Development, Relationship of the ASME Boiler- and Pressure Vessel Committee and the National Board of Boiler and Pressure Vessel Inspectors

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National Board of Boiler and Pressure Vessel Inspectors

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Harrison, S. F., "Development, Relationship of the ASME Boiler-and Pressure Vessel Committee and the National Board of Boiler and Pressure Vessel Inspectors" (1972). International Compressor Engineering Conference. Paper 73. https://docs.lib.purdue.edu/icec/73

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In the late 1800s and early 1900s, boiler explosions occurred in a Brockton, Mass. shoe factory on March 10, 1905, leaving 57 persons dead and 117 injured along with a $250,000 property loss. In Lynn, Mass., another shoe factory boiler explosion occurred on December 6, 1906, causing one death, several injuries, and a property loss of $422,000. These two losses resulted in the Commonwealth of Massachusetts enacting a boiler law on May 29, 1907, that created a Board of Boiler Rules; and in August 1907, the first rules for construction, installation, and operation of steam boilers were passed. An air tank explosion in 1911 caused the Commonwealth to add unfired pressure vessel rules to the boiler rules. This created the first legal code rules for construction of steam boilers and pressure vessels. The State of Ohio issued a similar boiler construction code in 1911.

The American Boiler Manufacturers Association, organized in 1887, tried to set up general acceptance standards. The fear of one another as competitors and reluctance to relinquish individual pet practices prevented agreement, but the report that was prepared nevertheless resulted in individual manufacturers materially improving their products.

In 1911, after many years of unsuccessful efforts to promote adoption of boiler construction standards, a member of the American Boiler Manufacturers Association was elected president of the American Society of Mechanical Engineers, and he succeeded in persuading the Council of the Society to appoint a committee to formulate standard specifications for the construction of steam boilers and other pressure vessels and for their care in service. The first Boiler and Pressure Vessel Code Committee consisted of seven members, including one consulting engineer, two professors of engineering, two boiler manufacturers' representatives, one material manufacturer's representative, and one boiler insurance inspection engineer.

The result of their work was the first ASME Boiler and Pressure Vessel Code, Section I, Power Boilers. It made its appearance in 1914 and became an official document in 1915. Other sections were published subsequently:

1921, Section III, Locomotive Boilers (in 1962, this section was integrated with Section I, and Section III was assigned to nuclear vessels).

1922, Section V, Miniature Boilers (also integrated into Section I in the 1962 edition).

1923, Section IV, Low Pressure Heating Boilers (Heating Boiler Code rewritten in 1965).

1924, Section II, Materials.

1925, Section VIII, Unfired Pressure Vessels (now known as the Pressure Vessel Code, Divisions 1 and 2, 1968 edition).

1926, Section VII, Care of Power Boilers.

1937, Section IX, Welding Qualifications.

1963, Section III, Nuclear Vessels.

The Code Committee has grown since its beginning in 1911 and the issuance of its first Boiler Code as an official document in 1915. Today it is referred to as the ASME Boiler and Pressure Vessel Code Committee and consists of the main committee, a conference committee, an executive committee, 12 standing subcommittees, and a varied number of subgroups, special committees, and task groups—a total of 55 groups. The total membership of all the committees is in the neighborhood of 565 persons.

By the year 1919, only the ASME Boiler Code, Section I, was in existence; and some 17 jurisdictions had adopted some type of boiler law, each with its own set of boilers rules. Even though they had adopted the ASME Boiler Code, the various jurisdictions had added rules and regulations to establish requirements beyond the minimum requirements of the Code. Each jurisdiction had its own qualification requirements and examinations for shop
and field inspectors.

After they had adopted the ASME Boiler Code, the jurisdictions continued to require that boilers be stamped with individual state or city standard stamps and that shop inspectors be qualified under their individual regulations. Thus, if a shop inspector was to become qualified to make shop inspections of boilers for the various states and jurisdictions, he was required to pass an examination in each city and state. When a boiler was built for stock or its destination was not known on completion, the manufacturer was required to affix each state and city standard stamp on the boiler. This required as many as 17 standard stamps to show that the authorized shop inspector was qualified under the requirements of each of the jurisdictions represented by these stamps.

Under these conditions, a construction standard could not exist; indeed, one did not exist.

