit shall be tight against moisture, thus reducing the possibility of damage due to freezing.

17.12 Connector Fittings shall be used at all "end to end", "tee", or "y" splices of lightning conductors. They shall be attached so as to withstand a pull test of 200 lb. Fittings used for required connections shall be of bolted, welded or high compression type and bear the ARL Listing and UL Listing.

17.13 Conductors shall be fastened securely to the structure upon which they are placed at intervals not exceeding 3 ft (1m). The fasteners, attached by nails, screws, bolts or adhesives as necessary, shall not be subject to breakage and shall be of the same material as the conductor or of a material as resistant to corrosion as that of the conductor. No combination of components shall be used that forms an electrolytic couple of such nature that in the presence of moisture, corrosion is accelerated.

17.14 Ground Terminations: A study shall be conducted to engineer a grounding system to a maximum of 25 ohms resistance in accordance with IEEE fall of potential ANSI/IEEE 141, *Recommended Practice for Electric Power Distribution for Industrial Power Plants,* method. The components for the grounding system shall be selected to be suitable for the soil conditions and the other side factors such as cathodic protection.

17.15 Ground electrodes shall be of copper-bond steel or copper plate in sufficient number as to achieve a 25 ohm maximum resistance to ground. Ground electrodes shall be installed so that the top of the electrode is a minimum 1' (0.3m) below finished grade minimum and 2' (0.6m) away from the foundation wall. See Figure 17.8.1.

17.16 Ground Rod Terminations. The down conductor shall be attached to the ground rod by mechanical clamp, exothermic welding or brazing. Clamps shall be suitable for direct burial.

17.17 Each down conductor shall terminate at a ground terminal system. A minimum of 3 ground terminals shall be provided per down conductor location. Configures in a straight line. Where the ground terminals are spaced a minimum of 8' (3m) apart. See Figure 17.8.1.

17.18 Ground terminals located under slabs or in crawl spaces shall be installed as near as practicable to the outside perimeter of the structure.

17.19 Electrical system grounding electrodes shall not be used in lieu of lightning ground rods. This provision shall not prohibit the required bonding together of grounding electrodes of different systems. *NOTE 1: For further information, see NFPA 70National Electric Code, which contains detailed information on the grounding of electrical systems.*

17.20 Common Grounding. All grounding media in or on a structure shall be interconnected to provide a common ground potential. This shall include lightning protection, electric service, telephone and antenna system grounds as well as underground metallic piping systems. Such piping systems include water service, well casings located within 25 ft (7.6m) of the structure, underground conduits (not already bonded) etc. Main size lightning conductors shall be used for interconnecting these grounding systems to the lightning protection system.

17.21 Common Ground Bonding. If electric, telephone or other systems are bonded to metallic water pipe; only one connection from the lightning protection system to the water pipe system is necessary, provided that the water pipe is electrically continuous between all systems. In situations where there are separate services for domestic and fire water entering the building both systems shall be bonded to the lightning protection grounding system. This may be accomplished via direct connection or through the ground loop system.

18. Level 3 Structural Steel Systems

18.1 General. The steel framework of a structure shall be permitted to be utilized as the main conductor of a lightning protection system if it is electrically continuous or is made electrically continuous.

18.2 Steel Structure Terminals. Ground terminals shall be connected to approximately every other steel column around the perimeter of the structure at intervals averaging not more than 60ft (18m). Connections shall be made near the base of the column, with a surface contact area not less than 8 sq inches (5200mm²) or by exothermic welding. Bonding plates shall have bolt pressure cable connectors and shall be bolted securely to the structural steel framework so as to maintain electrical continuity.

18.3 Connections to Framework. Conductors shall be connected to cleaned areas of the structural steel framework by the bonding of plates having a surface contact area of not less than 8 sq inches (5200mm²). The area of attachment shall be free of paint, grease, oil, and debris.

18.4 Early Streamer Emission Air Terminals shall be permitted to be bonded directly to structural, by means of direct attachment through mast or by use of two interconnection wires routed through roof and bonded at the top of the structural steel in the manner described in Section 18.3.

EXHIBIT B

USI®

April 29th, 2019

Heary Bros Lightning Protection Co Inc
11291 Moore Rd
Springville, NY 14141

To Whom It May Concern:

During the many years we have done business with Heary Brothers Lightning Protection Co. Inc., we have found your commitment to developing quality products for your customers as paramount. Included in that commitment would be the successful line of the Early Streamer Lightning Protection Equipment.

Your dedication has allowed us to establish a comprehensive and cost-effective insurance program for your companies. Because of your dedication, we have been able to secure 11 million dollars of Liability limits. This includes coverage for damage from direct lightning strikes to the structure of any buildings. Please see enclosed America Certificate of Guarantee as additional evidence.

In addition, claims activity has been negligible and we, as your broker, the The Travelers Insurance Company, as your carrier, appreciate your attention to workplace safety and products liability quality control efforts. In today's highly competitive world, this is critical.

Without a doubt, your company was built around a commitment to give customers the products they need and confidence in our ability to meet or exceed expectations. We encourage your efforts and with you continued success.

Sincerely,

Timothy M. Wroblewski

Timothy M. Wroblewski
Vice President

TW/lam

Property & Casualty • Employee Benefits • Personal Risk • Retirement Consulting
The USI ONE Advantage®

FIRST NIAGARA

April 24, 2015

Heary Bros Lightning Protection Co Inc
11291 Moore Rd
Springville, NY 14141

To Whom It May Concern:

During the many years we have done business with Heary Brothers Lightning Protection Co. Inc., we have found your commitment to developing quality products for your customers as paramount. Included in that commitment would be the successful line of the Early Streamer Lightning Protection Equipment.

Your dedication has allowed us to establish a comprehensive and cost-effective insurance program for your companies. Because of your dedication, we have been able to secure 11 million dollars of Liability limits. This includes coverage for damage from direct lightning strikes to the structure of any buildings. Please see enclosed America Certificate of Guarantee as additional evidence.

In addition, claims activity has been negligible and we, as your broker, the The Travelers Insurance Company, as your carrier, appreciate your attention to workplace safety and products liability quality control efforts. In today's highly competitive world, this is critical.

Without a doubt, your company was built around a commitment to give customers the products they need and confidence in our ability to meet or exceed expectations. We encourage your efforts and with you continued success.

Sincerely,

Timothy M. Wroblewski

Timothy M. Wroblewski
Vice President

TW/lam

First Niagara Risk Management, Inc.
726 Exchange Street, Suite 900 • Buffalo, NY 14210
Phone: 716-819-5500 • Toll Free: 800-854-9121 • Fax: 716-819-5140

EXHIBIT C

Preventor System Installations In Florida

ProjectName	Address	City	State
7000 Williams Island Building		Adventura	FL
Florida Hospital Altamonte Office		Altamonte Springs	FL
Turner Agriculture Center and Extension Office		Arcadia	FL
Marriott - Aventura Hotel		Aventura	FL
Alliant Food Service		Boca Raton	FL
Boca Museum		Boca Raton	FL
Boca Raton Condos		Boca Raton	FL
Caterpillar C-2 Expansion		Boca Raton	FL
Sears Store	Glades Road	Boca Raton	FL
TAG (The Answer Group) Main Building		Boca Raton	FL
TAG Main Building East Emissions Building		Boca Raton	FL
The Polo Club of Boca Raton		Boca Raton	FL
Bealls Corp Headquarters		Bradenton	FL
Paul Azinger Residence		Bradenton	FL
St. Stephens School		Bradenton	FL
Tara Preserve Golf Clubhouse		Bradenton	FL

Tuesday, April 08, 2003

ProjectName	Address	City	State
Suntree Elementary and Chiller Building		Brevard Co	FL
Florida Welcome Center		Campbelton	FL
Advanced Elastomers		Cantonement	FL
Cape Canaveral AF Station Patrick AFB Cape Arrays		Cape Canaveral	FL
Cape Canaveral Station	Patrick Air Force Ba	Cape Canaveral	FL
Satellite Assembly Bldg Cape Canaveral		Cape Canaveral	FL
Kreiseder Residence		Casey Key	FL
Silverstein Residence		Casey Key	FL
Florida Hospital		Celebration	FL
Clyde Dyal Water Treatment Plant		Christmas	FL
Citrus Springs Utilities	1360 N. Citrus Spri	Citrus Springs	FL
Baystreet Plaza @ International Mall		Clearwater	FL
Capitol One Phase IV		Clearwater	FL
Catile Tower		Clearwater	FL
Church of Scientology Sandcastle Addition		Clearwater	FL
Crescent Beach Club		Clearwater	FL
Crescent Beach Club		Clearwater	FL
General Services Bldg		Clearwater	FL

ProjectName	Address	City	State
Pinellas County Utilities		Clearwater	FL
Ruth Eckerd Hall		Clearwater	FL
Ruth Eckerd Hall - CEP Addition		Clearwater	FL
St. Cecelia Intraparochial School		Clearwater	FL
The Sirata Beach Resort		Clearwater	FL
The Tides@ Feather Sound		Clearwater	FL
Worthington Square Apartments		Clearwater	FL
City of Coconut Creek - Council Building		Coconut Creek	FL
City of Coconut Creek - Motor Pool Building		Coconut Creek	FL
Coconut Creek Public Safety		Coconut Creek	FL
Sabal Pines - Ball Field #2		Coconut Creek	FL
Sabal Pines - Elementary School		Coconut Creek	FL
Sabal Pines - Hockey Rink		Coconut Creek	FL
Sabal Pines - Maintenance Facility		Coconut Creek	FL
Sabal Pines - Pines Pavilion		Coconut Creek	FL
Sabal Pines - Soccer Field #1		Coconut Creek	FL
Body of Christ Family Life Center		College	FL
Stone/Bag Paper Container Facility	Hwy 29 & Becks La	Contonement	FL

ProjectName	Address	City	State
Alahamra Tower		Coral Gables	FL
The Alhambra Hotel/Office	50 Alhambra Circle	Coral Gables	FL
University of Miami Intra Mural Fields		Coral Gables	FL
Sheik Island Horse Farm		Dade City	FL
BCC Building 27/ New Child Develop. CTR		Davie	FL
BCC Student Services Building		Davie	FL
Nova Southeastern College Parking Garage		Davie	FL
Phil Smith Toyota		Davie	FL
Rolling Hills Golf and Country Club		Davie	FL
Daytona Auto Dealers Exchange		Daytona Beach	FL
Daytona Marriott Hotel	100 N Atlantic Ave	Daytona Beach	FL
Deerfield Beach Grand Hilton	100 Fairway Drive	Deerfield Beach	FL
Granada Royale Hotel	902 S. E. 20th Ave.	Deerfield Beach	FL
Deltona Lake Track "A"	Diamond Street	Deltona	FL
Deltona WWTP	Saxton & Agatha	Deltona	FL
Deltona WWTP	Lombardy Ctr	Deltona	FL
Deltona WWTP	Cortland Blvd	Deltona	FL
Deltona WWTP	Fisher Drive	Deltona	FL

ProjectName	Address	City	State
Well # 2 & High Service Pump	Unit 21 Sagmore Dr	Deltona	FL
Silver Beach Condominium		Destin Beach	FL
Guardian Angel School		Dunedin	FL
Our Lady of Lourdes		Dunedin	FL
Burdines Dept. Store		Fort Lauderdale	FL
Marriott - Ft Pierce Travel Plaza	Florida Turnpike Mi	Ft Pierce	FL
Granada Royale Hotel	1101 S.E. 17th Stree	Ft. Lauderdale	FL
Riverside Hotel		Ft. Lauderdale	FL
McGregor Point Hotel		Ft. Myers	FL
Raymond Building Products		Ft. Myers	FL
Raymond Building Supply Rack Storage		FT. Myers	FL
Raymond Building Supply Warehouse Building		FT. Myers	FL
Palm Court Yacht Club		Ft. Walton Beach	FL
Holy Faith Church	700 N.W. 39th Roa	Gainesville	FL
Main Library	on SR-26 Across fro	Gainesville	FL
Nordstrom Distribution Center		Gainesville	FL
UF Hotel and Conference Center		Gainesville	FL
Union Street Station		Gainesville	FL

ProjectName	Address	City	State
Jack Sawyer	608 Fairpoint Drive	Gulf Breeze	FL
Palmento General Hospital	W. 20th & W. 68th	Hialeah	FL
Aqua Penn Water Co.		High Springs	FL
City of Holmes Beach Baseball Field	5901 Marina Drive	Holmes Beach	FL
North Lake Elementary		Indian River	FL
Sebastian Highlands WTP	1001 Prineville Roa	Indian River City	FL
Richard Herrmann II Residence	405 15th Ave	Indian Rocks Beach	FL
Florida Power/Light Co Martin Combined Cycle # 3,4	State Road 710	Indiantown	FL
Martin Plant Combined Cycle 3 & 4		Indiantown	FL
Allbritton Communications	7025 AC Skinner Pk	Jacksonville	FL
Berkman Plaza		Jacksonville	FL
Cathedral Terrace		Jacksonville	FL
Cathedral Towers		Jacksonville	FL
Cathedral Townhouses		Jacksonville	FL
Cypress Village Apartments	4600 Middleton Par	Jacksonville	FL
Sears Logistics Center		Jacksonville	FL
The Pointe		Jupiter	FL
The Phoenix @ Peachtree		Kennesaw	FL

ProjectName	Address	City	State
Dolphin Hotel - Epcot Center	1500 Epcot Resort	Lake Buena Vista	FL
Dolphin/Swan Hotel Causeway & Grotto	1500 Epcot Resort	Lake Buena Vista	FL
Royal Plaza Hotel	1905 Preview Blvd	Lake Buena Vista	FL
Swan Hotel - Epcot Center	1500 Epcot Resort	Lake Buena Vista	FL
Westgate Lakes Sales Center		Lake Buena Vista	FL
Columbia Correctional Institution		Lake City	FL
Marriott - Lake Worth Travel Plaza	Florida Turnpike Mi	Lake Worth	FL
Publix Deli Plant	PO Box 407	Lakeland	FL
RMC Ewell Corp		Lakeland	FL
FCCI Insurance Group		Lakewood Ranch	FL
US Post Office - Land O Lakes		Land O Lakes	FL
Central Catholic High School		Lecanto	FL
Citrus Co. Landfill		Lecanto	FL
St. Stalastic Church		Lecanto	FL
FDOT District 5		Leesburg	FL
Lehigh Post Office		Lehigh	FL
Ben Price Residence	Gulf of Mexico Driv	Longboat Key	FL
James Gradner Residence		Longboat Key	FL

