Committee Scope: This Committee shall have primary responsibility for documents on the reduction of combustion system hazards in single- and multiple-burner boilers with a heat input rate of 12,500,000 Btu/hr and above. This includes all fuels. This Committee also is responsible for documents on the reduction of hazards in pulverized fuel systems, fluidized-bed boilers, heat recovery steam generators, and stoker-fired boilers, at any heat input rate.

Technical Committee on Stoker Operations

William H. Axton, Chair
Gray Gull Assoc., Inc., VA [SE]

J. Mike Cantrell, The McBurney Corp., GA [M]
Andrew K. Dant, CogenTech Energy, Inc., NC [U]
Joseph N. Darguzas, Sargent & Lundy, IL [SE]
John C. deRuyter, The DuPont Co., DE [U]
Thomas B. Hamilton, Hamilton Consulting Services, NC [SE]
John Hoh, Nat'l Board of Boiler and Pressure Vessel Inspectors, OH [E]
Tim Loviska, Detroit Stoker Co., MI [M]
Gerald E. McCullion, Honeywell I.A.C., PA [M]

Staff Liaison: Merton W. Bunker, Jr.

Committee Scope: This Committee shall have primary responsibility for documents covering the operation of stokers and related fuel burning equipment. This includes all fuels at any heat input rate.

These lists represent the membership at the time each Committee was balloted on the text of this edition. Since that time, changes in the membership may have occurred. A key to classifications is found at the front of the book.

The Report of the Committee on Boiler Combustion System Hazards is presented for adoption.

This Report was prepared by the Technical Committee on Stoker Operations and proposes for adoption amendments to NFPA 8505-1992, Recommended Practice for Stoker Operation. NFPA 8505-1992 is published in Volume 12 of the 1996 National Fire Codes and in separate pamphlet form.

This Report has been submitted to letter ballot of the Technical Committee on Stoker Operations, which consists of 9 voting members. The results of the balloting, after circulation of any negative votes, can be found in the report.

This Report has also been submitted to letter ballot of the Technical Correlating Committee on Boiler Combustion System Hazards, which consists of 25 voting members; of whom 20 voted affirmatively, 1 abstained and 2 ballots were not returned (Messrs. Cunningham and Polagye).

Mr. Moskal abstained stating: "Not an area of interest (stokers)."

Report of the Committee on Boiler Combustion System Hazards

Technical Correlating Committee

Dale E. Dressel, Chair
Monsanto Co., MO [U]

Merton W. Bunker, Nonvoting Secretary
Nat'l Fire Protection Assn., MA

Courtney D. Alvey, Lutherville, MD [SE]
Merton W. Bunker, Nonvoting Secretary
Nat'l Fire Protection Assn., MA

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Technical Committee on Stoker Operations

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Mr. Moskal abstained stating: "Not an area of interest (stokers)."
NFPA 8505 — F97 ROP

8505-1 - (Entire document): Accept
SUBMITTER: Technical Committee on Stoker Operations
RECOMMENDATION: Change NFPA 8505 from a recommended practice to a standard.

SUBSTANTIATION: In view of current industry practices, and monitoring of air pollution control regulations, it was deemed appropriate to convert this document into a standard. Additionally, in view of the Technical Correlating Committee decision to combine all 8500 series documents into one document, it was believed that 8505 would fit most appropriately in this new format.

COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 0
VOTE ON COMMITTEE ACTION: AFFIRMATIVE: 6
NOT RETURNED: 3 Cantrell, Darguzas, Loviska

8505-2 - (Chapter 1): Accept in Principle
SUBMITTER: John Hoh, Columbus, OH
RECOMMENDATION: Revise text as follows: Chapter 1 Introduction.

1-1 Scope.
1-1.1 This standard applies to boilers with a heat input rating of 12,500,000 Btu/hr (3663 Kw) or greater. This standard applies only to boiler-furnaces using a stoker to fire:
(a) Coal, as defined in Chapter 3
(b) Wood
(c) Refuse-Derived Fuel (RDF), as defined in Chapter 3
(d) Other solid fuels


Exception No. 1: The purge requirements of NFPA 8501 or NFPA 8502 are not required when the stoker is firing and the boiler is on-line. In those cases, if no cooling air is being provided to the auxiliary burners, a purge of their associated air supply ducts shall be provided.

Exception No. 2: When firing oil or gas in a supervised manual system in accordance with NFPA 8501, the excessive steam pressure interlock is not required.

1-1.3 This standard is not retroactive. This standard shall apply to new installations and to major alterations or extensions that are contracted subsequent to the effective date of this standard.

1-1.4 Since this standard is based on the present state-of-the-art, its application to existing installations is not mandatory. Nevertheless, operating companies are encouraged to adopt those features of this standard that are considered applicable and reasonable for existing installations.

1-1.5 Revisions to this document reflect the current state of knowledge and do not imply that previous editions were inadequate.

1-2 Purpose.
1-2.1 The purpose of this standard is to establish minimum standards for the design, installation, operation, and maintenance of stoker fired boiler-furnaces, their fuel-burning systems, and related control equipment, to contribute to operating safety.

1-2.2 No standard can be promulgated that will guarantee the elimination of boiler-furnace combustion hazards. Technology in this area is under constant development, reflected in part by revisions to this standard. The user of this standard must recognize the complexity of firing fuel with regard to the type of equipment and the characteristics of the fuel. Therefore, the designer is cautioned that the standard is not a design handbook. The standard does not explicitly eliminate the need to resort to competent engineering judgment. It is intended that a designer capable of applying more complete and rigorous analysis to special or unusual problems is to be given latitude in the development of such designs. In such cases, the designer is responsible for demonstrating the validity of the proposed design.

1-2.3 Emphasis is placed on the importance of operation and maintenance procedures, combustion control equipment, safety interlocks, alarms, trips, and other related controls that are essential to safe boiler operation.

1-2.4 The effect of gas cleanup systems located downstream of the post-combustion gas passes of the boiler-furnace is known to be significant. Coordination of the operating procedures and designs of the boiler-furnace and air quality systems air/flue gas path is required. Such coordination shall include requirements for ensuring a continuous flow path from the forced draft fan inlet through the stack. This standard offers only the general requirements of these systems because of the many variations of the designs.

SUBSTANTIATION: Modified text to reflect change to a standard and to be more consistent with other 8500 series documents.

COMMITTEE ACTION: Accept in Principle.
Accept in Principle with the following changes to the submitters proposed wording:
1. In Section 1-1.1, change "boiler-furnaces" to "boilers".
2. In Section 1-1.1, add a new subparagraph (d) as follows and re-letters subsequent subparagraphs accordingly:
   (d) Municipal Solid Waste (MSW) as defined in Chapter 3
3. In Section 1-1.2, change "Boiler-Furnaces" to "Boilers"
4. In Section 2-1.1, change "boiler-furnaces" to "boilers".
5. Change Section 2-1.4 through 2-1.4 to read the same as the corresponding sections of NFPA 8505 as follows:

1-2.2 No standard can guarantee the elimination of furnace explosions and implosions in boilers. Technology in this area is evolving constantly, and this is reflected in revisions to this standard. The user of this standard needs to recognize the complexity of firing fuel with regard to the type of equipment and the characteristics of the fuel. Therefore, the designer is cautioned that the standard is not a design handbook. The standard does not guarantee the elimination of furnace hazards. Coordination of the operating procedures and design of the boiler furnace system and air quality system air-flue gas path shall be required. Such coordination shall include requirements for ensuring a continuous flow path from the forced draft fan inlet through the stack. This standard provides only the general requirements for these systems because of the multiplicity of their designs.