In 1919, several chief boiler inspectors who were in charge of the boiler and pressure vessel inspection departments of the states and municipalities that had laws regulating the construction and installation of boilers formed the National Board of Boiler and Pressure Vessel Inspectors. Their purpose was to promote greater safety to life, limb, and property by securing concerted actions in maintaining uniformity in the construction, installation, inspection of steam boilers and other pressure vessels and their appurtenances, and also to secure interchangeability between political subdivisions of the United States and Canada.

The Uniform National Board Examination, Qualification and Acceptance Standards for Boiler and Pressure Vessel Inspectors were established in the bylaws of the National Board; and they are recognized and accepted by all the states and cities of the United States and by all the Canadian provinces. The chief boiler and pressure vessel inspectors of the various states and large cities of the United States and the Canadian provinces form the membership of the National Board.

The concept of inspection during construction by an independent third party inspector, employed by a recognized inspection agency responsible neither to the manufacturer nor the purchaser, is largely responsible for the high esteem with which the ASME Boiler and Pressure Vessel Code is regarded throughout the free world today. Recognized inspection agencies include states and cities of the United States and the Canadian provinces that have adopted one or more sections of the ASME Boiler and Pressure Vessel Code in their safety laws and also insurance companies that are authorized to write boiler and pressure vessel insurance in those various jurisdictions. Boilers and pressure vessels that are inspected during construction by a third party qualified inspector holding a National Board Commission and employed by a recognized inspection agency can be registered with the National Board with assurance of their acceptance in all of the states of the United States and the Canadian provinces during their useful life. Manufacturers’ data reports for such registered equipment are available at all times on written request to the office of the National Board of Boiler and Pressure Vessel Inspectors, Columbus, Ohio.

**WHY ASME AND BOARD STAMPS?**

The question is often asked, "Why is it necessary to stamp a boiler National Board in addition to the ASME symbol?" Primarily, the purpose of the stamp on a boiler is to identify its construction as being in compliance with a certain code standard. If it is stamped with an ASME symbol, this indicates that it was constructed in accordance with the requirements of the ASME Code. This Code provides for third party shop inspection and requires that such inspection shall be made by persons who have passed a written examination in any state of the United States or a Canadian province that has adopted the Code. The inspector must be in the employ of a state or municipality of the United States, a Canadian province, or a boiler and pressure vessel insurance company licensed to insure boilers and pressure vessels in the various states and provinces. Under this provision, it is possible that a state could have qualifications for shop inspectors that were not up to the standards of other states. Such an inspector could make shop inspections of boilers stamped with the ASME symbol, but a state whose qualification standards for inspectors were higher could not be expected to accept these boilers if they were stamped only with the ASME symbol.

A code of rules defining the construction of a boiler is one thing and the administration of such a code is another. A code is only a pious document until some jurisdiction says "Use it". Then it becomes law. We can have a uniform set of rules governing the construction of boilers; but if it is not uniformly enforced by qualified National Board commissioned third party inspectors who understand its provisions, we will get farther away from uniformity than we were in 1919 when there was no uniform code.

**WHAT IS THE NATIONAL BOARD?**

The National Board of Boiler and Pressure Vessel Inspectors is a non-profit organization which was organized in 1919. Its members are the jurisdictional authorities who administer boiler and pressure vessel laws in the States of the United States and the Provinces of Canada.

The object of this organization is stated in our constitution. The activities of the National Board has been and is presently directed at efficient and effective achievement of them as a means of promoting safety.

The objects of the National Board are:
1. To promote uniform enforcement of boiler and pressure vessel laws and rules.

2. To secure uniform approval of specific designs and structural details of boilers and pressure vessels, as well as of appurtenances and devices instrumental in the safe operation of such vessels.

3. To promote one uniform code of rules for, and one standard stamp to be placed on all boiler and pressure vessels constructed in accordance with the requirements of that code.

4. One standard of qualifications and examinations for inspectors who are to enforce the requirements of said code.

5. To gather and compile data and statistics useful to the members in their enforcement work on such boiler laws and rules, and to distribute these to the membership.

The relationships of the American Society of Mechanical Engineering Boiler and Pressure Vessel Committee and the National Board of Boiler and Pressure Vessel Inspectors is such that boilers and pressure vessels constructed in accordance with the ASME Code, stamped with the applicable ASME code symbol stamp, registered with the National Board, are acceptable across jurisdictional boundaries without difficulty.