ProjectName	Address	City	State
Sea Place Condominium Complex M1 & M2	1945 Gulf of Mexic	Longboat Key	FL
Wagner Residence	5940 Gulf of Mexic	Longboat Key	FL
Albert Whitted Expansion		Longwood	FL
Lowell Correctional Institution		Lowells	FL
St. Timothy's Catholic Church		Lutz	FL
Marco Island Pump Station	RTE 951	Marco Island	FL
South Fork High School		Martin Co.,	FL
Brevard Educational Facility		Melborne	FL
Eau Gallie High School Gymnasium & Auditorium		Melborne	FL
Brickell Station Towers	30 S.W. 8th Street	Miami	FL
Doral Concourse		Miami	FL
La Tour Condo		Miami	FL
Lincoln Financial Center	701 Brickell Ave.	Miami	FL
Marriott - Snapper Creek Travel Plaza	Florida Turnpike Mi	Miami	FL
Metropolitan Sun Bank	777 Brickell Ave	Miami	FL
Porta Vita		Miami	FL
Pro-Player Stadium		Miami	FL
Sienna		Miami	FL

ProjectName	Address	City	State
Softel Hotel	5800 Blue Lagoon	Miami	Fl
Telemundo Networf		Miami	FL
Tequesta Condominium	808 Bricknell Key D	Miami	FL
Three Tequesta Point		Miami	FL
University of Miami Hecht Athletic Center		Miami	FL
University of Miami Knight Baseball Stadium & Foot		Miami	FL
University of Miami Schiff Tennis Ctr & Hecht Ath		Miami	FL
Loews Hotel & Convention Center		Miami Beach	FL
Portofino Tower		Miami Beach	FL
Sandy Park Health Care Center		Miami Beach	FL
US Naval Air Station Bldg 1406 & 1424	Whiting Field South	Milton	FL
Mulberry Post Office		Mulberry	FL
North Port St. Lucie WTP	Gulf Port Terrace	N. Port St. Lucie	FL
Collier Residence		Naples	FL
Gerry Residence	3400 Gordon Drive	Naples	FL
HorseCreek Properties Collier Equestrian Facility		Naples	FL
Horsecreek Properties Collier Equestrian Facility	Daniels Road	Naples	FL
Naples Cay Seapointe Condo	10 Seagate Drive	Naples	FL

ProjectName	Address	City	State
Royal Poinciana Country Club	Goodlette Rd	Naples	FL
The Savoy Condo	4041 Gulf Shore Blv	Naples	FL
Blazer Residence		Navarre	FL
Caribbean Resort Condo		Navarre Beach	FL
The Fountaians Condominium		New Smyrna Beach	FL
Implant Innovations Inc.		North Palm Beach	FL
King Plastics Inc.		North Port	FL
Bishop Larkin Pastoral Center	9th Avenue	North St. Petersburg	FL
Lowell Correctional Facility Water Tower		Ocala	FL
Marion Oaks Water TRT Plant	14170 S.W. 39th Av	Ocala	FL
Marriott - Turkey Travel Plaza	Florida Turnpike Mi	Ocee	FL
Marriott - Ft Drum Travel Plaza	Florida Turnpike Mi	Okeechobee	FL
BIC Manufacturing Plant(III) Myerlake		Oldsmar	FL
Florida Hospital East Orlando		Orlando	FL
Florida Hospital Orlando		Orlando	FL
Martin Marietta Conflow Area Site	Kirtland Road	Orlando	FL
Orlando Utilities Commission Power Plant		Orlando	FL
St. Johns Rive Water Management		Palatka	FL

ProjectName	Address	City	State
St. Johns River Waste Management District Office		Palatka	FL
SWA Tipping Floor Building		Palm Beach	FL
The Diplomat Hotel - Main Building		Palm Beach	FL
SWA West Central Tipping Floor		Palm Beach Co	FL
George Young United Methodist Church		Palm Harbor	FL
St. Mark Village	Rte 19	Palm Harbor	FL
William E. Dunn Water Reclamation Facility		Palm Harbor	FL
Riviera Dunes Marina		Palmetto	FL
St. Andrews Condo		Panama City	FL
Hidden Dunes Condominium		Panama City Beach	FL
Landmark Holiday Beach Resort		Panama City Beach	FL
The Summit Resort	Thomas Drive	Panama City Beach	FL
Camp-O-Pines Pensacola Christian College		Pensacola	FL
Ellyson Industrial Park	Ellyson Field Proj	Pensacola	FL
Gelman Sciences	8730 Fly Road	Pensacola	FL
George Estes Residence		Pensacola	FL
Girls Parking Garage -Pensacola Christian College		Pensacola	FL
H-6 Academic Building		Pensacola	FL

ProjectName	Address	City	State
McKenzie Building- Pensacola Christian College		Pensacola	FL
Phoenix 10 Condominium		Pensacola	FL
University of West FL Admin. Building		Pensacola	FL
University of West FL Classroom Building		Pensacola	FL
Sabine Yacht & Racquet Club	330 Fort Pickens Rd	Pensacola Beach	FL
Eden Condominium		Peridido Key	FL
St. Clements Catholic Church		Plant City	FL
American Heritage Fine Arts Building		Plantation	FL
Crossroads 4		Plantation	FL
Motorola		Plantation	FL
Motorola Inc.		Plantation	FL
Spa Atlantis		Pompano	FL
Ligi Tool		Pompano Beach	FL
Marriott - Pompano Travel Plaza	Florida Turnpike Mi	Pompano Beach	FL
Charlotte County Public Works		Port Charlotte	FL
Dr. Eugene Gregosh Residence		Port Charlotte	FL
East Port Environmental Services		Port Charlotte	FL
Peace River WTP	Kings Hwy	Port Charlotte	FL

ProjectName	Address	City	State
Peace River WTP	Intake Structure	Port Charlotte	FL
Port Malabar WTP		Port Malbar	FL
Bishop Larkin School		Port Richey	FL
Charlotte County Sheriff's Administration	Metro Pkwy	Punta Gorda	FL
Chateau Towers	Gulfport Blvd	S. Pasadena	FL
Espirtu Santo Catholic School		Safety Harbor	FL
The Shipley Residence		Sannibel Island	FL
Baker Electronics		Sarasota	FL
C'A' D' Zan John't Mable Rigling Home		Sarasota	FL
Davis Residence		Sarasota	FL
Ed Windemuller Residence	Saddle Oaks Estates	Sarasota	FL
Ken Miller Barn		Sarasota	FL
Lincoln Properties/ NBD Bank Building	240 N Washington	Sarasota	FL
Marina Towers Condominium		Sarasota	FL
Meridian @ The Oaks Building III		Sarasota	FL
Sarasota Herald Tribune		Sarasota	FL
Scott Sign Systems		Sarasota	FL
Scott Signs Phase II		Sarasota	FL

ProjectName	Address	City	State
Sun Hydraulics Inc.		Sarasota	FL
The Phoenix Condo	Golden Gate Point	Sarasota	FL
The Radisson Hotel Lido Beach	Ben Franklin Drive	Sarasota	FL
The Renaissance		Sarasota	FL
Sebastian WTP	Filbert Street	Sebastian	FL
Lake Jackson Post Office		Sebring	FL
St. Cloud High School		St Cloud	FL
Casa Monica Hotel		St. Augustine	FL
St. Augustine Shores	771 Alahambra	St. Augustine	FL
Marriott - Canoe Creek Travel Plaza	Florida Turnpike Mi	St. Cloud	FL
School "C" Osceola Co. School District		St. Cloud	FL
Incarnation Church		St. Petersburg	FL
Jabil Circuit Inc.	10800 Roosevelt Blv	St. Petersburg	FL
Midcore Parking Garage		St. Petersburg	FL
San Seair Condominiums		St. Petersburg	FL
St. Marks Family Life Center	PO Box 43022	St. Petersburg	FL
Wheelbrator Corp		St. Petersburg	FL
SECO Office Building		Sumterville	FL

ProjectName	Address	City	State
Capital One Building One	8745 Henderson Ro	Tampa	FL
Capital One Phase II Building 2 Renaissance	8745 Henderson Ro	Tampa	FL
Capital One Phase II Parking Garage	8745 Henderson Ro	Tampa	FL
Capital One Phase III Parking Garage	8745 Henderson Ro	Tampa	FL
Capital One Phase IV Flagpole	8745 Henderson Ro	Tampa	FL
Capital One Softball Field	8745 Henderson Ro	Tampa	FL
Capital One Tai Chi Building	8745 Henderson Ro	Tampa	FL
Florida Aquarium		Tampa	FL
Gateway Post Office		Tampa	FL
Group Tech		Tampa	FL
Lee Moffit Cancer Center Parking Garage		Tampa	FL
Marriott -Tampa		Tampa	FL
Muvico	18002 Richmond Pa	Tampa	FL
Myrtle Oaks		Tampa	FL
Notre Dame High School		Tampa	FL
Seaboard Waste Water TRT Plant	8234 Causeway Blv	Tampa	FL
St. Mary's Episcopal Day School		Tampa	FL
St. Pete Catholic High School		Tampa	FL

ProjectName	Address	City	State
Tampa Bay Water Groundwater Clear Well Tank		Tampa	FL
Tampa Bay Water Surface		Tampa	FL
Tampa Juvenile Detention Center		Tampa	FL
The Garrison Condo		Tampa	FL
The Sorelle Residence		Tampa	FL
Westshore Plaza Phase III Expansion		Tampa	FL
City of Titusville Blue Heron WRF		Titusville	FL
City of Titusville Blue Heron WRF		Titusville	FL
Reliant Energy Corp. Maintenance Instrumentation B		Titusville	FL
Reliant Energy Corporation Intake Structure	Highway US 1	Titusville	FL
Sipprelle Residence		Ussepa Island	FL
Meridian @ The Oaks		Venice	FL
Woodmere Clubhouse		Venice	FL
Our Lady of the Rosary-Ballfield	21010 S.R. 54	West Land O'Lakes	FL
Our Lady of the Rosary-Flagpole	21010 S.R. 54	West Land O'Lakes	FL
SWA (CMRF)		West Palm Beach	FL
Marriott - Okahumpka Travel Plaza	Florida Turnpike Mi	Wildwood	FL
Florida Hospital		Winter Park	FL

ProjectName	Address	City	State
Florida Brewing Company		Ybor City	FL

EXHIBIT D

Preventor 2005 Installations (Government)

Project Name	Address	City	State
Kodiak Building (SCAT) Mobile Structure on Rails		Kodiak	AK
Huntsville Public Safety Complex		Huntsville	AL
New Phoenix City Hall	Package Street	Phoenix	AZ
Phoenix Central Library		Phoenix	AZ
Los Angeles Federal Bldg. GSA	255 E. Temple Street	Los Angeles	CA
GSA Oakland Federal Building		Oakland	CA
California Federal Service Center	1515 Walnut Grove Avenue	Rosemead	CA
V.A. Medical Center		San Diego	CA
FBI Center New 9 Story Office Bldg		Washington	DC
Florida Welcome Center		Campbelton	FL
Cape Canaveral AF Station Patrick AFB Cape Arrays		Cape Canaveral	FL
Cape Canaveral Station	Patrick Air Force Base	Cape Canaveral	FL
Satellite Assembly Bldg Cape Canaveral		Cape Canaveral	FL
General Services Bldg		Clearwater	FL
City of Coconut Creek - Council Building		Coconut Creek	FL
City of Coconut Creek - Motor Pool Building		Coconut Creek	FL

Project Name	Address	City	State
Coconut Creek Public Safety		Coconut Creek	FL
Marriott - Ft Pierce Travel Plaza	Florida Turnpike Mile Mkr 144	Ft Pierce	FL
City of Holmes Beach Baseball Field	5901 Marina Drive	Holmes Beach	FL
Marriott - Lake Worth Travel Plaza	Florida Turnpike Mile Mrk. 94	Lake Worth	FL
US Post Office - Land O Lakes		Land O Lakes	FL
FDOT District 5		Leesburg	FL
Marriott - Snapper Creek Travel Plaza	Florida Turnpike Mile Mkr 19	Miami	FL
US Naval Air Station Bldg 1406 & 1424	Whiting Field South & North Tower	Milton	FL
Mulberry Post Office		Mulberry	FL
Marriott - Turkey Travel Plaza	Florida Turnpike Mile Mkr 263	Ocee	FL
Marriott - Ft Drum Travel Plaza	Florida Turnpike Mile Mkr 184	Okeechobee	FL
St. Johns Rive Water Management		Palatka	FL
Marriott - Pompano Travel Plaza	Florida Turnpike Mile Mrk 65	Pompano Beach	FL
East Port Environmental Services		Port Charlotte	FL
Charlotte County Sheriff's Administration	Metro Pkwy	Punta Gorda	FL
Marriott - Canoe Creek Travel Plaza	Florida Turnpike Mile Mrk 229	St. Cloud	FL
Gateway Post Office		Tampa	FL
Marriott - Okahumpka Travel Plaza	Florida Turnpike Mile Mrk 299	Wildwood	FL

Project Name	Address	City	State
Cherokee County Public Safety Complex		Canton	GA
Montgomery County Courthouse		Chula	GA
Paulding County Courthouse	Courthouse Square	Dallas	GA
Handcock Co. Courthouse		Greenfield	IN
Courthouse		Tipton	IN
Campbell County Courthouse	4th Street	Newport	KY
Westover AFB Hangar		Chicopee	MA
Westover AFB Upgrade Hangar B-700		Chicopee Falls	MA
Melrose City Hall	Essex& Main St	Melrose	MA
Natick Municipal Complex		Natick	MA
Mt. Holyoke Summit Lodge	Holyoke State Park	S. Hadley	MA
Wellesley Town Hall	525 Washington St	Wellesley	MA
Bethesda Metro Center	7450 Wisconsin Ave	Bethesda	MD
National Park		Landover	MD
Van Buren County Courthouse		Paw Paw	MI
Public Service of New Hampshire Corporate Hdqrts.		Mancester	NH
Veterans Memorial Home	132 Evergreen Rd	Edison	NJ
Oyster Creek Emergency Bldg	Route 9	Forked River	NJ

Project Name	Address	City	State
Municipal Complex		Hanover Twp.	NJ
Manchester Town Hall	1 Colonial Drive @ Rte 37	Lakehurst	NJ
Morris County Hall of Records	Ann Street	Morristown	NJ
NJIT Library Bldg	Central Ave	Newark	NJ
South Brunswick Maintenance. Storage Complex		S. Brunswick	NJ
City Hall and Police Dept	Morris & Springfield Aves	Summit	NJ
GTE Government Systems White Sands Missile Range		WSMR	NM
State Legislature Building			NV
Yuca Mountain Test Site			NV
Regional Justice Center		Las Vegas	NV
New Reno Federal Building		Reno	NV
Galena Maintenance Station		Washoe	NV
Broadway Office Complex	625 Broadway	Albany	NY
Transitional Housing	Jackson & Cypress	Bronx	NY
Transitional Housing	141st	Bronx	NY
Transitional Housing for the Homeless	50 W. Mt Eden & Inwood	Bronx	NY
Transitional Housing	Linden Blvd	Brooklyn	NY
Transitional Housing for the Homeless	St. Johns Place & E. NY Ave.	Brooklyn	NY

Project Name	Address	City	State
Family Court Building		Buffalo	NY
The Rath County Office Building		Buffalo	NY
Tompkins County DOT Admin Facility. Bus Garage	Willow Ave	Ithaca	NY
Police & Hwy Dept Bldg	525 Pavement Road	Lancaster	NY
Niagara Falls Housing Authority-Wrobel Towers	Main Street	Niagara Falls	NY
Orchard Park Municipal Center	S-4295 South Buffalo Street	Orchard Park	NY
Criminal Courts Building		Riverhead	NY
Roosevelt Island Phase II	Building I	Roosevelt	NY
Manhasset Fire House	Prospect Rd	Thomaston	NY
West Valley Nuclear Services		West Valley	NY
Logan County Court House		Bellefontaine	OH
Wood County Court House		Bowling Green	OH
Gurnet County Courthouse		Cambridge	OH
Pickway County Courthouse		Circleville	OH
Fayette County Courthouse		Fayette	OH
Trumbull County Courthouse		Trumbull	OH
Owasso City Hall		Owasso	OK
Coudersport Court House		Coudersport	PA

Project Name	Address	City	State
Potter County Courthouse	1 East Second Street	Coudersport	PA
Cameron County Courthouse	20 East Fifth St	Emporium	PA
Emporium Court House		Emporium	PA
Valley Forge Plaza	First & Moore rd	King of Prussia	PA
Berks County Courthouse	6th & Court St,	Reading	PA
Berks County Services Center	Reed & Court Sts	Reading	PA
Elk County Court House		Ridgeway	PA
Warren County Courthouse		Warren	PA
City Hall Ave Parking Facility		Norfolk	VA
FBI Firearms Range Renov. [26m Range & Stress Obst		Quantico	VA
National Parks Service bldg	North Cascades Visitor Ctr	New Halem	WA

EXHIBIT E

Preface from NFPA 780

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See inside back cover for additional important notices and information.