COMMITTEE STATEMENT: All changes to submitters proposal were for correlation with other related standards pertaining to combustion systems hazards.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION: AFFIRMATIVE: 6
NOT RETURNED: 3 Cantrell, Darguzas, Loviska

8505-3 - (1-1.4): Accept
SUBMITTER: Neil H. Johnson, SFT, Inc.
RECOMMENDATION: Revise text:
NFPA 8501... or NFPA 85C Exception No. 1... or NFPA 85C...

SUBSTANTIATION: NFPA 8501 is single burner and NFPA 85C is multiple burner. A boiler has one or the other.

COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION: AFFIRMATIVE: 6
NOT RETURNED: 3 Cantrell, Darguzas, Loviska

Chapter 2 General.

2-1 Furnace Explosions.

2-1.1 The basic cause of furnace explosions is the ignition of an accumulated combustible mixture within the confined space of the furnace, the associated boiler pass, ducts, and fans that convey the gases of combustion to the stack.
2-1.2 A dangerous combustible mixture within the boiler enclosure consists of the accumulation of an excessive quantity of combustible materials in proportions resulting in a rapid or uncontrolled combustion where an ignition source is supplied. A furnace explosion can result from ignition of this accumulation, usually due to an explosive force created within the boiler. Moisture content of fuel.

2-1.3 Numerous conditions can arise in connection with the operation of a boiler that produce explosive conditions. The most common of these are as follows:

(a) An interruption of the fuel or air supply, sufficient to result in momentary loss of flames, followed by restoration and delayed reignition of an accumulation;
(b) Fuel leakage into an idle furnace and the ignition of the accumulation by a spark or other source of ignition;
(c) Attempts to light off without appropriate purging when firing gaseous, liquid, or pulverized fuels without stoker firing;
(d) Utilization of high volatile fuels such as gasoline for ignition purposes;
(e) The accumulation of an explosive mixture of fuel and air as a result of loss of flame or incomplete combustion;
(f) The accumulation of an explosive mixture of fuel and air as a result of a flameout and the ignition of the accumulation by a spark or other ignition source such as attempting to light an idle boiler;
(g) Purging with too high an airflow, which stirs up combustibles smoldering in hoppers; and
(h) Improper fuel consistency, especially when firing high volatile refuse fuels.

2-1.4 The conditions favorable to a boiler explosion described in 2-1.3 are typical examples. An examination of numerous reports of boiler explosions in stoker-fired units utilizing solid fuels suggests that the occurrence of small explosions or furnace puffs has been far more frequent than is usually recognized. It is believed that improved instrumentation, safety interlocks and protective devices, proper operating sequences, and a clearer understanding of the problem by both designers and operators can greatly reduce the risks and actual incidents of furnace explosions.

2-1.5 In a boiler, upset conditions or control malfunction may lead to an air/fuel mixture that may result in an unsafe condition. There may exist, in certain parts of the boiler-furnace enclosures or other parts of the unit, dead pockets susceptible to the accumulation of combustibles. These accumulations may ignite with explosive force in the presence of an ignition source.

2-1b.1 A furnace implosion is the result of the occurrence of excessively low gas side pressure, which causes equipment damage.

2-1b.2 Two conditions that have caused furnace implosions include:

(a) A maloperation of the equipment regulating the boiler gas flow, including air supply and flue gas removal, resulting in furnace exposure to excessive induced draft fan head capability.

(b) The rapid decay of furnace gas temperatures and pressure resulting from either a rapid reduction in fuel input or a master fuel trip.

2-1b.3 A combination of the two conditions indicated in 2-1b.2 has resulted in the most severe furnace implosion incidents.

2-2 Manufacture, Design, and Engineering.

2-2.1 The purchaser or the purchaser's agent shall, in cooperation with the manufacturer, assure that the unit is not deficient in apparatus that is required for proper operation, so far as is practical, with respect to protective parts, fuel burning equipment, and safe lighting and maintenance of stable conditions.

2-2.2 All fuel systems shall include provisions to prevent foreign substances from interfering with the fuel supply.

2-2.3 An evaluation shall be made to determine the optimum integration of manual and automatic safety features, considering the advantages and disadvantages of each trip function. NOTE: The use and number of automatic trip features does not necessarily provide for maximum overall safety. Some trip actions result in additional operations that increase exposure to hazards.

2-2.4 This standard requires a minimum degree of automation. The trend toward more complex plants or increased automation requires added provisions for:

(a) Information regarding significant operating events that allow the operator to make a rapid evaluation of the operating situation.

The operator shall be provided with continuous and usable displays of variables that allow the operator to avoid unsafe conditions.

(b) In-service maintenance and checking of system functions without impairing the reliability of the overall control system.

(c) An environment conducive to proper decisions and actions.

2-2.5 On the basis of observed operating sequences and field tests, the maximum negative furnace pressure is determined primarily by the maximum head characteristic of the induced draft fan; a major objective of the final design shall be to limit the maximum head capacity of draft equipment to that necessary for satisfactory operation. Special consideration shall be given to fan selection and arrangement of duct work to limit the effect of negative head.

2-2.6 With scrubbers or other high draft loss equipment for removing flue gas contaminants, a booster fan might be necessary. A bypass or other appropriate means shall be provided to counteract the potentially excessive negative pressure conditions resulting from combining the suction heads of both the induceddraft fan and booster fan.

2-3 Installation. The boiler shall not be released for operation before the installation and checkout of the safeguards and instrumentation system.

2-3.1 The constructor responsible for the erection and installation of the equipment shall ensure that all pertinent apparatus is properly installed and connected.

2-3.2 The purchaser, the engineering consultant, the equipment manufacturer, and the operating company shall accomplish temporary interlocks and instrumentation operation until such safeguards have been tested to operate properly as a system. In some instances it may be necessary to install temporary interlocks and instrumentation. Any such temporary system shall be reviewed by the purchaser, the engineering consultant, the equipment manufacturer, and the operating company, and agreement shall be reached on its suitability in advance of start-up.

2-3.3 Testing and checkout of the safety interlock system and protective devices shall be accomplished jointly by the organization with the system design responsibility and those who operate and maintain such systems and devices during the normal operating life of the plant. After installation, coordinated tests of all systems shall be accomplished before initial operation.

2-4.1 Documentation of the plant equipment, the system, and maintenance.

2-4.2 In the planning and the engineering phases of plant construction, design shall be coordinated with the operating company.

2-4.3 The proper integration of the various components consisting of boiler, burner, fuel and air supply equipment, controls, interlocks and safety devices, operator and maintenance functions, and communication and training shall be the responsibility of the operating company and shall be accomplished by the following:

(a) Design and operating personnel who possess a high degree of competence in this field and who are mandated to achieve these objectives;

(b) Periodic analysis of the plant with respect to evolving technology so that improvements can be made to make the plants safer and more reliable; and

(c) Documentation of the plant equipment, the system, and maintenance.