The National Board, with the agreement of its members, have established a uniform examination for boiler and pressure vessel inspectors. The examination is forwarded to the members who monitor the examination and return the examination papers to the National Board for grading. The National Board's minimum requirements for experience and education of persons and the examination is acceptable to all the jurisdictions in the United States and the majority of the Canadian provinces.

The National Board provides channels of communication from the jurisdictional authorities, and the shop inspector to and from the ASME Boiler and Pressure Vessel Committee by which the third party inspector may be informed of the latest code revisions and interpretations. We may also find an answer to any of his or her questions. This assures the users and owners and the manufacturers that he need not be subjected to personal judgement or whim of any one particular segment or inspector. The National Board works hand-in-hand with the jurisdictional authorities and the ASME in establishing the competency of the manufacturers to obtain authorization for use of the ASME Code Symbol Stamp.

The National Board has two permanent files of all registered boiler and pressure vessel data report forms. Over 8,000,000 of these records are easily found in our files. However, these records are not always found after some years, in the manufacturers' files. This information is required for installation, a majority of repair and resale of vessels.

The Manufacturers' Data reports are always available to the manufacturer of the vessel and the jurisdictional authorities where the vessel is located at no charge when registered with the National Board.

In our opinion, the survey review and audit activity, the quality controls and quality assurance programs used in manufacturers' plants are very worthwhile both to the public and to the jurisdictional authorities. However, by the same token, we must emphasize the importance of the jurisdictional authorities to the success of the surveys, reviews and audits and in turn the ASME Code. The state and provincial authorities, which are our National Board members have been designated by their jurisdictions to enforce the various ASME boiler and pressure vessel safety codes adopted by the jurisdiction. Also, it should be pointed out that they play a very prominent part in influencing state legislators to adopt the various boiler and pressure vessel safety laws.

It is very necessary that the chief inspector or his representative be present on each survey or audit because he is responsible for administering the Code as Law. It is the jurisdictional representative who gives legal status to the survey or audit team insofar as his jurisdiction is concerned.

The authorized inspector, who may be employed by a jurisdiction or an authorized boiler and pressure vessel insurance company inspector, is deputized by the state or provincial authorities to enforce the safety rules that have been adopted. Inspection laws adopted by the various jurisdictions follow closely, the pattern set by the Uniform Boiler and Pressure Vessel Laws Society.

The authorized inspector plays an important part in the survey and should be encouraged to participate in as much of the survey or audit activity as possible in conjunction with the engineering specialist inspection agency. It is necessary for him to understand the entire concept of the survey and the reason why it is felt that a definite system must be established within a given company because after the survey team has left, it is up to the authorized inspector to audit the Manufacturer's Quality Control Program, designate hold points in the manufacturing traveler, perform inspections required and see that the provisions of the Quality Assurance Manual developed by the manufacturer and accepted by the survey team during their visits in the plant is followed. Once the survey team has left, changes in the Quality Assurance Manual and the Quality Control Program may be made only with the acceptance of the authorized inspector through his agency and it is very important that he have a complete understanding of the need for certain requirements and the need for a con-
trolled system so that his judgement will be along the lines of the intent of the ASME and National Board requirements.

The National Board has been involved in a training program in an effort to keep its members and the third party authorized commission­ed inspectors abreast of changes since its existence, but the advent of the nuclear code it conducted its first formal training program in August, 1967. Since that time, our course on Fabrication, Inspection and Nondestructive Examination of Welded Pressure Vessels has been offered twice a year and is available on a first come, first serve basis to inspectors from both jurisdiction and authorized insurance companies that hold an active National Board Commission. The ASME Boiler and Pressure Vessel Committee recognizing the added burden, duties and responsibility being placed on authorized inspectors as a result of requiring the use of many nondestructive methods on materials and fabrications, wisely included a requirement for what is known as an engineering specialist. In order to have personnel to fill the position of an engineering specialist, a short course was held in New York City in June 1966. Information was presented on Quality Assurance and the various Nondestructive Test Methods as a refresher for representatives from jurisdictions and authorized inspection agencies.