3/02

EXHIBIT F

REPORT OF THE THIRD-PARTY INDEPENDENT EVALUATION PANEL ON THE EARLY STREAMER EMISSION LIGHTNING PROTECTION TECHNOLOGY

BY

John L. Bryan

Richard G. Biermann

Glenn A. Erickson

Submitted to the National Fire Protection Association Standards Council on September 1, 1999

Rison (336) reported in 1991 on studies conducted at the Langmuir Laboratory from July 15 to August 23, 1991 to evaluate whether a radioactive ESE air terminal provided protection within a 100 meter radius as reported by the Manufacturer. The ESE device was installed on a twenty foot mast 4 meters below South Baldy Peak. Video cameras were used to record the occurrence of lightning strikes. There were two recorded lightning strikes within the 100 meter radius area during the approximate five week study, one 85 meters from the ESE device and one approximately 78 meters from the device. However, the following statement should be noted from the report:

> Near the end of the test period, it was noticed that the radioactive Preventor had been damaged --the weld had broken between the spherical ball on the Preventor and the nut to which it attached. It is not certain when or how this happened. There was no evidence of tampering or vandalism. Examination of the tip of the Preventor under a microscope showed evidence of melting, such as would occur if lightning were to have struck it. Most likely, the Preventor was struck by lightning at a time when the camcorders were not turned on (when the peak was in a cloud, or a storm occurred in the early morning hours), and the lightning broke the weld.[13]

Thus, it might appear that the ESE device was active in a lightning strike not recorded by the video cameras utilized during the study, since there were periods during the study when the cameras were inactive.

---

[13]Rison, William, A Study of Lightning Strikes in The Vicinity of a Radioactive Preventor, Langmuir Laboratory, New Mexico Tech., Socorro, NM, 11-8-91, p. 4.

Moore *et al.* (248) reported in 1998 a summary of all the field tests of the radioactive "Preventor" ESE device during the summers of 1990, 1991, 1993, 1994, 1995, 1996, and 1997. Moore's analysis is as follows:

> In the six summers during which the "preventor" was exposed to thunderstorms overhead, lightning struck six different sites within 100 meters of the device yet the "preventor" itself was never struck.
>
> Digitized measurements with quarter-microsecond time resolution, of the currents that flowed from the "Preventor" during two nearby lightning strikes in September 1997 showed no indication that the "Preventor" emitted any effective "early streamers". In fact, during one of these discharges, lightning struck a blunt rod located 20 meters distant yet no streamers were emitted from the "Preventor" to connect with this close strike.[14]

It should be noted these seven-year tests involved a single ESE device of a radioactive type. It should also be noted that Moore's (243) field studies under natural lightning conditions have questioned the validity of the effectiveness of the sharp-pointed Franklin air terminal as follows:

> The failure of radioactive-ionizing and of sharply pointed air terminals to participate in lightning discharges by being pre-eminent connectors of lightning to earth is no surprise to scientists studying thunderstorms and lightning. For the past 40 years, I have been measuring the electric currents flowing into the air from both radioactive electrodes and from sharply pointed ones under the influence of the strong electric fields beneath thunderstorms but not one of my well-exposed electrodes has ever been struck by lightning.[15]

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[14] Moore, C. B., William Rison, and G. D. Aulich, An Assessment of The Radioactive "Preventor" as an Early Streamer Emitting Lightning Protector, New Mexico Tech,, Langmuir Laboratory for Atmospheric Research, Socorro,NM, 12-29-98, pp. 24-25.

[15] 243. Moore, Charles B., New Mexico Tech., "Personal Communication to Subcommittee of NFPA Board of Directors", 9-4-95, p. 1.

2. Consideration of System Performance

It would appear the ultimate evaluation of any complete lightning protection system would be the performance of the systems as installed on buildings. The submitted materials included one reference to the failure of a conventional system with Franklin rods (328) and there was one newspaper account of a Franklin rod system failure resulting in personnel injuries. (252) There were several studies of failures of ESE lightning protection systems. (146) (220).

The failure of the Franklin rod system resulting in the eleven personnel injuries occurred at the Robert F. Kennedy stadium in Washington, D.C. on June 13, 1998. (252) Richardson reported on the failure of a Franklin rod air terminal located approximately four feet from an externally mounted camera on the building which was damaged by a lightning strike. (328)

Makerras *et al.*, (220) have reported on four cases of lightning striking buildings in Singapore from the late 1960's until the 1980's. Hartono and Robiah (146) have reported on ten cases of failures on buildings protected with ESE lightning protection systems. This study utilized photographs of the building conditions both before and after the reported lightning strikes on the damaged areas of the buildings. It was found from this photographic study the damage appeared to be dependent on the number of strokes received, the strength of the lightning stroke and

the shape of the structure at the point of the stroke. Although not specified in the study Hartono and Robiah have indicated lightning strike damage was found on buildings protected with Franklin air terminals as indicated in the following statement:

> Studies conducted on the buildings equipped with the standard lightning air terminals (Franklin rod type) also exhibited similar lightning damage locations on or near the rooftop. Based on this comparison, we conclude that no advantage can be obtained by using the ESE device in protecting the building against direct lightning strikes.[21]

It should be noted that all of the incidents of system failure submitted to the panel lacked the necessary detailed documentation to enable a valid analysis as to the effectiveness of the system. Even the most detailed photo study lacked the necessary documentation consisting of the following: The manufacture and model of the air terminal. The date the installation was completed, thus establishing the age of the system when the lightning strike occurred. The maintenance and condition of the system when the strike occurred, including the condition of the down conductors and the grounding system. It would appear that detailed documentation of lightning protection system operations or failures is a needed component for the evaluation of the effectiveness of lightning protection systems of all types on various buildings of differing heights and configurations.

[21]Hartono, Zainal Abidin and Ibrahim Robiah, A Long Term Study on The Performance of Early Streamer Emission Air Terminals in a highly Isokeraunic Region. 2-19-99, p. 2.

Van Brunt *et al.*; (369) has referenced this problem of adequate data on lightning protection system performance in the following manner:

> There are reports of incidents where ESE devices failed to provide the protection specified by the manufacturer [156,158,165,215]. Statistics on the failure of conventional systems have also been documented [109]. When examining reports of "failures", one can always raise questions about their cause, e.g., whether they are primarily a consequence of exaggerated claims made by the manufacturer or a consequence of misuse (faulty installation) of the device. Reports of isolated failures raise legitimate concerns, but are seldom accompanied by enough supporting data about the event to enable a determination of why the failure occurred. Generally it is difficult to draw significant conclusions from single events that can be used to improve system design or evaluate system performance.[22]

Thus, given the present situation of lightning protection system performance not being a priority of the proponents of the systems, the manufacturers, the insurance companies or public officials it would appear little valid information or data relative to a validation of the theoretical basis of the systems will be obtained.

III. RECOMMENDATIONS TO STANDARDS COUNCIL

Based on a thorough and complete evaluation of the 377 items submitted to the third-party independent panel the members of the panel have agreed in a complete consensus on the following recommendations to the National Fire Protection Association Standards Council. It should be

[22] Van Brunt, Richard J., Thomas L. Nelson, Samar L. Firebaugh, Early Streamer Emission Air Terminals Lightning Protection Systems: Literature Review and Technical Analysis. Quincy, MA. National Fire protection Research Foundation, 1-31-95, p. 25.

recognized the Standards Council is the official designated authority on any action to be taken relative to the NFPA lightning protection documents.

A. Scientific and Technical Basis of ESE

The initial question posed to the third-party independent evaluation panel was stated as: "whether the ESE lightning protection technology is scientifically and technically sound." The panel's review of the submitted materials resulted in the following determinations:

1. The ESE air terminals appear to be technically sound since they are generally equivalent to the conventional Franklin air terminal in laboratory experiments.

2. However, neither the ESE air terminals nor the conventional Franklin rod appear to be scientifically or technically sound when evaluated in field tests under natural lightning conditions.

3. The ESE lightning protection technology as currently developed in the installation of complete systems does not appear to be scientifically and technically sound in relation to the claimed areas of protection or the essentials of the grounding system.

B. Adequacy of Theoretical Basis and Lab Tests

The second specific question posed to the third-party independent review panel was stated as: "whether the ESE lightning protection technology is supported by adequate scientific theoretical basis and

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laboratory testing." The panel's review of the submitted materials resulted in the following determinations:

1. There does appear to be an adequate theoretical basis for the early streamer emission lightning protection air terminal concept and design from a physical viewpoint.

2. There does not appear to be an adequate theoretical basis for the claimed enhanced areas of protection with limited down conductors and grounding system.

3. The high voltage laboratory tests of the ESE air terminals appear to be adequate in scope and quantity, but they are limited in that they are not equivalent to an evaluation of the complete ESE lightning protection system under natural thunderstorm conditions.

C. NFPA Lightning Protection Documents

The third-party independent evaluation panel was also directed in the Settlement Agreement as follows: "This panel, in issuing its report, shall address the following issues, and any other issues it deems relevant." The panel considered the issues of the existing NFPA 780 document titled: Standard for The Installation of Lightning Protection Systems 1997 edition. (294) and the proposed NFPA 781 document titled: Standard for Lightning Protection Systems Using Early Streamer Emission Air Terminals. (277) The panel considered the need for each document and each committee's membership and balance in accordance with NFPA

procedures. The panel's review of the submitted materials resulted in the following determinations:

1. The current NFPA 780 Committee should be discharged and the Committee should be completely restructured. The committee needs new and additional memberships in the membership categories of enforcer, consumer, user, insurance, labor, special expert and research/testing..

2. The Council should solicit memberships from prominent users such as: FAA, DOE, DOD, NASA, IBM, Reedy Creek Improvement District, phone, radio, television organizations and electric power utilities.

3. The NFPA 780 document should be reformulated as a Guide or Recommended Practice. It appears to the panel the NFPA 780 document does not meet the NFPA criteria for a standard since the recommended lightning protection system has never been scientifically or technically validated and the Franklin rod air terminals have not been validated in field tests under thunderstorm conditions. The NFPA criteria for a standard as stated in the NFPA 99 Directory (298) is as follows:

> Standard --A document, the main text of which contains only mandatory provisions using the word "shall" to indicate requirements and which is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions shall be located in an appendix, footnote, or fineprintnote and are not to be consider as part of the requirements of a standard.[23]

[23]NFPA, National Fire Protection Association 1999 Directory, Quincy, MA, 11-98, p. 52.

EXHIBIT G

EARLY STREAMER EMISSION AIR TERMINALS LIGHTNING PROTECTION SYSTEMS

LITERATURE REVIEW AND TECHNICAL ANALYSIS

Prepared by

Dr. Richard J. Van Brunt
Thomas L. Nelson
Samara L. Firebaugh

NATIONAL FIRE PROTECTION RESEARCH FOUNDATION

FIRE RESEARCH

NATIONAL FIRE PROTECTION RESEARCH FOUNDATION
BATTERYMARCH PARK
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development has been established from laboratory investigations [113], considerably less is known about the dynamics and interactions of these species in a discharge compared to what is known about ions. In particular, very little is known about how they contribute to lightning discharge initiation or propagation under relevant atmospheric conditions. As with negative ions, the metastable content of the air around a lightning terminal will be affected by relative humidity and general air contamination. The influence of metastable species should not extend significantly beyond the end of a lightning rod. Their role, if anything, will be to enhance initial development of a streamer at the rod tip.

In summary, it would appear that enhancement of upward streamer initiation from an ESE terminal (compared to a conventional terminal) has a plausible physical basis. However, it would also appear that a complete and universally accepted understanding of how all ESE devices work has not yet been achieved, and it can be argued that a better understanding is needed to make meaningful quantitative comparisons between the performances of ESE and conventional devices. To reach such an understanding it will undoubtedly be necessary to address numerous basic questions such as:

1. What are the predominant streamer initiation mechanisms under different conditions of polarity, atmospheric humidity, air contamination, and terminal geometry?

2. What are the relative roles of ions, electrons, and metastable species on the development and propagation of a streamer discharge from a terminal for different conditions?

3. What is the likelihood of corona formation around a terminal and how will the presence of corona affect the ability of the terminal to launch a streamer upon approach of a lightning stroke?

4. In the case of radioactive terminals, what is the dependence of the streamer initiation probability on the intensity and type of radiation source?

5. In the case of electrically triggered devices, how does the streamer initiation probability depend on the timing and magnitude of the electrically triggered spark?

6. Also for electrically triggered devices, how reliable is the field sensor that controls the triggering, and can its performance be affected by local space charge?

Attempts to find answers to questions like these are the focus of much ongoing experimental and theoretical research, not only on lightning, but on electrical discharge phenomena in general.