2-5 Maintenance Organization. A program shall be provided for maintenance of equipment at intervals consistent with type of equipment, service requirements, and the manufacturers' recommendations. (See Chapter 7.)

2-6.2 Written operating procedures and detailed check lists for operator guidance shall be provided for achieving these basic operating objectives. All manual and automatic functions shall be described.

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2-6.3 Proper procedures shall be established for taking appropriate and timely actions including reducing load, tripping equipment, or calling for outside assistance in case of emergency.

5-5 Combustion Control System.

5-5.1 Functional Requirements.

5-5.1.1 The combustion control system shall maintain furnace fuel and air input in accordance with demand.

5-5.1.2 The combustion control system shall control furnace inputs and their relative rates of change so as to maintain the air/fuel mixture within the limits required for continuous combustion and stable furnace pressure throughout the controllable operating range of the unit.

5-5.2 System Requirements.

5-5.2.1 Furnace input shall be controlled to respond to the energy demand under all operating conditions.

5-5.2.2 The air/fuel mixture shall be maintained within safe limits as established by test under any boiler output condition within the controllable operating range of the subsystem.

5-5.2.3 When changing the rate of furnace input, the airflow and fuel flow shall be changed simultaneously at the proper rates to maintain safe air/fuel ratio during and after the change. This shall not result in a major imbalance of air and fuel during changes in firing rate. Placing the fuel flow control on automatic without the air flow in automatic shall be prohibited.

5-5.2.4 On balanced draft units Furnace draft shall be maintained at a desired set point in the combustion chamber.

5-5.2.5 A means should be provided to prevent the control system from demanding a fuel-rich mixture.

5-5.2.6 A means of permitting as much on-line maintenance of the combustion control equipment as possible shall be provided.

5-5.2.7 A means shall be provided for calibration and check testing of combustion control and associated safeguard equipment.

5-5.3 Overfire Air.

5-5.3.1 If applicable, the high-pressure overfire air turbulence associated interlock equipment shall be furnished.

5-5.3.2 Furnace overfire air turbulence equipment shall also be controlled in two methods: (a) control the outlet pressure of the blower using a manual set point; or (b) control overfire air in parallel with forced draft flow.

5-5.4 Flue Gas Analysis.

5-5.4.1 Consideration shall be given to providing oxygen and combustibles meters for use as operating guides.

SUBSTANTIATION: Converted from Practice to Standard.

COMMITTEE ACTION: Accept in Principle.

1. Accept in Principle the proposal with the following changes:

   (a) In Section 2-1.2, next to last line, change "...equipment or control system malfunction..." to "...equipment or control system..."

   (b) In Section 2-1.5, change "boiler-furnace" to "boiler".

2. Change numbering for proposed Section 2-1.1b to read as "2-2 Furnace Implosions", renumbering subsequent sections accordingly as follows:

   Section 2-2 to 2-3
   Section 2-3 to 2-4
   Section 2-4 to 2-5
   Section 2-5 to 2-6
   Section 2-6 to 2-7

3. In proposed Section 2-2.3, move the Note to Appendix A, corresponding to the existing section (renumbered as 2-3.3).

4. In proposed Section 2-2.4, change "...standard requires..." to "...standard necessitates..." and "...required added..." to "...shall require additional..." and in subsection (b), change "...imparing..." to "...impairment of..."

5. Change proposed Section 2-2.5 as follows:

   2-4. Installation

   2-4.1 The boiler shall not be permitted to be operated before the installation and check of the required safeguards and instrumentation system.

   2-4.2 The party responsible for the erection and installation of the equipment shall ensure that all apparatus is installed and connected properly.

   2-4.3 The purchaser, the engineering consultant, the equipment manufacturer, and the operating company shall avoid boiler operation until such safeguards have been tested and operated properly as a system. In some instances, it might be necessary to install temporary interlocks and instrumentation to meet these test demands. Any such temporary system shall be reviewed by the purchaser, the engineering consultant, the equipment manufacturer, and the operating company, and agreement shall be reached on its suitability in advance of start-up.

6. The safe-standover system and protective devices shall be tested jointly by the organization responsible for the system design and those who operate and maintain such a system and devices during the normal operating life of the plant. After installation, coordinated tests of all systems shall be accomplished before initial operation.

7. In proposed Section 2-4.2, change "...operating company..." to "...operating personnel..."

8. Add new Section 2-5.2 (renumbered) as follows and renumber subsequent subsections accordingly:

   2-5.2 Furnace explosions have occurred as a result of unfavorable functional design. The investigation frequently has revealed human error and has overlooked the chain of causes that triggered the operating error completely. Therefore, the design, installation, and functional objectives of the overall system of components and their controls shall be integrated. Consideration shall be given to the existing ergonomics that can affect operation of the system.

9. In proposed Section 2-5 (2-6 renumbered), change "Chapter 7" to "Chapter 6"

10. In proposed Section 2-6.1(a), change "Establish" to "Establishment of..."

   11. In proposed Section 2-6.1(b), change "Standardize" to "Standardization of..." and "...is recommended to..." to "...is essential to..." and "...stop sequences..." to "...interrupt sequences..."

   12. In proposed Section 2-6.2, change "described" to "included".

   13. Renumber proposed Section 5-5 to Section 4-2.

   14. In proposed section 5-5.2.4, strike the words "On balanced draft units".

   15. In proposed Section 5-5.2.7, change "should" to "shall".

   16. Change proposed Section 5-5.2.6 as follows:

      Equipment shall be designed and procedures established to allow as much on-line maintenance of combustion control systems as practical.

   17. Change proposed Section 5-5.2.7 as follows:

      "Provisions for calibration and testing of combustion control and associated interlock equipment shall be established.

   18. In proposed Section 5-5.5.1, delete the word "also", and change "forced draft" to "under grate air".

   COMMITTEE STATEMENT: 1. Changes made to provide better correlation with other related standards pertaining to combustion systems hazards.

   2. Editorial changes for consistency and conformance with NFPA IM.

   NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9

   VOTE ON COMMITTEE ACTION: AFFIRMATIVE: 6
   NOT RETURNED: 3 Cantrell, Darguzas, Loviska

(End of Log #5)

8505-5. (2-2): Accept

SUBMITTER: John G. deBuyster, El DuPont Co., Inc.

RECOMMENDATION: Add a new 2-2 with title and paragraph 2.2 as shown and renumber the succeeding items accordingly.

2-2 Furnace Implosions.

2-2.1 Stoker fired boilers are inherently less prone to furnace implosions because of the absence of the sudden "flame collapse" phenomenon that exists on fluid bed or pulverized fuel fired boilers.

SUBSTANTIATION: This material was 5-4.2.3(c)4 and was moved to the General Section since it is more generic material. (Also, a minor editorial change to the wording).

COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9

VOTE ON COMMITTEE ACTION: AFFIRMATIVE: 6

NOT RETURNED: 3 Cantrell, Darguzas, Loviska

(End of Log #CP1)

8505-6. (3-1): Accept

SUBMITTER: Technical Committee on Stoker Operations

RECOMMENDATION: In Section 5-1, change "recommended practice" to "standard"

SUBSTANTIATION: Changing document to a standard from a recommended practice.

COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9

VOTE ON COMMITTEE ACTION: AFFIRMATIVE: 6

NOT RETURNED: 3 Cantrell, Darguzas, Loviska

(End of Log #CP6)

8505-7. (3-1 Air): Accept

SUBMITTER: Technical Committee on Stoker Operations

RECOMMENDATION: Delete heading of "Air" in definitions Section 3-1, and make each definition under that heading a stand alone definition, alphabetically placed in Section 3-1.
SUBSTANTIATION: Modified text to be more consistent with other 8500 series documents.
COMMITTEE ACTION: Accept.

SUBMITTER: Technical Committee on Stoker Operations

VOTE ON COMMITTEE ACTION: AFFIRMATIVE: 6
NOT RETURNED: 3 Cantrell, Darguzas, Loviska

8505-8 - (3.1 Air/Fuel Ratio): Accept

SUBMITTER: Technical Committee on Stoker Operations

RECOMMENDATION: Delete the entire section of Air/Fuel Ratio, in its entirety.

SUBSTANTIATION: This is the same as under grate air, and is redundant.
COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION: AFFIRMATIVE: 6
NOT RETURNED: 3 Cantrell, Darguzas, Loviska

8505-9 - (3.1 Air/Fuel Ratio, Air Rich, Fuel Rich, Air Theoretical, Air Excess (New)): Accept

SUBMITTER: Technical Committee on Stoker Operations

RECOMMENDATION: Add new definitions as follows:
- Air/Fuel Ratio. A ratio of air to fuel supplied to a furnace.
- Air-rich. Indicates a ratio of air to fuel supplied to a furnace that provides more than the minimum excess air needed for optimum combustion of the fuel.
- Fuel-rich. Indicates a ratio of air to fuel supplied to a furnace that provides less than the minimum excess air needed for optimum combustion of the fuel.
- Air Excess. Air supplied for combustion in excess of theoretical air.
- Air, Theoretical (Stoichiometric Air). The chemically correct quantity of air needed for complete combustion of a given quantity of a specific fuel.

SUBSTANTIATION: Modified text to be more consistent with other 8500 series documents.
COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION: AFFIRMATIVE: 6
NOT RETURNED: 3 Cantrell, Darguzas, Loviska

8505-10 - (3.1 Boiler): Accept

SUBMITTER: Technical Committee on Stoker Operations

RECOMMENDATION: Revise the definition of Boiler as follows:
- Boiler. A closed vessel in which water is heated, steam is generated, or steam is superheated, or in which any combination thereof takes place by the application of heat from combustible fuels, in a self-contained or attached furnace.

SUBSTANTIATION: Modified text to be more consistent with other 8500 series documents.
COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION: AFFIRMATIVE: 6
NOT RETURNED: 3 Cantrell, Darguzas, Loviska

8505-11 - (3.1 Boiler-Furnace Enclosure): Accept

SUBMITTER: Technical Committee on Stoker Operations

RECOMMENDATION: Revise the heading of the definition of Boiler-Furnace Enclosure to read as follows:
- Boiler Enclosure.

SUBSTANTIATION: Modified text to be more consistent with other 8500 series documents.
COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION: AFFIRMATIVE: 6
NOT RETURNED: 3 Cantrell, Darguzas, Loviska

8505-12 - (3.1 Bunker (New)): Accept

SUBMITTER: Technical Committee on Stoker Operations

RECOMMENDATION: Add a new definition for Bunker as follows:
- Bunker. An enclosure to store raw fuel.

SUBSTANTIATION: Modified text to be more consistent with other 8500 series documents.
COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION: AFFIRMATIVE: 6
NOT RETURNED: 3 Cantrell, Darguzas, Loviska

8505-13 - (3.1 Combustion Control System): Accept

SUBMITTER: Technical Committee on Stoker Operations

RECOMMENDATION: Revise definition of Combustion Control System as follows:
- Combustion Control System. The control system that regulates the furnace fuel and air inputs to maintain an air/fuel ratio within the limits necessary for continuous combustion and stable flame throughout the operating range of the boiler in accordance with demand. This control system includes the furnace draft control where applicable.

SUBSTANTIATION: Changes made to provide better correlation with other related standards pertaining to combustion systems hazards.
COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION: AFFIRMATIVE: 6
NOT RETURNED: 3 Cantrell, Darguzas, Loviska

8505-14 - (3.1 Damper): Accept

SUBMITTER: Technical Committee on Stoker Operations

RECOMMENDATION: Under the definition of Damper, delete all sub-types, but keeping the main definition of Damper.

SUBSTANTIATION: These definitions are not unique, but are industry standards.
COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION: AFFIRMATIVE: 6
NOT RETURNED: 3 Cantrell, Darguzas, Loviska

8505-15 - (3.1 Extension (New)): Accept

SUBMITTER: Technical Committee on Stoker Operations

RECOMMENDATION: Add a new definition of extension as follows:
- Extension. An addition to the boiler system or additional sub-systems, such as, but not limited to, air quality control.

SUBSTANTIATION: This definition was added to cover a term used in the standard, and for consistency with other 8500 series standards.
COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION: AFFIRMATIVE: 6
NOT RETURNED: 3 Cantrell, Darguzas, Loviska

8505-16 - (3.1 Fuel Cutback): Accept

SUBMITTER: Technical Committee on Stoker Operations

RECOMMENDATION: Revise the definition of Fuel Cutback as follows:
- Change "to reduce" to "that reduces".

SUBSTANTIATION: Changes made to provide better correlation with other related standards pertaining to combustion systems hazards.
COMMITTEE ACTION: Accept.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION: AFFIRMATIVE: 6
NOT RETURNED: 3 Cantrell, Darguzas, Loviska
8505-17 - (3-1 Furnace): Accept
SUBMITTER: Technical Committee on Stoker Operations
RECOMMENDATION: Revise the definition of Furnace to read as follows:
Furnace. The portion of the boiler enclosure within which the combustion process takes place and wherein heat transfer occurs predominantly by radiation.
SUBSTANTIATION: Changes made to provide better correlation with other related standards pertaining to combustion systems hazards.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION: AFFIRMATIVE: 6
NOT RETURNED: 3 Cantrell, Darguzas, Loviska

8505-18 - (3-1 Gate, Raw Fuel): Accept
SUBMITTER: Technical Committee on Stoker Operations
RECOMMENDATION: In the definition of Gate, Raw Fuel, change "bin" to "bunker".
SUBSTANTIATION: There is no definition of bin, changes made for correction of the term.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION: AFFIRMATIVE: 6
NOT RETURNED: 3 Cantrell, Darguzas, Loviska

8505-19 - (3-1 Gate Stoker): Accept
SUBMITTER: Technical Committee on Stoker Operations
RECOMMENDATION: Change the heading and relocate the definition "Gate Stoker" to "Gate, Stoker".
SUBSTANTIATION: Change made for clarity.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION: AFFIRMATIVE: 6
NOT RETURNED: 3 Cantrell, Darguzas, Loviska

8505-20 - (3-1 Hand-Fired Grate): Accept
SUBMITTER: Technical Committee on Stoker Operations
RECOMMENDATION: The term is not used in the standard.
SUBSTANTIATION: The definition of Hand-Fired Grate.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION: AFFIRMATIVE: 6
NOT RETURNED: 3 Cantrell, Darguzas, Loviska