The National Board, in recognizing a need to keep their membership abreast of changes in Nondestructive Test Methods included in the various ASME Code Sections, conducted a training course in Columbus, Ohio in the summer of 1967. Each training course is conducted using professors from Ohio State University Department of Welding Engineering and the National Board Staff.

Subsequent to that first course, the National Board Training Course has been offered twice a year with each session lasting two weeks and using the same instructors. Enrollment in the course is held to forty (40) members. Since 1967 we have given nine (9) training schools at a cost to the National Board of more than $125,000 which covers only 12% of the National Board Commissioned Inspectors.

The program is directed toward updating the authorized shop inspector according to the latest quality control and inspection requirements of the ASME Codes. Some of the general topics covered in the course are Arc Welding, Discontinuities in Wells, Distortion and Residual Stresses, Joint Fit-up, Liquid Penetrant, Magnetic Particle, Ultrasonic and Radiographic Examination Techniques, General Quality Assurance and Control, Welding, Material, Procedure Development and Welding Procedure and Perform­ance Qualification. During and at the end of each week of the course, all participants are given an examination to determine if they have comprehended sufficient materials to receive a passing grade.

The training course is conducted by professionals in a professional manner for the improvement of inspectors so that they can better understand welding procedures, tests, non­destructive test methods and procedures, the theoretical aspects as well as the practical aspects: Thereby, putting them in a better position to carry out their duties as specified in the applicable safety construction code. The authorized boiler and pressure vessel insurance companies and the state jurisdictions are involved in a constant program of upgrading and the National Board School is one approach.

Our efforts are to keep authorized inspectors abreast of changes to make them competent in enforcement of the applicable ASME Code Sections adopted as law by the jurisdictions and in carrying out their duties with respect to safety protecting the public.

The course in Columbus is a cram training course for the improvement of our authorized third party National Board Commissioned Inspectors and is also accepted as a training course for the ASME engineering specialists. Designation of engineering specialist is the responsibility of the state, province or authorized insurance company for which the inspector is working.

Each year we work to more closely relate the course content with the ASME Code requirements. Additionally, we should mention that while in the past our examination for a National Board Commission has been primarily related to Section I, Power Boiler Code, we now include questions that cover other sections of the Code, especially NDE.

Another area that I would like to discuss with you today is the National Board's role in surveillance of reported Code violations. Most Code violations are reported by the jurisdictional authorities (shop inspectors) when they inspect a boiler or vessel received in their jurisdiction for installation: However, violations may be received from owners, users, inspectors or other agencies.

When there are violations of the boiler and pressure vessel codes, the manufacturer and the authorized National Board Commissioned Inspector both may be involved.

When a Code violation is found during an investigation, the National Board Commissioned Inspector is dealt with by the National Board Executive Committee, Hearing Committee, as per the National Board By-Laws. Findings of the investigation regarding the manufacturer are reported to the ASME Boiler and Pressure Vessel Committee with our recommendation for review, evaluation and action.

The National Board Commissioned Inspector is accountable to the jurisdictional authorities and the National Board of Boiler and Pressure
Vessel Inspectors for his duties.

The manufacturer is accountable to the ASME Boiler and Pressure Vessel Committee for his responsibility.

The National Board staff makes unannounced visits to the various manufacture shops of boilers and pressure vessels.

In addition, the National Board administers a Boiler and Pressure Vessel Law or at the jurisdiction's request the National Board staff makes an evaluation of the manufacturer's shop qualifications when he makes application for use of an ASME Code symbol stamp.

This service is also available to any jurisdiction that may wish to request the National Board to make these evaluations in their behalf.

The National Board financial support is obtained from the registration of Manufacturers' Data Reports for boilers and pressure vessels filed with the National Board surveys, audits, reviews and investigations of manufacturing shops.

As a result of the jurisdictional authorities, the National Board of Boiler and Pressure Vessel Inspectors, and the ASME Boiler and Pressure Vessel Committee activities, you rarely hear of a serious boiler or pressure vessel explosion in industrial, schools, buildings, institutions, places of public assembly, apartments and homes.

This is an indication that boilers and pressure vessels that are constructed, inspected and stamped in accordance with the requirements of the ASME Boiler and Pressure Vessel Codes and registered with the National Board are built and inspected by the highest safety standards.