D. Validation of ESE System Performance

Three general methods have been used to evaluate and test the performance of lightning protection systems, namely: 1) small-scale laboratory or outdoor tests in which lightning, or the effects of lightning are simulated by applying high-voltage impulses

lightning seldom hits a terminal regardless of whether or not it is equipped with an ESE device [182,183,215]. Although a few isolated strikes to the mountain were reported to have occurred within the supposed zones of protection of ESE terminals [183,215], it would appear that the overwelming majority of strikes to the mountain were at considerable distance from any terminal. In any case, the failure of air terminals to attract lightning on mountain tops at elevations of 3000 m (9843 feet) or more is obviously disturbing and raises questions about the interpretation of such observations. Before any serious conclusions are drawn about the performance of lightning attractors from tests performed on mountain tops, it may be necessary to consider the perturbing effect of the mountain itself on such parameters as the surface charge distribution and electric-field profile under a thundercloud, as well as the extent that lightning strokes at such high elevations differ from those that normally occur in lower, flatter locations. It would appear that the answers to some of these questions might already be found in the literature.

It is noted in some papers that lightning that occurs at high elevations generally differs on average from that which occurs at sea level, if in no other respect than that it has less distance to cover in going from the cloud to ground [36]. At an elevation of 3000 m, the ground can be quite close to or even engulfed by the base of a storm cloud. Certainly the results from high mountain tests cannot be dismissed, and such tests should continue, as should similar tests underway at other locations [107]. The problem is how to interpret the results of these tests and infer what they might imply about air terminal performance at lower elevations, and what they indicate about the influence of mountainous or rocky terrain on the effective zone of protection of an air terminal.

The unfavorable statistical odds associated with natural lightning can be partially overcome by using artificially triggered lightning. Tests have shown that lightning can be triggered with reasonably high probability by a rocket launched into a thundercloud [124,160,190,193]. A long trailing wire is usually attached to the rocket which provides a low resistance path to guide the initial discharge and define its direction of propagation [45,120,193]. Transportable facilities have been developed for rocket triggering of lightning that can be used for testing at nearly any location [231]. Although tests of air terminals are being made using triggered lightning, there are questions that can be raised about the meaning of such tests. There is evidence that triggered lightning is unlike natural lightning both in its intensity and propagation characteristics. In particular, it has been noted that triggered lightning is of lower current than natural lightning and exhibits characteristics more like those of return strokes observed in natural lightning [78,161]. It has also been argued that triggered lightning does not satisfactorily mimic the primary stroke and is therefore unsuited for investigation of the attachment to a grounded lightning conductors, i.e. its use in evaluating air terminals would appear to be questionable [78]. The extent to which rocket-triggered lightning behaves like natural lightning seems to depend on the length of the trailing wire and the distance of the bottom end of the wire above

3. Radiation hazards

In the case of ESE devices that employ radioactive materials, issues have been raised in the literature about the possible radiation hazards to humans that the use of these devices present [24,25,39,81,180,196,278]. As noted above, radioactive air terminals are banned in some countries, presumably because of perceived health hazards. It has been noted that ^{241}Am sources used in lightning protection devices are not any more hazardous than similar sources approved for use in smoke detectors or static eliminators [109,167,180]. Nevertheless, there are those who argue that the public may be placed at risk from a proliferation of radioactive materials in devices that can enter the environment without adequate controls [25,81,180]. An evaluation of the health and safety aspects of radioactive sources used in air terminals lies outside the scope of this report. However, we have identified this as a serious issue that the manufacturers and users of radioactive terminals must be prepared to address.

4. Damage and maintenance

Given that ESE devices likely have a structure and associated instrumentation that are more complex than conventional air terminals, questions can be raised about their susceptibility to damage during a lightning strike. The electric current and energy deposited by a lightning stroke can be sufficiently high to actually melt metallic structures and destroy electronic components. There are numerous reports of damage inflicted by the primary lightning stroke to metal parts on aircraft, etc. [70,79,138,209,237,269]. The possibility of damage means that a lightning protection device may require periodic inspection and/or maintenance that is generally not required for conventional terminals. Although this problem is pointed out [155], there seems to be very little discussion about it in the open literature.

IV. CONCLUSIONS

The possible conclusions that can be drawn from an examination of the literature included in the bibliography are discussed in this section. The main conclusions of this report are briefly summarized in Section VI.

Because of the sparsity of information that can be found in the peer-reviewed literature from tests of early streamer emission air terminals, either in the laboratory or in the natural environment, it is nearly impossible to make quantitatively meaningful statements or judgements about the performance of ESE devices in comparison to conventional Franklin rods. In fact, insufficient reliable quantitative data seem to exist about the performance of conventional rods, and there seems to be an ongoing debate about the best geometrical design for conventional terminals required to achieve optimum lightning attraction efficiency.

Nearly all of the information or data that could found on ESE device performance resulted either from tests performed by manufacturers of lightning protection sys-

tems or by those directly or indirectly employed by such manufacturers. Although abundant criticism is published by non-manufacturers about the performance of ESE devices, especially radioactive air terminals, it is seldom based on actual test data. Those on both sides of the issue invoke lack of evidence in making their case about the performance of ESE terminals. Proponents of these devices claim that a lack of credible statistical data on failure of ESE terminals proves their effectiveness; while critics of these terminals argue that a lack of evidence about the improved performance of ESE terminals over conventional terminals proves their ineffectiveness. In either case, one must beware of faulty logic, in as much as a lack of evidence never proves the lack of something.

There are reports of incidents where ESE devices failed to provide the protection specified by the manufacturer [156,158,165,215]. Statistics on the failure of conventional systems have also been documented [109]. When examining reports of "failures", one can always raise questions about their cause, e.g., whether they are primarily a consequence of exaggerated claims made by the manufacturer or a consequence of misuse (faulty installation) of the device. Reports of isolated failures raise legitimate concerns, but are seldom accompanied by enough supporting data about the event to enable a determination of why the failure occurred. Generally it is difficult to draw significant conclusions from single events that can be used to improve system design or evaluate system performance. There is no reason to believe that an air terminal is 100% efficient in attracting lightning, regardless of what kind of ESE device it uses, if any. Considering the wide range of possible atmospheric conditions and types of lightning behavior that have been recorded, it is not surprising that air terminals of all types will sometimes fail [37,201,271]. Tall structures are reported to be struck occasionally by lightning at points far below the top, i.e., outside of the "protection zone" [173,185,186]. Any claims of 100% efficiency in the performance of a lightning attractor should be viewed with skepticism. In any case, the meaning of the term "efficiency", when specified for an air terminal, should be clearly defined and understood.

A reasonable physical basis for the operation of an ESE device appears to exist in the sense that there is good evidence from laboratory investigations that the probability of initiating a streamer discharge from an electrode can be increased significantly by irradiation or electrical triggering. However, the precise amount by which this enhancement in streamer initiation improves the lightning attraction efficiency of an air terminal remains questionable. There is reason to doubt that it significantly extends the maximum range of protection. A lightning stroke that would not hit a conventional terminal because of the fact that it does not enhance the field at the terminal tip enough to allow streamer formation will also not likely hit a terminal equipped with an ESE device. (The exception would be an ESE device that significantly increases the terminal potential during the approach of a lightning stroke.) In our view, the possible advantage offered by an ESE device, if operated properly, is that it helps to insure that a streamer will be initiated if the field produced by the

The controlling statutory standards for approving an amendment or modification to the Florida Building Code are as follows. Proposed code modification 7211 does not meet the statutory standards:

1. *Is needed in order to accommodate the specific needs of this state.*
2. *Has a reasonable and substantial connection with the health, safety, and welfare of the general public.*

It is undisputed that structural fire incidents are declining – not increasing – in the United States from 1977 to 2015 so there is no reason for FBC to impose this new tax for LPS and SPD on Florida's economy. Haynes, *Fire Loss in the United States 2015*, NFPA, September 2016, Figure 1 at p. 11. Haynes concludes that "[t]he total number of fires continues to be on a downward trend, as does the number of outside fires, structure fires and vehicle fires." P. 35. Direct property damage from lightning fires has declined as well from 1977 to 2015 in 2015 dollars. More specifically, the amount of direct property damage to non-home structures caused by lightning fires dropped over 70% annually from 1980 to 2014 ($249 million to $65 million). Ahrens, *Structure Fires Started by Lightning*, NFPA, April 2017, at Table 2, p. 4. http://www.nfpa.org/news-and-research/fire-statistics-and-reports/fire-statistics/fire-causes/lightning-fires-and-lightning-strikes

In 2011 Fire Departments reported 27,100 total lightning fires in the United States. Of these reported fires 20,400, or 75% of the total, were outside fires or non-structure fires. Only 7% of lightning fires from 2007-2011 were "non-home structure fires." Ahrens, *Lightning Fires and Lightning Strikes*, NFPA, Fire Analysis and Research Div., June 2013, p. 1. Exhibit C. There were only 1,800 "non-home structure" fires. *Lightning Fires and Lightning Strikes* at Table 4, p. 14. By 2014, the number of "non-home structure fires" was even lower (1,400). *Structure Fires Started by Lightning*, at Table 2, p. 4.

Therefore, the Proposed Code Modification is not needed and does not have a reasonable and substantial connection with the health, safety and welfare of Floridians. The Proposed Code Modification overstates the risk and costs of lightning damage to structures in Florida and given the overstated threat of damage caused by lightning strikes, the costs of complying with the proposed LPS and SPD requirements exceed the benefits of their installation in Florida.

3. *Strengthens or improves the Florida Building Code, or in the case of innovation or new technology, will provide equivalent or better products or methods or systems of construction.*
4. *Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities.*

The restriction of approved LPS to only NFPA 780-compliant systems provides no equivalent products, methods, or systems of construction and is entirely discriminatory as to all other products, methods and systems. The Proposed Code Modification would wholly exclude from Florida construction projects UL Certified Lightning Protection Systems and specific Components and Systems such as UL96A Master Labeled LPSs and UL Letter of Findings LPS. Further the modification excludes LPS such as IEC 62305, DOD DDESB 6055.9, DOE M440.1-

1, FAA Std – 019e, FAA 6950.19A, NASA E-0012F, API – 2003, and any new LPS technology that may be developed and otherwise certified.

5. *Does not degrade the effectiveness of the Florida Building Code.*

An inherent conflict exists in the Proposed Code Modification. While LPS must be NFPA 780-compliant, SPD must be installed in accordance with NFPA 70, National Electric Code. These codes conflict as to installation of SPDs and where they are required to be installed in a structure.

§553.73 (9) (a)

Further, a proposed amendment must include a fiscal impact statement that documents the costs and benefits of the proposed amendment:

The proposed modification would needlessly – but substantially – unfairly tax the Florida economy. The narrative for Proposed Code Modification 6460 in 2017 providing for new LPS building requirements admitted that "[t]he average cost of a complete LPS is approximately 1% to 5% of total construction cost of the building." Dr. Issa's draft report presented to the Technical Advisory Committee at that time directly acknowledges these additional costs:

> "[t]he largest cost impact for the 2015 Florida specific changes came from proposed code change E6460, the installation of Lightning Protection Systems (LPS). The anticipated cost of the LPS was estimated to add 5% to the buildings total cost. Up to 80% of that cost reportedly could be offset through insurance reductions, **however such insurance reductions are not guaranteed and were therefore omitted from this cost estimate.**" (emphasis supplied) Issa, *Evaluation of the Cost Impact of Florida's specific changes to 2015 I-Codes "Prescriptive Code Changes"*, Draft Final Report, April 17, 2017, at Executive Summary p. 1.

§553.73 (9) (b)

VILLAGE PLACE

A GRACE MGMT COMMUNITY

18400 Cochran Blvd Port Charlotte, Fl 33948
Phone: (941)255-2000

Village Place
18400 Cochran Blvd.
Port Charlotte, Fl 333948

Gail G. Matillo, MPA
2292 Wednesday St., Suite 1
Tallahassee, Fl 32308
President and CEO

May 23, 2019

Dear Gail,

Village Place disagrees with the Florida Building Code Proposed Code Modification SP 7211, requiring Florida's Assisted Living Facilities (ALFs) to install lightning protection systems, and requests the Proposal be denied for the following reasons:

(1) The Florida Building Code for construction of ALFs is based on a residential model while nursing home construction is based on an institutional model. Residents of ALFs are ambulatory and self-preserving and do not require 24-hour care like those living in nursing homes;

(2) The intent of the Legislature in Part I of Chapter 429, Florida Statutes, specifically states that ALFs "should be operated and regulated as residential environments with supportive services and not as medical or nursing facilities." S. 429.01(2), Fla. Stat. Section 429.41(1) goes further to state that regulations should "ensure a safe and sanitary environment that is residential and noninstitutional in design or nature." Residents of ALFs are ambulatory and capable of self-preservation;

(3) This proposal will greatly increase construction and consumer costs in ALFs for one of Florida's most vulnerable populations. The average cost of a comprehensive facility lightning protection system (FLPS) for a commercial building is typically in the range of $35,000;

(4) All new ALFs must be fully sprinklered so there is already ample fire protection; a review of NFPA records of fire incidents in ALFs indicates a lack of physical harm to residents over at least the past two decades; and

(5) Implementation of a single-system lightning arrangement limits the discretion of important parties within the ALF construction industry; we believe in an open standard that allows the marketplace to offer competitive solutions on any updated lightning/surge code requirements.

In 2018, the state mandated ALFs install generators and fuel tank systems, costing communities millions of dollars. Additionally, a large number of ALFs rely solely on Medicaid reimbursement to provide care to low-income residents. Proposed Code Modification SP 7211 of the Florida Building Code would impose additional costs to the industry that cannot be absorbed. Adding additional mandated cost to this industry at this time would be a harsh and unwarranted implementation by the state. Many ALFs would be forced to reconsider building new developments and may seek to build in states with less restrictive laws.

Respectfully Yours,

Melody Thornton-Giuliano

Melody Thornton-Giuliano
Executive Director
Village Place
(941)661-4193 cell

FALA
FLORIDA ASSISTED LIVING ASSOCIATION
Promoting Excellence in Assisted Living

Ref: SP7211

Dear Commission:

The Florida Assisted Living Association strongly disagrees with the proposed amendment. The proposal intends to place requirements on assisted living facilities without any safety justifications; and further provides an undue cost burden on new communities. The Florida Legislature has provided that as residential environments with supportive services and not as medical or nursing facilities. *See, 429.01, F.S.* This proposed requirement does no more than attempt to place additional requirements similar to nursing homes.

While this change impacts both private pay assisted living communities, it disproportionately affects small and Medicaid funded assisted living communities. Assisted living facilities providing care to Florida's low-income seniors are at a breaking point. Depending on the area of the state, reimbursement is locked in between $900 - $1,300.00 per month. To compound this problem, residents living in these assisted living facilities are becoming frailer, requiring higher levels of care at the same payment rate received in 2014. During this five-year period there has been no additional funding for yearly cost increases, thus eroding the rate of reimbursement year over year. As the costs of goods and services continue to increase over the last five (5) years, wages have become more stagnant and programs and activities are threatened. In short, there is no way to shift this proposed cost increase to the Florida Medicaid program, which theoretically pays for low income senior care in assisted living facilities.

The Florida Assisted Living Association respectfully request that this modification and undue burden not be placed on assisted living facilities.