8505-21 - (3-1 Interlock): Accept
SUBMITTER: Technical Committee on Stoker Operations
RECOMMENDATION: Revise the definition of Interlock as follows:
Interlock. A device or group of devices arranged to sense a limit or off-limit condition or improper sequence of events and to shut down the related equipment or to prevent proceeding in an improper sequence in order to avoid a hazardous condition.
SUBSTANTIATION: Changes made to provide better correlation with other related standards pertaining to combustion systems hazards.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION: AFFIRMATIVE: 6
NOT RETURNED: 3 Cantrell, Darguzas, Loviska

8505-22 - (3-1 Monitor): Accept
SUBMITTER: Technical Committee on Stoker Operations
RECOMMENDATION: Revise the definition of Monitor as follows:
Monitor. To sense and indicate a condition without initiating automatic corrective action.
SUBSTANTIATION: Changes made to provide better correlation with other related standards pertaining to combustion systems hazards.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION: AFFIRMATIVE: 6
NOT RETURNED: 3 Cantrell, Darguzas, Loviska

8505-23 - (3-1 Municipal Solid Waste (MSW) (New)): Accept
SUBMITTER: Technical Committee on Stoker Operations
RECOMMENDATION: Add new definition for Municipal Solid Waste as follows: Municipal Solid Waste (MSW). Untreated solid waste material as collected from household and commercial establishments. It is highly variable in appearance, density and BTU content.
SUBSTANTIATION: To provide a definition for a term used in the standard.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION: AFFIRMATIVE: 6
NOT RETURNED: 3 Cantrell, Darguzas, Loviska

8505-24 - (Chapter 3): Accept
SUBMITTER: Technical Committee on Stoker Operations
RECOMMENDATION: In the definition of overfire air, add the following sentence: "This can also be referred to as secondary air."
SUBSTANTIATION: This change is for clarification and consistency with industry practices.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION: AFFIRMATIVE: 6
NOT RETURNED: 3 Cantrell, Darguzas, Loviska

8505-25 - (3-1 Purge): Accept
SUBMITTER: Technical Committee on Stoker Operations
RECOMMENDATION: Revise the definition of purge as follows:
1. Delete the word "will"
2. Change "remove" to "removes".
3. Add "or suspended" after "gaseous".
4. Change "replace" with "replaces".
5. Change "may" to "can"
SUBSTANTIATION: Changes made to provide better correlation with other related standards pertaining to combustion systems hazards.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION: AFFIRMATIVE: 6
NOT RETURNED: 3 Cantrell, Darguzas, Loviska

8505-26 - ((New)): Accept
SUBMITTER: Technical Committee on Stoker Operations
RECOMMENDATION: 1. Delete the definition of Recommended Practice.
2. Add stock definitions for "Standard" and "Shall."
SUBSTANTIATION: No longer needed as the document will be a standard.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION: AFFIRMATIVE: 6
NOT RETURNED: 3 Cantrell, Darguzas, Loviska

8505-27 - (3-1 Repair (New)): Accept
SUBMITTER: Technical Committee on Stoker Operations
RECOMMENDATION: Add new definition for Repair as follows: Repair. A process that returns the boiler system or subsystem to its original design specifications or criteria.
SUBSTANTIATION: Modified text to be more consistent with other 8500 series documents.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION: AFFIRMATIVE: 6
NOT RETURNED: 3 Cantrell, Darguzas, Loviska

(Structured Text)

8505-28 - (3.1 Stoker): Accept
SUBMITTER: Technical Committee on Stoker Operations
RECOMMENDATION: Revise the definition of Stoker as follows:
1. Delete the main heading, Stoker.
2. Make each type of stoker heading separate, beginning with the
   word "Stoker", followed by the type.
SUBSTANTIATION: Change made for clarity.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION: AFFIRMATIVE: 6
NOT RETURNED: 3 Cantrell, Darguzas, Loviska

8505-29 - (3.1 Under Grate Air): Accept
SUBMITTER: Technical Committee on Stoker Operations
RECOMMENDATION: In Chapter 3, definition of under Grate Air,
add the following sentence:
"This can also be referred to as primary air."
SUBSTANTIATION: This change is for clarification and
consistent with industry practices.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION: AFFIRMATIVE: 6
NOT RETURNED: 3 Cantrell, Darguzas, Loviska

8505-30 - (Chapter 4): Accept
SUBMITTER: Technical Committee on Stoker Operations
RECOMMENDATION: Relocate Chapter 4 in its entirety, as new
Appendix B, Fuel, Number accordingly.
SUBSTANTIATION: This material is explanatory and does not
belong in the body of the standard.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION: AFFIRMATIVE: 6
NOT RETURNED: 3 Cantrell, Darguzas, Loviska

8505-31 - (5.1 through 5.3): Accept
SUBMITTER: Technical Committee on Stoker Operations
RECOMMENDATION: Relocate Sections 5.1 through 5.3, with
figures as a new Appendix C, Stoker Descriptions. Number accordingly.
SUBSTANTIATION: This material is explanatory and belongs in the
appendix.
COMMITTEE ACTION: Accept.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION: AFFIRMATIVE: 6
NOT RETURNED: 3 Cantrell, Darguzas, Loviska

8505-32 - (5.4): Accept
SUBMITTER: John C. deBuyster, El DuPont Co., Inc.
RECOMMENDATION: Revise Section 5-4 as shown:
5.4 Fuel Burning System.
5.4.1 Functional Requirements.
5.4.1.1 The fuel burning system shall function to continuously
convert any ignitable furnace input into unreactive products of
combustion at the same rate the fuel and air reactants enter the
furnace.
5.4.1.2 The fuel burning system shall be properly sized to meet
the operating requirements of the unit, shall be compatible with
other boiler component systems, and shall be capable of being
controlled over the full operating range of the unit.
5.4.2 System Requirements.
5.4.2.1 The fuel burning system shall consist of the following
subsystems: air supply, fuel supply, grate, furnace, combustion
products removal, and ash removal. Each subsystem shall be
properly sized and interconnected to satisfy the functional
requirements and not interfere with the combustion process.
5.4.2.2 The fuel burning system shall provide means for safe start-
up, operation, and shutdown of the combustion process. This
shall include appropriate openings and configurations in the
components' assemblies to permit suitable observation,
measurement, and control of the combustion process.
5.4.2.3 The fuel burning system shall include the following:
(a) Air Supply Subsystem.
1. The air supply equipment shall be properly sized and
arranged to ensure a continuous steady airflow for all operating
conditions of the unit.
2. The arrangement of air inlets and ductwork shall minimize
contamination of the air supply by such materials as water and fuel.
Appropriate drains and access openings shall be provided.
(b) Fuel Supply Subsystem.
1. The fuel supply equipment shall be properly sized and
arranged to ensure a continuous, controlled fuel flow adequate for
all operating requirements of the unit.
2. Fuel unloading, transfer, and preparation facilities shall be
designed and arranged to properly size the fuel, remove foreign material, and minimize interruption of fuel supply.
This includes fuel sizing equipment and magnetic separators
when necessary.
3. Mass fired municipal solid waste fired systems shall
incorporate fire detection and fire extinguishing systems into and
over the feed system to extinguish and control the flashbacks of fuel
or the unit out of service. See NFPA 850 for additional requirements.
(c) Furnace Subsystem.
1. The furnace shall be properly sized and arranged with respect
to the grate subsystem so that the grate can be fire to maintain
stable combustion and minimize furnace pressure fluctuation.
2. Properly placed observation ports shall be provided to permit
inspection of the furnace and grate. Refer to Section 4.9.
3. Observation ports and lancing doors for mass fired MSW units
shall be provided with vision ports that will permit observation and
operation of the unit while puffs are expected and occurring.
4. Glasses shall be replaceable without taking the unit out of service.
Consideration shall also be given to the use of protective control loops similar to those shown
in Chapter 5 of NFPA 85C, modified or simplified in accordance with
the manufacturer's recommendations to apply to stoker usage.
(d) Combustion Products Removal Subsystem.
1. The flue gas duct, fan(s), and stack shall be properly sized and
arranged to remove the products of combustion at the same
rate that they are generated by the fuel burning process.
2. Convenient, appropriate access and drain openings shall be
provided.
3. The flue gas duct system shall be designed so that it will not
contribute to furnace pulsations.
(e) Ash Removal Subsystem.
1. The grate subsystem and flue gas cleaning subsystem shall be
sized and arranged to remove the ash at least at the same rate it is
generated by the fuel burning process during unit operation.
2. Convenient access and drain openings shall be provided.
SUBSTANTIATION: Modified wording to reflect change to a
standard. Revised implantion provisions to be more specific and
consistent with NFPA 8502, but still recognizing stoker needs.
Revised per Committee discussions.
COMMITTEE ACTION: Accept.
1. Accept the proposal, except renumber the proposed section
from 5-4 to 4-1, and locate in new Chapter 4, Equipment
Requirements.