National Board members form the conference committee of the ASME Boiler and Pressure Vessel Committee, and they serve on many subcommittees allowing the National Board and jurisdictional authorities to keep abreast of safety standards and to express opinions regarding safety standards and additions or changes to various Code sections.

HOW ASME CODE COMMITTEE WORKS

In general, the membership of each ASME subcommittee includes one or more members of the main committee. In nearly every case, the subcommittee chairman is a member of the main committee, an arrangement that has obvious advantages. The remaining members of a subcommittee are especially well informed in the particular field; and the membership is balanced with respect to representation from manufacturers; owners, users, material suppliers; jurisdictional and inspection authorities; U. S. Coast Guard, U. S. Navy, and other governmental agencies; private consultants; and other interested parties. This structure gives reason-

able assurance of proper consideration and action on the various problems encountered.

All inquiries that are received by the committee are screened by the secretary, who refers them to the chairman of the subcommittee, subgroup, or special committee involved in consideration of the subject. Many items are of such nature that consideration is required by more than one subcommittee.

A majority in a subcommittee is all that is necessary for a chairman to refer a subject to the main committee for final consideration. Unless the discussion at the main committee meeting indicates a pronounced difference of opinion, the chairman calls for a form of vote, and the vote is recorded in the minutes provided at least three-fourths of those members present and voting are in the affirmative. Any action at the main committee meeting on interpretations, revisions, new rules, or official communications is not final; it becomes effective only after letter ballot approval of the minutes containing the action. One negative letter ballot received within 12 days is sufficient to necessitate reconsideration of the question by the subcommittee involved. The reason for the negative vote must accompany the letter ballot. After the subject has been reviewed by the subcommittee and reported back to the main committee, the main committee's action is final and effective provided not more than two negative votes are received from Boiler and Pressure Vessel Committee members in this letter ballot, subject to approval by the council.

Affirmative actions are published in "Mechanical Engineering" magazine for comments. This is the mechanism by which manufacturers, users, and other interested parties may formally object to any actions taken by the Committee. Adverse comments on any items receive consideration and are acted on either affirmatively or negatively in the same manner as a new inquiry. If no unfavorable comments are received within 30 days after publication, an action of the main committee is approved by the Council of ASME. It is then published as an active Code interpretation case or a revision of the Code. Code interpretation cases are published as soon as practical after approval by Council and are immediately applicable. Code cases usually do not change Code rules; rather, they merely explain intent or provide permission to use new materials not yet covered by the Code. In those instances where they do change rules, however, the changes become acceptable upon issuance of the Code case and mandatory six months thereafter. Semi-annual addenda to the Code are published for the purpose of incorporating Code cases, eliminating inconsistencies of errors, clarifying intent, or incorporating new revisions. Use of these addenda is permissive on issuance and becomes mandatory six months after the date of issue, except for boilers and pressure vessels contracted for prior to the end of the six month period.
As a rule, new editions of the various Code sections are prepared every three years. The mechanics are such that new editions generally do not introduce revisions or changes in the rules but rather carry over into the documents those revisions and changes that have been issued in the form of addenda.

The ASME Boiler and Pressure Vessel Committee and the National Board of Boiler and Pressure Vessel Inspectors do not review or comment on specific designs. Such review is a duty of the authorized inspector and the inspection agency's engineering staff. The Committee will consider all inquiries submitted to the ASME secretary in the nature of requests for interpretations of existing Code requirements; requests for modifications, withdrawals, or additional rules; or requests for permission to use new materials.

The operations of the ASME Boiler and Pressure Vessel Code Committee are such that any interested party may participate in the development of new rules and the prevention of actions that might create hardships. All meetings of the main committee, subcommittees, subgroups, and special committees are open; and participation by guests and certainly by a person who has an inquiry before the committee is encouraged.

DUTIES OF INSPECTORS

The Code does not recognize inspection agencies as such; rather, it recognizes individuals classified as authorized third party inspectors. These inspectors have a duty to perform and must be satisfied that the minimum requirements of the Code are met in the construction of vessels, components, pumps, piping, and valves. They do not inspect to the requirements of a purchase specification; their inspections are based on the applicable Code requirements as a minimum standard.