Florida Assisted Living Association
1618 Mahan Center Blvd., Suite 103, Tallahassee, FL 32308 • Tel: 850-383-1159 • Fax: 850-224-0448 • www.fala.org

Lightning Protection Installation Cost Study

Prepared by Michael Chusid, RA FCSI for East Coast Lightning Equipment, Inc.
2015-July

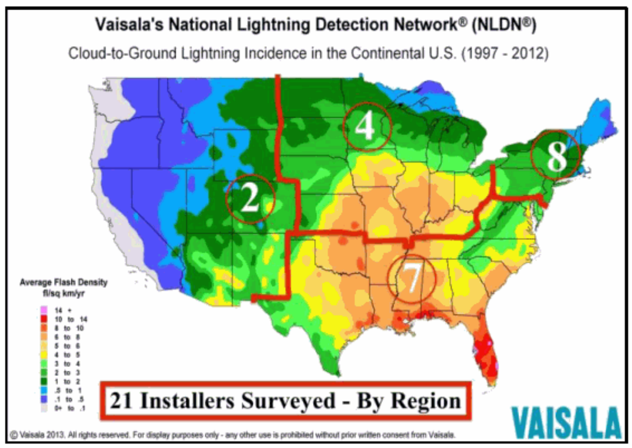
Background

Lightning accounts for about $1 billion a year in homeowner's insurance claims for property damage. Lightning fires in non-residential properties cause an average of over $100 million in direct property damage annually, not including damage due to electrical or equipment malfunctions, non-fire-related structural damage, or consequential damages. Additional risks include injury and death due to lightning strikes.[1]

Fortunately, reliable lightning protection of buildings and structures is available. Data on the cost of installing lightning protection, however, has not been readily available. The purposes of this study, therefore, are 1) to understand the cost of installing lightning protection, and 2) to provide building owners and their architects, engineers, and risk management consultants with cost estimating guidelines for use during the planning and design phases of construction projects.

To prepare this study, East Coast Lightning Equipment, Inc. (www.ecle.biz) collected construction cost data from lightning protection installers throughout the US. The cost data, summarized below, confirms that lightning protection is economical and can be justified on a cost-to-benefit basis in at-risk buildings.

Methodology



During the second quarter of 2015, lightning protection installers were asked to submit "bids" for installation of lightning protection on three hypothetical projects. Prices were to include installer's overhead and profit but not a general contractor's mark-up. The projects include a single-family residence, a low-rise building typical of educational, commercial, and industrial occupancies, and a five story building typical of many office buildings, healthcare, and similar occupancies. See Appendix for survey instrument.

Responses were received from 21 installers that are certified for lightning protection work by the Lightning Protection Institute. The distribution of respondent trade territories is shown on map according to US Census Regions. The distribution of respondents is similar to the frequency of lightning strikes; higher in Eastern and Southern states, least in the West.

The results were tabulated by Michael Chusid, RA, FCSI, an independent construction consultant, www.chusid.com, and are summarized below.

---

[1] www.iii.org/fact-statistic/lightning, accessed 2015-06-03.

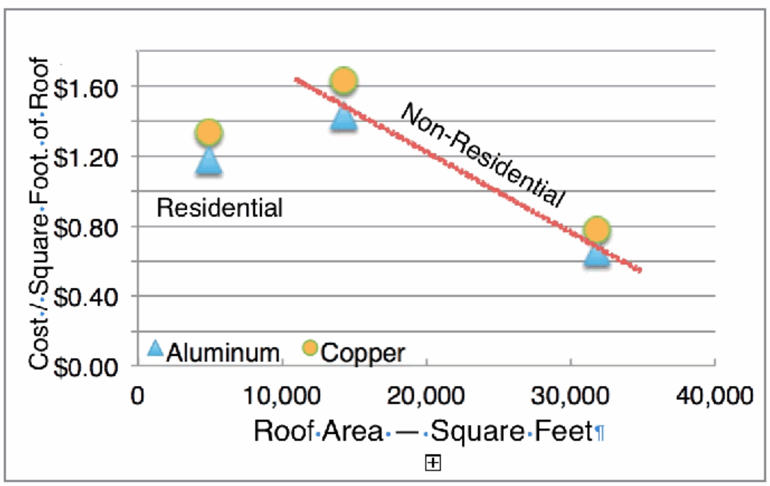
Lightning Protection Installation Cost Study

Key Findings

Lightning Protection Installation Cost Estimates						
	Residential Building		Low-Rise Building		5-story Building	
	Aluminum	Copper	Aluminum	Copper	Aluminum	Copper
Northeast						
$/Sq.Ft. of Roof	$1.56	$1.58	$0.74	$0.89	$1.75	$1.89
$/Sq.Ft. of Floor	$0.94	$0.95	$0.54	$0.65	$0.35	$0.38
South						
$/Sq.Ft. of Roof	$0.98	$1.10	$0.42	$0.50	$1.16	$1.33
$/Sq.Ft. of Floor	$0.59	$0.66	$0.31	$0.37	$0.23	$0.27
Midwest						
$/Sq.Ft. of Roof	$0.88	$1.06	$0.78	$1.02	$1.45	$1.82
$/Sq.Ft. of Floor	$0.53	$0.64	$0.58	$0.75	$0.29	$0.37
West						
$/Sq.Ft. of Roof	$1.60	$1.77	$0.88	$1.04	$1.46	$1.61
$/Sq.Ft. of Floor	$0.96	$1.06	$0.65	$0.76	$0.29	$0.32
National						
$/Sq.Ft. of Roof	$1.18	$1.34	$0.65	$0.78	$1.44	$1.64
$/Sq.Ft. of Floor	$0.71	$0.80	$0.48	$0.58	$0.29	$0.33

Cost of protecting sitework, such as trees, is not included.

Estimated Cost of Lightning Protection per Square Foot of Roof Area, National Averages



Page 2

Lightning Protection Installation Cost Study

Analysis

General: Variations between regions are due to regional trade practices, wages and benefits, soil conditions governing the type of ground terminals used, and other factors. Variations within regions can also be significant, especially between urban and rural locations.

Copper lightning protection equipment is generally more expensive than aluminum due to commodity prices. There are also regional biases that favor one material over the other.

Nonresidential Buildings: In nonresidential buildings, roof area is the most significant factor in determining the work required to install lightning protection. Hence, multistory buildings will generally cost less per square foot of interior floor area.

Costs will generally be more in buildings with extensive roof top equipment and demanding architectural considerations; less in building with a modicum of rooftop equipment and a simple configuration.

Buildings over 75 feet in height (Class II) will incur additional expenses. These estimates do not apply to buildings that house explosives and other special occupancies.

Residential Buildings: In most homes with pitched roofs, air terminals need only be installed at the roof ridge, not the perimeter of the roof. This explains why lightning protection costs for the home in our study is below the trend line shown for non-residential construction.

Note, however features such as dormers, chimneys, balconies, skylights, rooftop equipment, and large flat areas can add to the cost.

How to Use

These cost estimates can be used in the early stages of planning or designing a project. Once the overall configuration of a building is determined, consultation with a qualified lightning protection designer or installer will yield a more accurate estimate and identify ways to improve protection while reducing costs.

These cost estimates are subject to change with time and can be adjusted using the *Engineering News Record* Construction Cost Indexes or other databases of historical construction costs. Lightning protection costs are also subject to fluctuations in raw material costs.

For Additional Information

Lightning Safety Alliance, www.LightningSafetyAlliance.org

Lightning Protection Institute, www.lightning.org

East Coast Lightning Equipment, Inc., www.ecle.biz, info@ecle.biz, +1 860-379-2046

Lightning Protection Installation Cost Study

APPENDIX

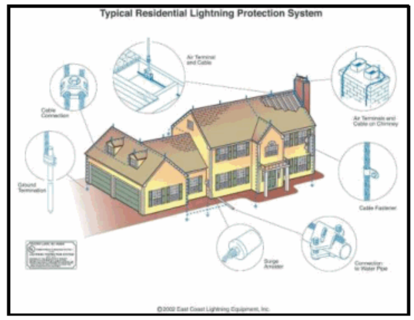
The following survey instrument was sent via e-mail to qualified lightning protection professionals.

ECLE requests your assistance in creating cost estimating guidelines that can be used by architects and engineers. Many designers ask us about the cost of installing lightning protection so they can include lightning protection in their project estimates. Your information will help them make better cost-to-benefit calculations that will, we believe, make it more likely for them to specify lightning protection. Please take a few minutes to look at the three buildings below then send us your price estimate to perform each of the installations.

Your data will be **confidential**. Michael Chusid, RA FCSI, a construction industry consultant, will compile regional and national averages and use the information to write articles for leading construction industry publications. We will send you a copy of his report as our thank you.

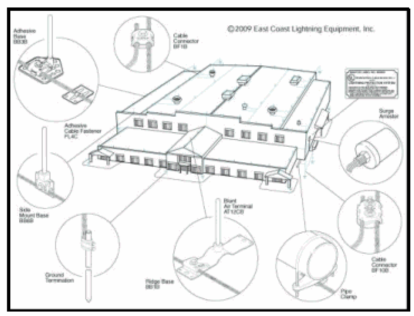
Residential Project

Assume the following:
Normal grounding conditions
Concealed installation - new construction
LPI or UL Certification Required
Please price in copper and aluminum
Price as you would to a GC or EC



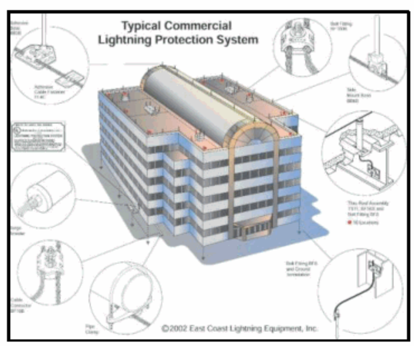
High School Project

Assume the following:
Normal grounding conditions
Exposed installation - existing construction
EPDM Roof
LPI or UL Certification Required
Please price in copper and aluminum
Price as you would to a GC or EC



Government Office Building Project

Assume the following:
Normal grounding conditions
Structural Steel to Ground installation
New construction
Built-Up Roof
LPI or UL Certification Required
Please price in copper and aluminum
Price as you would to a GC or EC
Click to download office dimensions



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Apparent lightning strike caused ALF fire

By Austin L. Miller
Posted Jun 16, 2017 at 4:27 PM
Updated Jun 16, 2017 at 6:48 PM

The fire that forced the evacuation of residents and staff at an assistant living facility in Belleview was apparently caused by Mother Nature.

According to a spokesperson from the State Fire Marshal's Office, it appears the fire was caused by a lightning strike. Damage to the attic area is approximately $30,000. The exact cause of the fire won't be determined until the investigation is complete.

Marion County Fire Rescue officials said Friday there were reports of heavy weather with lightning in the area prior to the fire. Fire officials said the blaze started in the attic above the electric panels and moved along the trusses.

Firefighters, sheriff's deputies and others placed 56 residents from Hampton Manor Assisted Living, 10590 SE 62nd Avenue Road, onto buses that transported them to another Hampton Manor facility.

Fire officials said they received the call about 5:05 p.m. and arrived on scene at 5:11 p.m. The fire was under control at 5:29 p.m.

Beatrice Kelty, community director at Hampton Manor, told the Star-Banner that Donna Clifford was in the kitchen when she heard a pop sound in the breaker and then saw fire in the ceiling. Clifford, the dietary supervisor, immediately pulled the alarm. There were seven staff members on duty at the time of the fire.

Kelty said she quickly went to the kitchen and doused the blaze with a fire extinguisher. Kelty said she and the other team members, including Dawn Crossley, a resident care manager, went to get the residents and evacuate them.

None of the residents were in the kitchen at the time of the fire. When the fire started, Kelty said, they were in the middle of dinner.

"My team was excellent and the residents cooperated," Kelty said.

According to a fire report, as the fire made its way through the attic, a single fire sprinkler was activated and it contained the fire to the general area until firefighters arrived. The report also said that as soon as flames were seen in the attic, a staff member pulled the kitchen pull station that activated the hood. Though no fire was present in the hood, fire officials said it prevented the gas from going into the kitchen.

"The early actions by the staff to activate the fire alarm and notify MCFR along with the operation of the sprinkler system allowed for a quick response and to contain the damage," according to the report.

Cindy Campbell, director of operations, told the Star-Banner that all the residents remain at the Hampton Manor at 1500 SE 24th Road because the Belleview building sustained significant damage in the kitchen area.

Campbell said its unknown when the repairs will begin or end or when residents will be able to return to the Belleview building. For now, she said, they're looking for an alternate location, and the residents at the Southeast 24th Road facility are adjusting well.

Contact Austin L. Miller at 867-4118, austin.miller@starbanner.com or @almillerosb.

SP7686

Date Submitted	12/4/2018	**Section**	449	**Proponent**	James gregory
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation No Affirmative Recommendation
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **Yes**

Related Modifications

Summary of Modification

Deletes redundant language

Rationale

The nurse call system requirements in NFPA 99 are redundant and contradictory to the FGI Guidelines. Sections are deleted because they are redundant to the Guidelines.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

There is no fiscal impact on the local entity relative to enforcement.

Impact to building and property owners relative to cost of compliance with code

There is no fiscal impact to building and property owners relative to the cost of compliance.

Impact to industry relative to the cost of compliance with code

There is no fiscal impact to industry relative to the cost of compliance.

Impact to small business relative to the cost of compliance with code

There is no fiscal impact to small business relative to the cost of compliance.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Has a reasonable and substantial connection with the health and safety an welfare of the general public.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Strengthens or improves the code by making the code requirements clearer to the user.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

Does not degrade the effectiveness of the code.

Alternate Language

2nd Comment Period

7686-A4

Proponent scott waltz **Submitted** 5/24/2019 **Attachments** Yes

Rationale

Clarifies language in proposal and brings back language previously stricken.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Impact to Small Business relative to the cost of compliance with code

There is no fiscal impact to small business relative to the cost of compliance.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Yes

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

It does not

Does not degrade the effectiveness of the code

It does not

Alternate Language

2nd Comment Period

7686-A2

Proponent James gregory **Submitted** 5/11/2019 **Attachments** Yes

Rationale

This paragraph was accidentally deleted in the original modification and that is why this modification was not approved. This alternate language put back this paragraph so there is no change to the building code for the illumination of the means of egress.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

No impact. Puts back original and existing code language.

Impact to building and property owners relative to cost of compliance with code

No impact. Puts back original and existing code language.

Impact to industry relative to the cost of compliance with code

No impact. Puts back original and existing code language.

Impact to Small Business relative to the cost of compliance with code

There is no fiscal impact to small business relative to the cost of compliance.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Puts back original code language for the health safety and welfare.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Strengthens the code by putting back original and existing code language.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate against materials products methods or systems.

Does not degrade the effectiveness of the code

Improves the code by putting back language that was struck.

449.3.13 Nurse call system. Reference The Guidelines for other requirements. The requirements for nurse call systems as described in NFPA 99 shall not apply.