(NFPA 8505 — F97 ROP)
6-4.1 The firing rate shall be regulated by increasing or decreasing the fuel and air supply simultaneously to the grate(s), maintaining normal air/fuel ratio and fixed firing rates.

6-4.2 Each stoker has adjustments for the distribution of the fuel. Manual adjustments for distribution of fuel are made from visual observation of the fuel bed, furnace, and oxygen analyzer. Visual observations of the fuel bed conditions through open doors shall be made with extreme care. (See Section 9.9 and 9.10.)

6-4.3 Manual adjustments to the individual rows of overfire turbulence air nozzles for maximum furnace efficiency and minimum emission discharge shall be permitted.

6-4.4 Fuel shall be fed to maintain an even depth of ash. As the percent of ash in the fuel changes, it might be necessary to make adjustments. It is necessary to observe the depth of ash at the discharge end of the grate.

6-5 Normal Shutdown. Normal shutdown procedure shall be as follows:

(a) Manually reduce the boiler load to minimum load.
(b) Fuel shutoff gates, where furnished above the fuel feeders, shall be closed.
(c) Remaining fuel after the shutoff gate shall be burned out.
(d) Normal furnace draft shall be maintained throughout this process.
(e) Overfire air fan shall be left running.

Exception: This rule may not apply to boilers where manufacturer’s recommendations state otherwise.
(f) After fuel feed ceases and the fire is burned out, the overfire air and forced draft fan shall be operated in accordance with the manufacturers recommended cool down rate. The overfire air fan shall be left running until the furnace and boiler are sufficiently cool to prevent damage to the overfire system from a back flow of hot gases safety interlocks.

(g) Where the forced draft fan is shut off, a natural draft flow of air through the grates shall be provided.
(h) For spreader stokers, fuel feeders with rotating devices shall be left running to maintain even temperature until the furnace has cooled sufficiently to prevent damage to these rotating devices.

6-6 Normal Hot Start.

6-6.1 When it is desired to restart the unit after it has been bottled up under pressure for a short time, and grate burning has stopped, the start procedure shall be as follows:

(a) Verify that the fuel feed system is clear of foreign material and operational.
(b) Feeder control operational through full range.
(c) All air and flue gas control dampers operational through full range.
(d) Proper drum level established.
(e) Oxygen and combustible analyzers, where provided, operating satisfactorily.

(f) The vent and drain valves shall be set in accordance with the boiler manufacturer’s instructions.

6-6.2 When it is desired to restart the unit after it has been bottled up under pressure, the start procedure shall be as follows:

(a) Verify the open flow path from the inlet of the forced draft (FD) fan to the stack. Where there is not sufficient natural draft for initial firing, the induced draft fan shall be started and normal furnace draft maintained
(b) Fill feeder hopper with fuel, start feed mechanism, and establish a bed of fuel on the grate.
(c) Spray the fuel bed with a light coat of distillate oil or place gasoline, alcohol, or other highly volatile material shall not be used for light-off.
(d) Open furnace access door, light a torch, and ignite fuel by passing torch through the door.
(e) When the bed of fuel is burning, start ID fan, where the ID fan is not in operation, and place the draft control in automatic mode of operation.
(f) Undergrate air pressure shall always be greater than furnace pressure to prevent reverse flow.
(g) When fuel bed is actively burning, start FD fan with dampers at minimum position.
(h) The overfire air fan shall be started immediately to prevent damage from gases passing through the ductwork.
(i) Start fuel feed. Operate observation and adjust fuel rate and air as required until boiler steam pressure is at desired operating pressure.
(j) Place fuel and air in automatic mode of operation.

6-3.1 Consideration shall be given for the operation of auxiliary fuel burners when starting up and firing high moisture fuel.

6-3.2 Where a boiler is equipped with auxiliary gas or oil burners, it shall be permitted to put the boiler using this auxiliary fuel and then feed the solid fuel up on the grate, where it will ignite from radiant heat of the auxiliary burners. Care shall be taken to protect the grate from overheating.

6-3.3 Start-up procedures for other wastes, as described in Appendix A are dependent on the characteristics of the particular waste. In all cases, manufacturer’s instructions shall be consulted.

6-4 Normal Operation.
6-7 Emergency Shutdown. In all of the following situations, manufacturer's emergency procedures shall be considered.

6-7.1 For emergency shutdown caused by an interruption of fuel when the fuel supply cannot be restarted in a very short length of time, the normal shutdown procedure shall be followed.

6-7.2 Loss of the induced draft fan would require that:
(a) The ID damper go into the full open position.
(b) The fuel feed immediately shut off.
(c) The forced draft fan shut down.
(d) The forced draft damper go into the closed position.
(e) Overfire air fan shall remain running, and overfire airflow dampers placed in the closed position.

6-7.3 Loss of the forced draft fan shall require immediate:
(a) Shutdown of fuel feed.
(b) Detailed, knowledgeable planning for effecting repair or modifications using qualified personnel, procedures, and equipment.
(c) Use of comprehensive equipment history that records conditions found, maintenance work done, changes made, and date of each.
(d) Written comprehensive maintenance procedures incorporating the manufacturer's instructions to define the tasks and skills required shall be provided. Any special techniques, such as nondestructive testing or those tasks necessitating special tools, shall be specified. Special environmental factors such as temperature limitations, dusts, contaminated or oxygen-deficient atmospheres, and limited access or confined space restrictions shall be included.
(e) Shutdown maintenance inspections, comprehensive in scope, to cover all areas.
(f) Sufficient available spare parts meeting specifications that provide reliable service without necessitating make-shift repairs.
(g) An inspection and maintenance schedule shall be established and followed.