Jurisdictional bodies and insurance companies enter into agreements or contracts with pressure vessel manufacturers and under these agreements incur obligations to provide manufacturers with third party inspectors, properly trained to handle the work projected by the manufacturers. Further, they have an obligation to equip the inspectors with the commissions necessary to satisfy jurisdictional authorities.

An inspector's job is limited to satisfying himself that minimum safety code requirements have been met in construction. Under these conditions, it cannot be expected that the authorized inspector be held legally responsible for the failure of a vessel to perform in service. Further, it is not expected that the authorized inspector or his employee be held legally responsible for the failure of a pressure vessel manufactured to Code requirements when misused. The intent of the Code is that the manufacturer is responsible for the pressure vessel manufactured by him for a given use.

Qualified inspectors servicing a manufacturer insist that the manufacturer have a quality assurance program in the plant or in field assembly, and it is desirable that the quality control people of the manufacturer answer to management and not production people.

The Code holds the manufacturer responsible for compliance with all of the requirements of the Code when he completes any vessel and marks it with a Code symbol and registers it with the National Board. In any violation of the Code and the boiler and pressure vessel laws, there are usually two persons involved: the manufacturer and the authorized National Board Commissioned Inspector. The laws provide penalties for either or both parties. In case of a violation, the inspector's commission of competency issued by the jurisdictional authorities can be revoked for cause. The inspector's National Board Commission may be suspended for cause after proper investigation by the National Board Executive Committee. The manufacturer's authorization to use ASME symbol stamps may be revoked after proper investigation. Therefore, any violation of the ASME Boiler and Pressure Vessel Code is reported by National Board members to the executive director of the National Board for investigation.

NEW: NUCLEAR CODE

On January 1, 1970, Section III requirements for nuclear piping, pumps, and valves became mandatory for contracts let after that date. This makes it mandatory for manufacturers and contractors of nuclear piping, pumps, and valves, to comply with Section III, quality assurance requirements. A manufacturer who fabricates a vessel, parts of a vessel, pumps, valves, or pressure piping, or joins such components by welding must have a valid certificate of authorization for the use of the appropriate Code symbol. The Code symbol may be applied by the manufacturer only after he has complied with all requirements of Section III with the approval of a qualified third party inspector.

The manufacturer's quality assurance program must be evaluated and approved for compliance by the Society initially and on each renewal of the certificate of authorization to use the applicable Nuclear Code symbol stamp.

The qualified inspectors and inspection agencies permitted to perform inspections required by this code are defined in Paragraph NA-5000.

To comply with the requirements of Section III, a manufacturer or contractor must first be surveyed by a nuclear survey team, which visits his plant or the location of field assembly on a nuclear job. The ASME survey team usually consists of one representative of the authorized third party inspection agency, as required by Paragraph NA-5000 of the Nuclear Code; one representative of the National Board of Boiler and Pressure Vessel Inspectors, usually the director of inspec-
tions, the executive director, or his designee; one or more ASME consultants, as designated by the secretary of the ASME Boiler and Pressure Vessel Committee; and one representative of the jurisdictional authority at the shop or job site.

The survey team's purpose is to compile a report dealing with the applicant's quality assurance capabilities at the plant or in the field. When the team is in accord as to its findings, the manufacturer is informed verbally, and a report is submitted to the secretary of the Boiler and Pressure Vessel Committee, who carries out the necessary procedures leading to issuance of a certificate of authorization to the manufacturer to use the applicable Nuclear Code symbol stamp.

WHAT'S NEEDED IN QUALITY CONTROL
The basic requirements of a manufacturer's or contractor's quality assurance program are:

1) All products or parts of products made by a manufacturer or those obtained from an outside supplier should be controlled at all points so as to assure conformance with the Code requirements.

2) A system should be established to provide for ready detection of nonconforming materials or processes and for timely and positive corrective action.

3) The authority of those in charge of quality assurance should be clearly established; freedom of responsibility to production personnel is required.

4) A system of drawing control is necessary so that the latest drawings, specifications, and Code requirements are in use for manufacturing and inspection.

5) A written description of procedures for control of quality (quality control manual) should be maintained.

6) A system of quality audits should be established within the manufacturer's plant.

7) A clearly defined system of record keeping, including proper forms, should be established.

To assist shop and field inspectors in implementing the Code, the National Board has developed a training course using the professional engineering staff of Ohio State University and the National Board.