449.3.13.1 In addition to the requirements of radiofrequency systems described in The Guidelines, wireless type nurse call systems shall be permitted if they have been tested and approved by a national recognized testing laboratory (NRTL) to meet the requirements of UL 1069, 7th edition, Section 49, Wireless Systems published October 12, 2007 as referenced in Chapter 35 of this code.

449.3.13.2 In addition to the areas required by The Guidelines, an emergency resuscitation alarm (CodeBlue) calling station shall be provided for staff use in each operating and cesarean delivery room.

449.3.13.3 An emergency staff assistance station shall be located within each psychiatric seclusion room and shall be of hands-free operation.

449.3.14.4 There shall be illumination of the means of egress in accordance with NFPA 101 and designed for automatic dusk-to-dawn operation. Such illumination shall continue to the public way or to a safe area(s) located at a minimum of 30 feet (9.144 m) from the building and large enough to accommodate the required occupant load of the exit discharge.

449.3.14.4 There shall be illumination of the means of egress in accordance with NFPA 101 and designed for automatic dusk-to-dawn operation. Such illumination shall continue to the public way or to a safe area(s) located at a minimum of 30 feet (9.144 m) from the building and large enough to accommodate the required occupant load of the exit discharge

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SP7729

Date Submitted	12/6/2018	**Section**	453.10.3.7	**Proponent**	Don Whitehead
Chapter	4	**Affects HVHZ**	No	**Attachments**	No
TAC Recommendation	No Affirmative Recommendation				
Commission Action	Pending Review				

Comments

General Comments **No** **Alternate Language** **Yes**

Related Modifications

Summary of Modification

To clarify the exterior light shielding requirements.

Rationale

To clarify the amount of exterior light shielding required by this section, section 3.2(4), State Requirements for Educational Facilities and section 255.2575, F.S.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Impact to small business relative to the cost of compliance with code

None

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This modification will clarify the maximum amount of light pollution that affects the welfare of the neighboring general public.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This modification will strengthen and improve the code with clearer exterior light shielding requirements.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This modification will not discriminate against materials, products, methods or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

This modification does not degrade the effectiveness of the code.

Alternate Language

2nd Comment Period

7729-A7

Proponent Don Whitehead **Submitted** 5/24/2019 **Attachments** Yes

Rationale

This modification will clarify the requirements for light shielding and align the code with section 3.2(5), State Requirements for Educational Facilities, Rule 6A-2.0010, Florida Administrative Code.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None.

Impact to building and property owners relative to cost of compliance with code

None.

Impact to industry relative to the cost of compliance with code

None.

Impact to Small Business relative to the cost of compliance with code

None

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This modification will clarify the health and safety requirements for installation of light fixtures.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This modification will strengthen and improve the code with clearer light fixture requirements.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This modification will not discriminate against materials, products, methods or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

This modification will not degrade the effectiveness of the code.

Alternate Language

2nd Comment Period

7729-A4

Proponent Don Whitehead **Submitted** 5/9/2019 **Attachments** Yes

Rationale

To clarify the amount of exterior light shielding required by this section, section 3.2(4), State Requirements for Educational Facilities and section 255.2575, F.S.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None

Impact to building and property owners relative to cost of compliance with code

None

Impact to industry relative to the cost of compliance with code

None

Impact to Small Business relative to the cost of compliance with code

None

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This modification will clarify the maximum amount of light pollution that affects the welfare of the neighboring general public.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This modification will strengthen and improve the code with clearer exterior light shielding requirements.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This modification will not discriminate against materials, products, methods or systems of construction of demonstrated capabilities.

Does not degrade the effectiveness of the code

This modification will not degrade the effectiveness of the code.

453.10.3.7 Shielding. Exterior lighting shall be shielded from adjacent properties for all exterior lighting equipment as described in Sections 453.10.3.7.1 and 453.10.3.7.2.

Exception: Lighting used for the following exterior applications is exempt where equipped with a control device independent of the control of the nonexempt lighting:

1. Specialized signal, directional, and marker lighting associated with transportation.
2. Advertising signage or directional signage.
3. Lighting integral to equipment or instrumentation and installed by its manufacturer.
4. Theatrical purposes, including performance, stage, film production, and video production.
5. Temporary lighting.
6. Roadway lighting required by governmental authorities.
7. Lighting used to highlight features of public monuments and registered landmark structures.
8. Lighting classified for and used in hazardous areas.
9. Lighting for swimming pools, spas and water features.
10. Lighting for the national flag in light pollution zones B, C and D.

453.10.3.7.1 Lighting Pollution Zones. The light pollution zone for the building site shall be determined from Table 453.10.3.7(1) unless otherwise specified by the jurisdiction.

Table 453.10.3.7(1)

LIGHT POLLUTION ZONES

LIGHT POLLUTION ZONE	DESCRIPTION
A	Rural and low-density residential areas such as, but not limited to: agricultural districts, one- and two-family residential communities, business parks, rural town centers, commercial or industrial areas with

	limited nighttime activity and the developed areas within parks and open space preserves.
B	Light commercial business districts and high-density or mixed-use residential districts such as, but not limited to: neighborhood business districts, light industrial areas with moderate nighttime activity, multifamily residential uses, institutional residential uses, hospitals, hotels, motels, churches, schools and neighborhood recreation facilities.
C	High-density commercial business districts, and heavy industrial or manufacturing areas such as, but not limited to: business districts in large cities, commercial corridors, high-density suburban commercial areas, town center mixed-use areas, industrial uses and shipping and rail yards with high nighttime activity, high-use recreation facilities, regional shopping malls, car dealerships, gas stations, and other exterior retail areas with high nighttime activity.
D	Areas such as, but not limited to: high-density entertainment districts and heavy industrial areas, where approved by the code official.

453.10.3.7.2 Light trespass. Exterior luminaires shall not exceed the applicable backlight ratings specified in Table 453.10.3.7(2).

Table 453.10.3.7(2)

MAXIMUM ALLOWABLE BACKLIGHT RATINGS [a, b, c]

HORIZONTAL DISTANCE TO LIGHTING BOUNDARY (H_{LB})	LIGHT POLUTION ZONE (LPZ)			
	A	**B**	**C**	**D**
$H_{LB} > 2h_m$	B3	B4	B5	B5
$h_m < H_{LB} = 2\ h_m$	B2	B3	B4	B4
$0.5\ h_m = H_{LB} = h_m$	B1	B2	B3	B3
$H_{LB} < 0.5\ h_m$	B0	B0	B1	B2

h_m = Mounting Height: The distance above finished grade at which a luminaire is mounted, measured to the midpoint of the luminaire.

a. Backlight (B) ratings are defined by ANSI/IESNA TM-15-11 Addendum A.

b. Luminaires located two mounting heights or less from the *lighting boundary* shall be installed with backlight towards the nearest *lighting boundary*, unless lighting a roadway, bikeway or walkway that intersects a public roadway.

c. The rating shall be determined by the actual photometric geometry in the specified mounting orientation.

468.3.7.1 Illumination level in classrooms/instructional spaces. Illumination at the normal task level for the type of classroom/instruction space shall be ~~a minimum~~ designed to provide and maintain an average of 40 footcandles (400 Lux).

Modify FBC-Building Chapter 35 as follows:

IESNA Illuminating Engineering Society of North America,

120 Wall Street, 17th Floor,

New York, NY 10005-4001

Standard	Referenced
Reference	in code

Number	Title	section number
ANSI/IESNA RP-28-07	Lighting and the Visual Environment for Senior Living	450.3.15.3
ANSI/IESNA TM-15-11		
Addendum A	Backlight, Uplight, and Glare (BUG) Ratings…………………………………………………..	453.10.3.7.2

453.10.3.7 Shielding. Exterior lighting shall be shielded from adjacent properties for all exterior lighting equipment as described in Sections 453.10.3.7.1 and 453.10.3.7.2.

Exception: Lighting used for the following exterior applications is exempt where equipped with a control device independent of the control of the nonexempt lighting:

1. Specialized signal, directional, and marker lighting associated with transportation.
2. Advertising signage or directional signage.
3. Lighting integral to equipment or instrumentation and installed by its manufacturer.
4. Theatrical purposes, including performance, stage, film production, and video production.
5. Temporary lighting.
6. Roadway lighting required by governmental authorities.
7. Lighting used to highlight features of public monuments and registered landmark structures.
8. Lighting classified for and used in hazardous areas.
9. Lighting for swimming pools, spas and water features.
10. Lighting for the national flag in light pollution zones B, C and D.

453.10.3.7.1 Lighting Pollution Zones. The light pollution zone for the building site shall be determined from Table 453.10.3.7(1) unless otherwise specified by the jurisdiction.

Table 453.10.3.7(1)

LIGHT POLLUTION ZONES

LIGHT POLLUTION ZONE	DESCRIPTION
A	Rural and low-density residential areas such as, but not limited to: agricultural districts, one- and two-family residential communities, business parks, rural town centers, commercial or industrial areas with

	limited nighttime activity and the developed areas within parks and open space preserves.
B	Light commercial business districts and high-density or mixed-use residential districts such as, but not limited to: neighborhood business districts, light industrial areas with moderate nighttime activity, multifamily residential uses, institutional residential uses, hospitals, hotels, motels, churches, schools and neighborhood recreation facilities.
C	High-density commercial business districts, and heavy industrial or manufacturing areas such as, but not limited to: business districts in large cities, commercial corridors, high-density suburban commercial areas, town center mixed-use areas, industrial uses and shipping and rail yards with high nighttime activity, high-use recreation facilities, regional shopping malls, car dealerships, gas stations, and other exterior retail areas with high nighttime activity.
D	Areas such as, but not limited to: high-density entertainment districts and heavy industrial areas, where approved by the code official.

453.10.3.7.2 Light trespass. Exterior luminaires shall not exceed the applicable backlight ratings specified in Table 453.10.3.7(2).

Table 453.10.3.7(2)

MAXIMUM ALLOWABLE BACKLIGHT RATINGS [a, b, c]

HORIZONTAL DISTANCE TO LIGHTING BOUNDARY (H_{LB})	LIGHT POLUTION ZONE (LPZ)			
	A	B	C	D
$H_{LB} > 2h_m$	B3	B4	B5	B5
$h_m < H_{LB} = 2\ h_m$	B2	B3	B4	B4
$0.5\ h_m = H_{LB} = h_m$	B1	B2	B3	B3
$H_{LB} < 0.5\ h_m$	B0	B0	B1	B2

h_m = Mounting Height: The distance above finished grade at which a luminaire is mounted, measured to the midpoint of the luminaire.

a. Backlight (B) ratings are defined by ANSI/IESNA TM-15-11 Addendum A.

b. Luminaires located two mounting heights or less from the *lighting boundary* shall be installed with backlight towards the nearest *lighting boundary,* unless lighting a roadway, bikeway or walkway that intersects a public roadway.

c. The rating shall be determined by the actual photometric geometry in the specified mounting orientation.

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Modify FBC-Building Chapter 35 as follows:

IESNA Illuminating Engineering Society of North America,

120 Wall Street, 17th Floor,

New York, NY 10005-4001

Standard		Referenced
Reference		in code
Number	Title	section number

ANSI/IESNA RP-28-07	Lighting and the Visual Environment for Senior Living	450.3.15.3
ANSI/IESNA TM-15-11		
Addendum A	Backlight, Uplight, and Glare (BUG) Ratings……………………………………………………	453.10.3.7.2

453.10.3.7 Shielding. Exterior lighting shall be shielded from adjacent properties in accordance with Section 409 Site Lighting, International Green Construction Code.

453.10.3.7 Shielding. Exterior lighting shall be shielded from adjacent properties for all exterior lighting equipment as described in Sections 453.10.3.7.1 and 453.10.3.7.2.

Exception: Lighting used for the following exterior applications is exempt where equipped with a control device independent of the control of the nonexempt lighting:

1. Specialized signal, directional, and marker lighting associated with transportation.
2. Advertising signage or directional signage.
3. Lighting integral to equipment or instrumentation and installed by its manufacturer.
4. Theatrical purposes, including performance, stage, film production, and video production.
5. Temporary lighting.
6. Roadway lighting required by governmental authorities.
7. Lighting used to highlight features of public monuments and registered landmark structures.
8. Lighting classified for and used in hazardous areas.
9. Lighting for swimming pools, spas and water features.
10. Lighting for the national flag in light pollution zones B, C and D.

453.10.3.7.1 Lighting Pollution Zones. The light pollution zone for the building site shall be determined from Table 453.10.3.7(1) unless otherwise specified by the jurisdiction.

Table 453.10.3.7(1)
LIGHT POLLUTION ZONES

LIGHT POLLUTION ZONE	DESCRIPTION
A	Rural and low-density residential areas such as, but not limited to: agricultural districts, one- and two-family residential communities, business parks, rural town centers, commercial or industrial areas with limited nighttime activity and the developed areas within parks and open space preserves.
B	Light commercial business districts and high-density or mixed-use residential districts such as, but not limited to: neighborhood business districts, light industrial areas with moderate nighttime activity, multifamily residential uses, institutional residential uses, hospitals, hotels, motels, churches, schools and neighborhood recreation facilities.
C	High-density commercial business districts, and heavy industrial or manufacturing areas such as, but not limited to: business districts in large

	cities, commercial corridors, high-density suburban commercial areas, town center mixed-use areas, industrial uses and shipping and rail yards with high nighttime activity, high-use recreation facilities, regional shopping malls, car dealerships, gas stations, and other exterior retail areas with high nighttime activity.
D	Areas such as, but not limited to: high-density entertainment districts and heavy industrial areas, where approved by the code official.

453.10.3.7.2 Light trespass. Exterior luminaires shall not exceed the applicable backlight ratings specified in Table 453.10.3.7(2).

Table 453.10.3.7(2)
MAXIMUM ALLOWABLE BACKLIGHT RATINGS [a, b, c]

HORIZONTAL DISTANCE TO LIGHTING BOUNDARY (H_{LB})	LIGHT POLUTION ZONE (LPZ)			
	A	**B**	**C**	**D**
$H_{LB} > 2h_m$	B3	B4	B5	B5
$h_m < H_{LB} \leq 2\ h_m$	B2	B3	B4	B4
$0.5\ h_m \leq H_{LB} \leq h_m$	B1	B2	B3	B3
$H_{LB} < 0.5\ h_m$	B0	B0	B1	B2

h_m = Mounting Height: The distance above finished grade at which a luminaire is mounted, measured to the midpoint of the luminaire.

a. Backlight (B) ratings are defined by ANSI/IESNA TM-15-11 Addendum A.
b. Luminaires located two mounting heights or less from the *lighting boundary* shall be installed with backlight towards the nearest *lighting boundary*, unless lighting a roadway, bikeway or walkway that intersects a public roadway.
c. The rating shall be determined by the actual photometric geometry in the specified mounting orientation.