6-7.4 An emergency shutdown caused by loss of feedwater would require:
(a) Low Drum Level.
1. Stop all fuel feed(s).
2. Decrease combustion air and maintain furnace draft.
3. Close all fuel feed(s) that supply combustion air to the unit.
4. Continue running ID fan with combustion air damper at minimum setting to limit continued combustion of the residual fuel bed.

(b) High Operating Steam Pressure.
1. Reduce all fuel feed(s).

(c) The forced draft fan shut down.

6-7.5 Critical Emergency Situations. Critical emergency situations requiring action are:

(a) Low Drum Level.
1. Stop all fuel feed(s).
2. Decrease combustion air and maintain furnace draft.
3. Close all fuel feed(s) that supply combustion air to the unit.
4. Continue running ID fan with combustion air damper at minimum setting to limit continued combustion of the residual fuel bed.

(b) High Operating Steam Pressure.
1. Reduce all fuel feed(s).

5. In proposed Section 6-6.1(g), add the following to the end of the sentence:
   "into the furnace. The caution statement was added to address a concern over negative drafts. Purging is covered by Chapter 1. Other changes for editorial correction and correlation with other NFPA 85505 and documents.

6. In proposed Sections 6-3(0 and 6-6.1(g), change "is burning" to "has ignited".

7. In proposed Section 6-6.2(e), delete the words "When the bed of fuel is burning."

8. After proposed Sections 6-3(0, 6-6.1(b), 6-6.2(e), 6-7.3, and 6-7.5(a), add a new Caution statement as follows:
"Caution: Excessive negative draft can cause fuel to be pulled from the feeders onto the grate."

9. In proposed Section 6-7.1, change "cause" to "caused".

10. Revise proposed Section 6-8 as follows:
6-8* Multifuel Firing.

6-8.1 The total fuel input shall be limited to the maximum design steam raising capacity of the boiler.
6-8.2 An adequate amount of excess air shall be maintained at all times by continuously observing the burner flames, the air/fuel ratio, or an oxygen indicator, where provided.

11. In proposed Section 6-9, place material following proposed Section 6-9 (Beginning with the words "Air/Fuel Ratio Control") in new Appendix A Section A-6.8.

12. Delete proposed Section 6-9 in its entirety.

COMMITTEE STATEMENT: Stoker fired units should never be lit from inside the furnace. The caution statement was added to address a concern over negative drafts. Purging is covered by Chapter 1. Other changes for editorial correction and correlation with other NFPA 85505 and documents.

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9

VOTE ON COMMITTEE ACTION: AFFIRMATIVE: 6
NOT RETURNED: 3 Cantrell, Darguzas, Loviska

SUBMITTER: Technical Committee on Stoker Operations
RECOMMENDATION: Insert a new Chapter 6 as follows:

Chapter 6 Maintenance, Inspection, Training, and Safety

6-1 Maintenance and Equipment Inspection.

6-1.1 The objective of a maintenance program is to identify and correct conditions that adversely affect the safety, continued reliable operation, and efficient performance of equipment. A program shall be provided for maintenance of equipment at intervals consistent with the type of equipment used, service requirements, and manufacturers' recommendations.

6-1.2 As a minimum, the maintenance program shall include the following:
(a) In-service inspections to identify conditions that need corrective action or further study.
(b) Detailed, knowledgeable planning for effecting repair or modifications using qualified personnel, procedures, and equipment.
(c) Use of comprehensive equipment history that records conditions found, maintenance work done, changes made, and date of each.
(d) Written comprehensive maintenance procedures incorporating the manufacturer's instructions to define the tasks and skills required shall be provided. Any special techniques, such as nondestructive testing or those tasks necessitating special tools, shall be specified. Special environmental factors such as temperature limitations, dusts, contaminated or oxygen-deficient atmospheres, and limited access or confined space restrictions shall be included.
(e) Shutdown maintenance inspections, comprehensive in scope, to cover all areas.
(f) Sufficient available spare parts meeting specifications that provide reliable service without necessitating make-shift repairs.

6-1.3 An inspection and maintenance schedule shall be established and followed.

6-1.4 Operation, set points, and adjustments shall be verified by periodic testing, and the results shall be documented.

6-1.5 Defects shall be reported and corrected, and the repairs shall be documented.

6-1.6 System configuration, including logic, set points, and sensing hardware, shall not be changed without evaluation and approval of the effect.

6-1.7 Inspections, adjustments, and repairs shall be performed by trained personnel, using tools and instruments suitable for the work. Maintenance and repairs shall be performed in accordance with the manufacturer's recommendations and applicable standards and codes.

6-2 Training.
6-2.1 Operator Training.
SUMMARY:

The committee voted to accept in principle a new chapter focusing on maintenance and training. The chapter includes revisions to existing sections and new content on maintenance, training, and safety requirements. The following changes were made:

- Changes were made to calibration checks and oxygen analyzer readings to require them to be consistent with changes in equipment and personnel.
- Procedures for maintaining air distribution, fuel feed mechanisms, and grate drive shear pins were updated.
- Training programs were emphasized to ensure personnel are current with changes in equipment and personnel.
- Safety requirements were updated to include access or confined space restrictions.

COMMITTEE ACTION:

COMMITTEE STATEMENT:

The committee voted to accept the new chapter as a reference to the changes made to the existing NFPA 8505 series standards.

RECOMMENDATION:

Revise Chapter 8 as shown: Chapter 8 Training

8-1.1 A formal training program shall be established to prepare personnel to operate equipment safely and effectively. This program can consist of a review of operating manuals and videotapes, programmed instruction, testing, use of simulators, and field training, among others. The training program shall be specific to the equipment and potential hazards involved.

8-1.4 Operating procedures shall be reviewed periodically to keep them current with changes in equipment and personnel.

8-2.2 Maintenance procedures shall be established to cover routine and special techniques. Any potential environmental factors such as temperature limitations, dust, contaminated or oxygen-deficient atmospheres, internal pressures, and limited access or confined space restrictions shall be included.

8-2.3 Procedures shall be consistent with safety requirements and the manufacturer's recommendations.

8-2.4 Procedures shall be reviewed periodically to keep them current with changes in equipment and personnel.

VOTE ON COMMITTEE ACTION:

AFFIRMATIVE: 6

NOT RETURNED: 3

NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9

VOTE ON COMMITTEE ACTION: AFFIRMATIVE: 6

NOT RETURNED: 3

Cantrell, Darguzas, Loviska
VOTE ON COMMITTEE ACTION: AFFIRMATIVE: 6
NOT RETURNED: 3 Cantrell, Darguzas, Loviska

NFPA 8505 — F97 ROP

9-1 General. Protective clothing, including but not limited to hard hats and safety glasses, shall be used by personnel during maintenance operations.

9-2 Confined Spaces.
9-2.1 A confined space is any work location or enclosure in which any of the following may exist:
   (a) The dimensions are such that a person 6 ft (1.8 m) tall cannot fully stand up in the middle of the space, or extend his or her arms in all directions without hitting the enclosure.
   (b) Access to or from the enclosure is by manhole, hatch, port, or other relatively small opening that limits ingress and egress to one person at a time.
   (c) Confined spaces include but are not limited to ducts, heaters, windboxes, cyclones, dust collectors, furnaces, bunkers, or bins.