Modify FBC-Building Chapter 35 as follows:

IESNA

Illuminating Engineering Society of North America,
120 Wall Street, 17th Floor,
New York, NY 10005-4001

Standard Reference Number	Title	Referenced in code section number
ANSI/IESNA RP-28-07	Lighting and the Visual Environment for Senior Living	450.3.15.3
ANSI/IESNA TM-15-11 Addendum A	Backlight, Uplight, and Glare (BUG) Ratings	453.10.3.7.2

ANSI/IESNA TM-15-11 Addendum A can be found at:

https://www.ies.org/wp-content/uploads/2017/03/TM-15-11BUGRatingsAddendum.pdf

453.10.3.7 Shielding. Exterior lighting shall be shielded from adjacent properties for all exterior lighting equipment as described in Sections 453.10.3.7.1 and 453.10.3.7.2.

Exception: Lighting used for the following exterior applications is exempt where equipped with a control device independent of the control of the nonexempt lighting:

1. Specialized signal, directional, and marker lighting associated with transportation.
2. Advertising signage or directional signage.
3. Lighting integral to equipment or instrumentation and installed by its manufacturer.
4. Theatrical purposes, including performance, stage, film production, and video production.
5. Temporary lighting.
6. Roadway lighting required by governmental authorities.
7. Lighting used to highlight features of public monuments and registered landmark structures.
8. Lighting classified for and used in hazardous areas.
9. Lighting for swimming pools, spas and water features.
10. Lighting for the national flag in light pollution zones B, C and D.

453.10.3.7.1 Lighting Pollution Zones. The light pollution zone for the building site shall be determined from Table 453.10.3.7(1) unless otherwise specified by the jurisdiction.

Table 453.10.3.7(1)
LIGHT POLLUTION ZONES

LIGHT POLLUTION ZONE	DESCRIPTION
A	Rural and low-density residential areas such as, but not limited to: agricultural districts, one- and two-family residential communities, business parks, rural town centers, commercial or industrial areas with limited nighttime activity and the developed areas within parks and open space preserves.
B	Light commercial business districts and high-density or mixed-use residential districts such as, but not limited to: neighborhood business districts, light industrial areas with moderate nighttime activity, multifamily residential uses, institutional residential uses, hospitals, hotels, motels, churches, schools and neighborhood recreation facilities.
C	High-density commercial business districts, and heavy industrial or manufacturing areas such as, but not limited to: business districts in large

	cities, commercial corridors, high-density suburban commercial areas, town center mixed-use areas, industrial uses and shipping and rail yards with high nighttime activity, high-use recreation facilities, regional shopping malls, car dealerships, gas stations, and other exterior retail areas with high nighttime activity.
D	Areas such as, but not limited to: high-density entertainment districts and heavy industrial areas, where approved by the code official.

453.10.3.7.2 Light trespass. Exterior luminaires shall not exceed the applicable backlight ratings specified in Table 453.10.3.7(2).

Table 453.10.3.7(2)
MAXIMUM ALLOWABLE BACKLIGHT RATINGS [a, b, c]

HORIZONTAL DISTANCE TO LIGHTING BOUNDARY (H_{LB})	LIGHT POLUTION ZONE (LPZ)			
	A	B	C	D
$H_{LB} > 2h_m$	B3	B4	B5	B5
$h_m < H_{LB} \leq 2\ h_m$	B2	B3	B4	B4
$0.5\ h_m \leq H_{LB} \leq h_m$	B1	B2	B3	B3
$H_{LB} < 0.5\ h_m$	B0	B0	B1	B2

h_m = Mounting Height: The distance above finished grade at which a luminaire is mounted, measured to the midpoint of the luminaire.

a. Backlight (B) ratings are defined by ANSI/IESNA TM-15-11 Addendum A.

b. Luminaires located two mounting heights or less from the *lighting boundary* shall be installed with backlight towards the nearest *lighting boundary*, unless lighting a roadway, bikeway or walkway that intersects a public roadway.

c. The rating shall be determined by the actual photometric geometry in the specified mounting orientation.

468.3.7.1 Illumination level in classrooms/instructional spaces. Illumination at the normal task level for the type of classroom/instruction space shall be ~~a minimum~~ designed to provide and maintain an average of 40 footcandles (400 Lux).

Modify FBC-Building Chapter 35 as follows:

IESNA Illuminating Engineering Society of North America, 120 Wall Street, 17th Floor, New York, NY 10005-4001

Standard Reference		Referenced in code

Number	Title	section number
ANSI/IESNA RP-28-07	Lighting and the Visual Environment for Senior Living	450.3.15.3
ANSI/IESNA TM-15-11 Addendum A	Backlight, Uplight, and Glare (BUG) Ratings...	453.10.3.7.2

ANSI/IESNA TM-15-11 Addendum A can be found at:

https://www.ies.org/wp-content/uploads/2017/03/TM-15-11BUGRatingsAddendum.pdf

SP8038

Date Submitted 12/12/2018
Chapter 4
Section 453.27.3
Affects HVHZ No
Proponent Joseph Garrity
Attachments No
TAC Recommendation No Affirmative Recommendation
Commission Action Pending Review

Comments

General Comments **No** **Alternate Language** **Yes**

Related Modifications

Summary of Modification

Now, innovative relocatables falling under Type V are not permitted via the pre-manufactured building program as SREF-compliant for classroom use. But, incorporating fire sprinklers in a Type V relocatable provides greater life-safety than that of a non-sprinklered Type I, II or IV relocatable.

Rationale

Currently, combustible Type V construction is not allowed for relocatables for use in public educational facilities. However, there have been great advances in the design to Type V construction for relocatables including cost-effective, advanced designed Type V relocatables that are fully protected by a NFPA 13 Fire Sprinkler System.

These innovative relocatables falling under Type V are not permitted via the pre-manufactured building program as SREF-compliant for classroom use. But, incorporating fire sprinklers in a Type V relocatable provides greater life-safety than that of a non-sprinklered Type I, II or IV relocatable. Automatic suppressions systems limit fire impact in educational properties.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None - Plan Review and Construction Inspections would be the responsibility of the manufacturer, as under the Florida modular building program. Local costs would be the same for inspection of installation and site plan review, as with currently allowed units under the current code language.

Impact to building and property owners relative to cost of compliance with code

Minimal - the costs for NFPA 25 required inspections per pre-manufactured unit could be as little as $300/year depending on the volume of units inspected at a time.

Impact to industry relative to the cost of compliance with code

None, in part due to the fact that the proposed change would not impact currently permitted relocatables. There will be no increased cost for Type I, II or IV relocatables, and the cost for Type V will be factored into the overall design and construction cost bore by the manufacturer.

Impact to small business relative to the cost of compliance with code

None, there is no change in the cost of compliance relative to the current code. Moreover, the change requested is specific to public educational facilities and not small businesses.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The purposed amendment allows Type V relocatables that are fully protected by a NFPA 13 Fire Sprinkler System provides equal, or greater, safety than what is currently required under the Florida Building Code, Section 453.27.3.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Having Type V relocatables that are fully protected by a NFPA 13 Fire Sprinkler System provides equal, or greater, safety than what is currently allowed under the Florida Building Code, Section 453.27.3. The amendment allows for better products, methods, and systems of construction.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The proposed change expands the types of materials, products, methods, and systems of construction allowed under the Florida Building Code, Section 453.27.3 while ensuring safety by requiring Type V construction to be fully sprinklered when used as a relocatable in public educational facilities.

Does not degrade the effectiveness of the code

The current code allows structures that are not fully spinklered. Having Type V relocatables that are fully protected by a NFPA 13 Fire Sprinkler System provides equal, or greater, safety than what is currently required under the Florida Building Code, Section 453.27.3.

Alternate Language

2nd Comment Period

8038-A1

Proponent Joseph Garrity **Submitted** 5/26/2019 **Attachments** Yes

Rationale

Currently, combustible Type V construction is not allowed for relocatables for use in public facilities. However, there have been great advances in the designs of type V construction from relocatables including cost-effiective, advanced designed Type V relocatables that are fully protected by a NFPA 13 Fire Sprinkles System. These advances include structures with materials not suseptible to decay or termite damage. These advances include having materials and constuction methods in compliance with all parts of the Florida Building Code regarding protection from decay and termites.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

None - Plan Review and Construction Inspections would be the responsibility of the manufacturer, as under the Florida modular building program. Local costs would be the same for inspection of installation and site plan review, as with currently allowed units under the current code language.

Impact to building and property owners relative to cost of compliance with code

Minimal - the costs for NFPA 25 required inspections per pre-manufactured unit could be as little as $300/year depending on the volume of units inspected at a time.

Impact to industry relative to the cost of compliance with code

None, In part due to the fact that the proposed change would not Impact currently permitted relocatables. There will be no increased cost for Type I, II or IV relocatables, and the cost for Type V will be factored into the overall design and construction cost bore by the manufacturer.

Impact to Small Business relative to the cost of compliance with code

None, there is no change in the cost of compliance relative to the current code. Moreover, the change requested is specific to public educational facilities and not small businesses.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

The purposed amendment allows Type V relocatables that are fully protected by a NFPA 13 Fire Sprinkler System provides equal, or greater; safety than what is currently required under the Florida Building Code, Section 453.27.3.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Having Type V relocatables that are fully protected by a NFPA 13 Fire Sprinkler System provides equal, or greater; safety than what is currently allowed under the Florida Building Code, Section 453.27.3. The amendment allows for better products, methods, and systems of construction.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

The proposed change expands the types of materials, products, methods, and systems of construction allow under the Florida Building Code, Section 453.27.3 while ensuring safety by requiring Type V construction to be fully sprinklered when used as a relocatable in public educational facilities.

Does not degrade the effectiveness of the code

The current code allows structures that are not fully spinklered. Having Type V relocatables that are fully protected by a NFPA 13 Fire Sprinkler System provides equal, or greater, safety than what is currently required under the Florida Building Code, Section 453.27.3.

Is the proposed code modification part of a prior code version? No

1st Comment Period History

SP8038-G1

Proponent Don Whitehead **Submitted** 2/4/2019 **Attachments** Yes

Comment:

See attached file.

453.27.3 Construction type. All new relocatables constructed, purchased or otherwise acquired by a board shall be noncombustible Type I, II, or IV construction, or Type V Construction if fully protected by a NFPA 13 Fire Sprinkler System and is (a) constructed of material not susceptible to decay and termite damage or (b) is fully compliant with all sections of Florida Building Code regarding protection against decay and termites related to material and construction methods used.

453.27.3 Construction type. All new relocatables constructed, purchased or otherwise acquired by a board shall be noncombustible Type I, II, or IV construction, or Type V Construction if fully protected by a NFPA 13 Fire Sprinkler System.

453.27.3 Construction type. All new relocatables constructed, purchased or otherwise acquired by a board shall be noncombustible Type I, II, or IV construction, or Type V Construction if fully protected by a NFPA 13 Fire Sprinkler System <u>and is (a) constructed of material not susceptible to decay and termite damage or (b) is fully compliant with all sections of Florida Building Code regarding protection against decay and termites related to material and construction methods used</u>.

As staff to the State Board of Education, I would not be able to recommend acceptance of Modification SP8038. This code modification seeks to allow Type V construction, which would allow light weight wood construction in public educational facilities. Currently, the State Board of Education has not authorized light weight wood construction. This change proposes to eliminate a Florida-specific requirement that was adopted to promote the public health and safety of the schools in Florida. The ICC model codes do not take into account the unique situations in Florida as shown by the following explanations:

Relocatables constructed in Florida are vulnerable to termite damage and other wood destroying organisms, such as powderpost beetles and carpenter bees. Because the destruction is hidden below the surface, pest control inspections can only minimize the danger, but not completely eliminate it. Because noncombustible construction is extremely durable, fire and termite resistant, and has a life expectancy of around 100 years, it is a popular building material in Florida. Because wood deteriorates more quickly with the high humidity in Florida, its life expectancy is about 25 years. Also, fire-retardant treated wood is expressly prohibited from being used in the construction of educational facilities by Rule 6A2.0010, of the Florida Administrative Code.

As an example of the potential hazard, allow me to share one school district's experience. Marion County School District was conducting an asbestos abatement of Anthony Elementary Cafetorium. During the asbestos abatement of the 9x9 floor tiles, one of the workers fell through the floor exposing the serious structural damage of the original wood floor framing system, which had been destroyed by powderpost beetles. Wood destroying organisms can cause structural failure without warning, and endanger the life safety of the occupants.

As staff to the State Board of Education, I urge the committee to not approve this code modification as submitted.

SP8213

Date Submitted	12/14/2018	**Section**	464	**Proponent**	James gregory
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation No Affirmative Recommendation
Commission Action Pending Review

Comments

General Comments Yes **Alternate Language** No

Related Modifications

None

Summary of Modification

Adds requirements for emergency power in accordance with Florida Administrative Code.

Rationale

These new requirements are necessary because of a new FAC and because all of the physical plant requirements are to be included in the FBC, not another rule. This requirement also prohibits the use of gasoline fuel for the generatros due to the fire-safety issues of using and storing such a highly flammable liquid inside of or near to an occupied residential building and carbon monoxide issues that were apparent in every major hurricane in Florida.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

There is no fiscal impact on the local entity relative to enforcement.

Impact to building and property owners relative to cost of compliance with code

There is an incres fiscal impact to building and property owners relative to the cost of compliance.

Impact to industry relative to the cost of compliance with code

There is no fiscal impact to industry relative to the cost of compliance.

Impact to small business relative to the cost of compliance with code

There is a fiscal impact to industry relative to the cost of compliance.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Has a reasonable and substantial connection with the health and safety an welfare of the general public.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Strengthens or improves the code by making the code requirements clearer to the user.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Does not discriminate against materials, methods, or systems of construction. Does prohibit the use of gasoline.

Does not degrade the effectiveness of the code

Does not degrade the effectiveness of the code.

2nd Comment Period

SP8213-G1

Proponent Shaddrick Haston **Submitted** 5/26/2019 **Attachments** Yes

Comment:

The Florida Assisted Living Association objects to this proposed change. See attached document for full comments.

464.4.2 Heating and cooling.

464.4.2.1 When outside temperatures are 65°F (18°C) or below, an indoor temperature of at least 72°F (22°C) shall be maintained in all areas used by residents during hours when residents are normally awake. During night hours when residents are asleep, an indoor temperature of at least 68°F (20°C) shall be maintained.

464.4.2.2 During hours when residents are normally awake, mechanical cooling devices, such as electric fans, must be used in those as are of buildings used by residents when inside temperatures exceed 85°F (29°C) provided outside temperatures remain below 90°F (32°C). No residents shall be in any inside area that exceeds 90°F (32°C). However, during daytime hours when outside temperatures exceed 90°F (32°C), and at night, an indoor temperature of no more than 81°F (27°C) must be maintained in all areas used by residents.

464.4.2.3 Residents who have individually controlled thermostats in their bedrooms or apartments shall be permitted to control temperatures in those areas.