9-2.2 Specific procedures shall be developed and used for personnel entering confined spaces and shall:
   (a) Positively prevent inadvertent introduction of fuel, hot air, steam, or gas.
   (b) Positively prevent inadvertent starting or moving of mechanical equipment or fans.
   (c) Prevent accidental closing of access doors or hatchs.
   (d) Include tags, permits, or locks to cover confined space entry.
   (e) Determine need for ventilation or self-contained breathing apparatus where the atmosphere may be stagnant, depleted of oxygen, or contaminated with irritating or combustible gases.

Tests for an explosive or oxygen-deficient atmosphere shall be made.

9-3.1 In addition to the general provisions of Section 9-1, additional specific provisions for entering and working in fuel bunkers or bins shall be made, recognizing the high probability of the presence of combustible or explosive gases and the hazards associated with shifting or sliding fuel.

9-3.2 No one shall be permitted to enter fuel bunkers or bins without first notifying the responsible supervisor and obtaining appropriate permits, tags, clearances, etc.

9-3.3 The responsible supervisor shall inspect the bunker, see that all necessary safety equipment is on hand, and that a safety attendant, who will have no other duties during the job, is also on hand. The supervisor shall review with the safety attendant and the workers the scope of the job and safety procedures to be followed.

9-3.4 No smoking, flames, or open lights shall be permitted. All lamps shall be suitable for Class II, Division 1 locations as defined in NFPA 70, National Electrical Code.

9-3.5 Tests shall be made for the presence of an explosive and oxygen-deficient atmosphere in a bunker or bin. If such an atmosphere is found, positive ventilation shall be provided and entry prohibited until the atmosphere returns to safe limits.

Sufficient retests shall be made during the course of the work to ensure a safe atmosphere, and if it is not maintained, the bunker shall be evacuated.

Exception: A nonexplosive, oxygen-deficient atmosphere may be entered with suitable breathing apparatus.

9-3.6 No person shall enter a bunker containing burning fuel.

9-3.7 No person shall enter a bunker or walk on the fuel unless the safety attendant is present and the person is equipped with a safety belt or harness and lifeline. The lifeline shall be secured to an adequate support above the person and shall have only sufficient slack to permit limited movement necessary to perform the job. The lifeline shall be manila rope at least 1/2 in. (12.7 mm) in diameter, or equivalent, in good condition.

9-3.8 The safety attendant shall remain outside or above the bunker and shall keep the workers in full view at all times. An adequate means of communication shall be provided to the safety attendant in case additional help is needed.

9-3.9 Whenever practical, work shall be done from platforms, ladders, scaffolds, etc., rather than from the surface of the fuel itself.

9-3.10 No one shall walk on or work on a fuel surface that is more than 3 ft (0.9 m) lower than the highest point of the surrounding fuel, in order to avoid the possibility of being covered by sliding fuel.

9-3.11 Full-face respirators or respirators and goggles shall be worn where dust conditions make them necessary, as directed by the responsible supervisor or the safety attendant.

9-4 Housekeeping.

9-4.1 Good housekeeping is essential for safe operation and prevention of fires or explosions; therefore, provisions shall be made for periodic cleaning of horizontal ledges or surfaces of buildings and equipment to prevent the accumulation of combustible dust or deposits.

9-4.2 Creation of dust clouds shall be minimized during cleaning. Compressed air shall not be used to dislodge fuel dust accumulations; water washing or vacuum cleaning methods are preferred.


9-5.1 Fire-resistant blankets or other approved methods shall be used in such manner as to confine weld spatter or cutting sparks.

9-5.2 A careful inspection of all areas near where welding or cutting has been done, including the floors above and below, shall be made when the job is finished or interrupted, and such areas patrolled for a period long enough to make certain that no smoldering fires have started.

9-6 Electrical Tools and Lighting.

9-6.1 Where flammable dust or dust clouds are present, sparking electrical tools shall not be used. All lamps shall be suitable for Class II, Division 1 locations as defined in NFPA 70, National Electrical Code.

9-6.2 Either ground-fault protected or specifically approved low voltage (6 to 12 volts) extension cords and lighting shall be used for all confined spaces and where moisture may be a hazard.

9-7 Explosion-Operated Tools. Explosion-operated tools and forming techniques shall not be used where combustible dust or dust clouds are present. When these operations become necessary, all equipment, floors, and walls shall be cleaned and all dust accumulation removed by an approved method. A careful check shall be made to be sure that no cartridges or charges are left in the work area.

9-8 Furnace Inspection.

9-8.1 Personnel shall be prevented from entering the furnace until slag deposits have been removed. Care shall be exercised to protect personnel from falling objects.

9-8.2 On overfeed mass burning stokers, the feed gate shall be blocked open to prevent accidental dropping of the gate.

9-9 On-Line Maintenance. Extreme care shall be exercised and furnace draft shall be increased and held while performing any maintenance that requires personnel exposure to the furnace, such as grate and feeder work. Appropriate protective clothing shall be worn while performing such maintenance. When possible, such repairs shall be performed with the unit shut down. Any work that would require the presence of personnel inside the undergrate plenum chamber while the unit is in operation is prohibited.

9-10 Access Doors or Observation Ports.

9-10.1 Proper protective clothing and face shields shall be used while viewing the furnace through access doors or observation ports and while manipulating the fuel or ash bed.

9-10.2 The furnace draft shall be increased before access doors or observation ports are opened, to prevent any potential blowback.

9-11 Ash Hopper Access Doors.

9-11.1 Fly ash hopper access doors shall not be opened while the boiler is operating. Hot or smoldering fly ash that may have bridged over the ash removal connection could cascade out of the door. Small capped clean-out connections shall be used at the hopper bottom for unplugging bridged fly ash.

9-11.2 Care shall be taken when opening ash hopper access doors after shutdown. Hot or smoldering fly ash that may have bridged over the ash removal connection could cascade out of the door. Care shall be taken to avoid stepping into accumulated ash while inspecting equipment. Fly ash may be smoldering long after unit shutdown.

9-11.3 Vertical lifting ash pit doors shall be securely blocked open prior to personnel entry.

9-12 Ash Handling. Hazards associated with ash handling include high temperature materials and dust. Appropriate protective equipment shall be utilized.
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9-13 Finely Divided Solid Fuels.
9-13.1 Characteristics of finely divided solid fuel approach those of pulverized fuel. Care shall be taken in the handling of these to prevent accumulations that could ignite spontaneously.
9-13.2 These fuels shall be handled separately from other solid fuels, and, therefore, special care shall be taken to follow safe design and operating procedures. Recommendations of the equipment manufacturer shall be followed.

SUBSTANTIATION: Modified text to reflect change to a standard and to be more consistent with other 8500 series documents.
COMMITTEE ACTION: Accept.

COMMITTEE STATEMENT: Change is strictly editorial.
NUMBER OF COMMITTEE MEMBERS ELIGIBLE TO VOTE: 9
VOTE ON COMMITTEE ACTION: AFFIRMATIVE: 6
NOT RETURNED: 3 Cantrell, Darguzas, Loviska