464.4.2.4 In accordance with Chapter 58A-5.036 Emergency Environmental Control for Assisted Living Facilities, Florida Administrative Code, a new facility shall be equipped with ~~either~~ a permanent on-site alternate power source, such as an optional stand-by generator, to operate for a period of 96 hours for the demand load of the heating, ventilation and air conditioning equipment of the facility.

464.4.2.4.1 If the alternate power source is a generator, it shall meet the requirements of NFPA 70 for an Optional Stand-by generator.

464.4.2.4.2 If the alternate power source is a generator, gasoline shall not be permitted for use as a fuel.

FLORIDA ASSISTED LIVING ASSOCIATION
Promoting Excellence in Assisted Living

Ref: SP8213

Dear Commission:

The Florida Assisted Living Association strongly disagrees with the proposed amendment requiring the use of stand-by generators as **the only** means to allow compliance if a generator is to be used. The modification would prevent assisted living facilities from being compliant by using portable generators. Florida's current law takes into account the special needs of large and small assisted living communities. Florida has more than 1,640 assisted living facilities that are eight (8) beds or less. The majority of these small assisted living facilities are located in small residential communities.

Assisted living facilities providing care to Florida's low-income seniors are at a breaking point. Funding. Assisted living providers were informed that the rates were supposed to be negotiated between managed care plans and assisted living providers; however, providers are given a take-it-or-leave-it contract. Depending on the area of the state, those rates are locked in between $900 - $1,300.00 per month. To compound this problem, residents living in these assisted living facilities are becoming frailer, requiring higher levels of care at the same payment rate received in 2014. During this five-year period there has been no additional funding for yearly cost increases, thus eroding the rate of reimbursement year over year. As the costs of goods and services continue to increase over the last five (5) years, wages have become more stagnant and programs and activities are threatened. In short, there is no way to shift cost increase to the Florida Medicaid program, which theoretically pays for low income senior care in assisted living facilities.

<u>Changes May Violate The Fair Housing Act Amendments of 1988</u>

The 14th Amendment's Equal Protection Clause prohibits states from denying a person equal protection of the law. This and three federal laws—section 504 of the Rehabilitation Act of 1973; Title II of the Americans with Disabilities Act (ADA); and the Fair Housing Act, especially its 1988 amendments (FHAA)—

FLORIDA ASSISTED LIVING ASSOCIATION
Promoting Excellence in Assisted Living

limit local control over group home siting. The FHAA is probably the most significant since it applies to dwellings. The three laws build on one another by applying consistent definitions and nondiscrimination standards.

In *Marbrunak, Inc. v. City of Stow, Ohio, 974 F.2d 43 (6th Cir. 1992),* the city informed the provider of a group home that it would have to satisfy a series of extensive safety requirements, including sprinklers, an interconnected alarm system, lighted exit signs, push bars on all doors, and a fire extinguisher every 30 feet. The city admitted that these requirements were far more extensive than those required of single-family dwellings. The federal appeals court agreed with the lower court's conclusion that the fire safety requirements were "based on generalized perceptions about the inability of developmentally disabled persons to live safely in a 'normal home.' *Murbank, 974 F.2d at 47.* The lower court indicated that *Marbrunak* was required "'to install an alarm system, doors with push bars, and fire walls and flame-retardant wall coverings without showing why such renovations were needed to ensure the safety of the residents.

The Courts have held that a town's classifying the home as a boarding or rooming house and requiring structural changes had an undeniable discriminatory effect. It found the house would not be able to operate in a single-family zone; residents, unlike a family with seven related members, would not be able to live in any neighborhood with single-family zoning; and recovering alcoholics and drug addicts could not live in a sober house in a residential setting in order to enhance their chances of making a full recovery (*Tsombanidis v. City of West Haven*, 129 F. Supp. 2d 136, 180 F. Supp. 2d 262, 208 F. Supp. 263 (2001, 2002); affirmed in part, reversed in part 352 F.3d 565).

The Florida Assisted Living Association respectfully request that this modification and undue burden not be placed on assisted living facilities.

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SP8281

Date Submitted	12/15/2018	**Section**	453.8.3	**Proponent**	Paul Coats
Chapter	4	**Affects HVHZ**	No	**Attachments**	No

TAC Recommendation No Affirmative Recommendation
Commission Action Pending Review

Comments

General Comments Yes **Alternate Language** No

Related Modifications

Summary of Modification

Removes restrictions on public school construction types which are in conflict with Chapters 5 and 6 of the code.

Rationale

Currently, the special occupancy provisions for schools in the Florida Building Code prohibit wood-frame construction, regardless of building size, except for heavy timber. However, both the International Building Code (IBC) and the NFPA Building Construction and Safety Code (NFPA 5000) now have time-tested criteria for schools of all construction types, the same provisions which regulate private schools in Florida. They contain criteria for school size (according to construction type), fire resistance, fire sprinklers, fire alarm systems, means of egress, interior finishes, and many other safety features specific to schools. By retaining outdated materials restrictions for schools, Florida gains nothing in school safety or longevity while losing significant advantages for cost effectiveness, energy efficiency, environmental sustainability, and construction efficiency. The building code should provide the same protections and opportunities regardless of building ownership. This proposal eliminates the materials restrictions for public schools which conflict with the building code provisions regulating other schools in the state. It does not require the use of any particular material.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

Removes overlapping and conflicting requirements for schools.

Impact to building and property owners relative to cost of compliance with code

May reduce the cost of construction.

Impact to industry relative to the cost of compliance with code

May reduce the code of construction.

Impact to small business relative to the cost of compliance with code

May reduce the cost of construction.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

Yes.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

Improves the code by removing conflicting requirements.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

Removes discriminatory materials provisions.

Does not degrade the effectiveness of the code

Does not degrade the effectiveness of the code.

2nd Comment Period

SP8281-G2

Proponent Gregory Young **Submitted** 5/2/2019 **Attachments** No

Comment:

I agree with Don Whitehead's rationale. The wood industry just wants to sell more wood.

2nd Comment Period

SP8281-G3

Proponent Harold Barrineau **Submitted** 5/26/2019 **Attachments** No

Comment:

I agree with this modification.

1st Comment Period History

SP8281-G1

Proponent Don Whitehead **Submitted** 2/4/2019 **Attachments** Yes

Comment:

See attached file.

453.8.3Construction type.

School board and Florida college buildings including auxiliary, ancillary and vocational facilities shall comply with ~~the following:~~ <u>the construction type provisions of this code.</u>

~~**453.8.3.1Noncombustible Type I, II or IV.**~~

~~The minimum construction type for one- and two-story public educational facilities shall be noncombustible Type I, II or IV construction or better.~~

~~**453.8.3.1.1**~~

~~Interior nonload-bearing wood studs or partitions shall not be used in permanent educational and auxiliary facilities or relocatable buildings.~~

~~Exception: Historic buildings to maintain the fabric of the historic character of the building.~~

~~**453.8.3.2Type I.**~~

~~Facilities three stories or more shall be Type I construction.~~

~~**453.8.3.3Type IV.**~~

~~When Type IV construction is used, wood shall be exposed and not covered by ceilings or other construction.~~

~~**453.8.3.4Exceptions to types of construction:**~~

1. ~~1.Covered walkways open on all sides may be Type V construction.~~
2. ~~2.Single story dugouts, press boxes, concession stands, related public toilet rooms, detached covered play areas, and nonflammable storage buildings that are detached from the main educational facility by at least 60 feet (1829 mm), may be Type V construction.~~

As staff to the State Board of Education, I would not be able to recommend acceptance o f Modification SP8281. This code modification seeks to allow Type III and Type V construction, which would allow light weight wood construction in public educational facilities. Currently, the State Board of Education has not authorized light weight wood construction. This change proposes to eliminate a Florida-specific requirement that was adopted to promote the public health and safety of the schools in Florida. The ICC model codes do not take into account the unique situations in Florida as shown by the following explanations:

As directed by Section 1013.372 of the Florida Statutes, schools in Florida are often used as hurricane shelters. Hurricane shelters are required to meet much higher standards, to protect the occupants during a storm. These higher standards include design wind speeds in excess of 200 mph and missile impact speeds in excess of 80 mph. Using wood construction as the structure of a hurricane shelter would be very inefficient, because it would not only require more valuable classroom space, but it would require more taxpayer dollars.

Buildings constructed in Florida are vulnerable to termite damage and other wood destroying organisms, such as powderpost beetles and carpenter bees. Because the destruction is hidden below the surface, pest control inspections can only minimize the danger, but not completely eliminate it. Because concrete block is extremely durable, fire and termite resistant, and has a life expectancy of around 100 years, it is a popular building material in Florida. Because wood deteriorates more quickly with the high humidity in Florida, its life expectancy is about 25 years. Also, fire-retardant treated wood is expressly prohibited from being used in the construction of educational facilities by Rule 6A2.0010, of the Florida Administrative Code.

As an example of the potential hazard, allow me to share one school district's experience. Marion County School District was conducting an asbestos abatement of Anthony Elementary Cafetorium. During the asbestos abatement of the 9x9 floor tiles, one of the workers fell through the floor exposing the serious structural damage of the original wood floor framing system, which had been destroyed by powderpost beetles. Wood destroying organisms can cause structural failure without warning, and endanger the life safety of the occupants.

As staff to the State Board of Education, I urge the committee to not approve this code modification as submitted.

SP7363

Date Submitted	11/20/2018	**Section**	3001.2	**Proponent**	Bryan Holland
Chapter	30	**Affects HVHZ**	No	**Attachments**	No
TAC Recommendation	No Affirmative Recommendation				
Commission Action	Pending Review				

Comments

General Comments **Yes** **Alternate Language** **No**

Related Modifications

Summary of Modification

This proposed modification adds "emergency elevator communication systems for the deaf, hard of hearing and speech impaired" to the code.

Rationale

This belongs in the code. A significant part of the population is serviced by this proposal where currently there is a void. Current technologies should be able to be readily adapted to meet the requirements of this proposal. The referenced installation and design standards do not apply to all elevators and conveying systems and their components. Each standard is for a certain type. Although covered for accessibility in Section 1109.8, the installation standard for Platform Lifts and Stairway Chairlifts, ASME A18.1, is not included in Chapter 30. ASME A18.1 is a separate standard, not covered by Section 1.1.2 of ASME A17.1.

Fiscal Impact Statement

Impact to local entity relative to enforcement of code

This proposed modification will not impact the local entity relative to code enforcement.

Impact to building and property owners relative to cost of compliance with code

This proposed modification will not change the cost of compliance to building and property owners.

Impact to industry relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact industry.

Impact to small business relative to the cost of compliance with code

This proposed modification will not change the cost of compliance or impact small business.

Requirements

Has a reasonable and substantial connection with the health, safety, and welfare of the general public

This proposed modification is directly connected to the health, safety, and welfare of the general public.

Strengthens or improves the code, and provides equivalent or better products, methods, or systems of construction

This proposed modification improves and strengthens the code.

Does not discriminate against materials, products, methods, or systems of construction of demonstrated capabilities

This proposed modification does not discriminate against materials, products, methods, or systems of construction.

Does not degrade the effectiveness of the code

This proposed modification enhances the effectiveness of the code.

2nd Comment Period

SP7363-G4

Proponent Harold Barrineau **Submitted** 5/25/2019 **Attachments** No

Comment:

I agree with this modification

1st Comment Period History

SP7363-G1

Proponent Comingore Michelle **Submitted** 1/4/2019 **Attachments** No

Comment:

If adopted into the building code, this proposal would likely be unenforceable. Florida Statute (F.S.) 399.035 provides accessibility requirements for elevators. Paragraph 399.035(1)(c), F.S., requires elevators to comply with s. 2.27 of ASME A17.1. The requirements in this proposal exceed the requirements in ASME code, which include push-button based two-way communication with a visual indicator, on-demand notification of the building location, elevator number and that assistance is required, and system operability verification.

Paragraph 399.035(4), F.S., states "This section supersedes all other state laws and regulations and local ordinances and rules affecting the accessibility of passenger elevators to the physically handicapped..." Adding this proposal to the building code would make the building code more stringent than the statutorily-mandated two-way communication requirements and present a conflict between statute and the building code.

1st Comment Period History

SP7363-G3

Proponent	andy cid	Submitted	2/3/2019	Attachments	Yes

Comment:

See attached comment file.

3001.2 Emergency elevator communication systems for the deaf, hard of hearing and speech impaired. An emergency two-way communication system shall be provided that:

1. Is a visual and text-based and a video-based 24/7 live interactive system.

2. Is fully accessible by the deaf, hard of hearing and speech impaired, and shall include voice-only options for hearing individuals.

3. Has the ability to communicate with emergency personnel utilizing existing video conferencing technology, chat/text software or other approved technology.

3001.~~2~~ 3. Referenced standards.

FBC Public Comment by Andy Cid, President/Founder, Barrier Free Solutions for the Deaf and Hard of Hearing, LLC.

I am the author and main proponent of the current code under IBC Chapter 30, Section 3001.2 (effective 2018 through 2021 AND I submitted another code change, which passed and is now public- effective 2021 and good through 2024).

I support Bryan Holland's proposal to adopt the code language under Section 3001.2. Why? Besides providing access to 50 million people of the Deaf in the U.S, the key word to Mr. Holland's proposal and for this code language is SAFETY. If the State of Florida does not adopt progressive safety standards, it will lag behind the rest of the country, as all or most jurisdictions adopt the IBC codes and the relevant standards.

The current ASME a17 standard, in Section 2.27, was re-written in late 2018 (t/b published in 2019) to honor the intent of the IBC code. I was a part of the task force that assisted the a17 in designing the standard language.

Also, the old standard, under 2.27, requires AUDITORY PHONE SYSTEMS ONLY, or insufficient "one way push button" systems. This is NOT two-way interaction for the Deaf community.

Even if the old or new standard is referenced by the FBC, the building code still takes precedence over the standard. See below:

Chapter 1, ICC - Scope and Administration:

102.4 REFERENCED CODES AND STANDARDS -

The codes and standards referenced in this code shall be considered part of the requirements of this code to the prescribed extent of each such reference and as further regulated in Sections 102.4.1 and 102.4.2. [A] 102.4.1 Conflicts. Where differences conflicts occur between provisions of this code and referenced codes and standards, the provisions of this code shall apply.

[A] 102.4.2 Provisions in referenced codes and standards. Where the extent of the reference to a referenced code or standard includes subject matter that is within the scope of this code or the ICC Codes in section 101.4, the provisions of this code or the ICC codes in Section 101.4, as applicable, shall take precedence over the provisions in the referenced code or standard.

Therefore, I urge the State of Florida and its building official community to adopt this code change for the FBC. If it is not adopted, the state is doing a disservice to its own citizens by lagging behind the times and not protecting its own. And there is also the liability issue where building owners run the risk of liability and litigation by not providing communication access in elevators, in the event of an elevator system breakdown, with entrapped Deaf occupants.