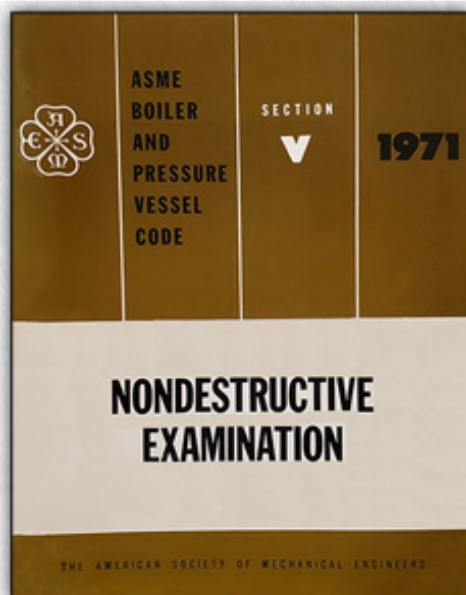
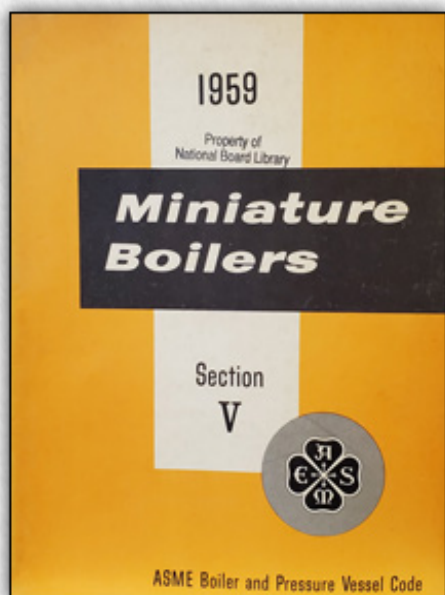


ASME's Section V: Nondestructive Examination

50th Publication Anniversary





Provided by the National Board of Boiler and Pressure Vessel Inspectors, April 2021
www.nationalboard.org

In celebration of ASME's Section V Nondestructive Examination 50th anniversary, the National Board is republishing from the National Board's archives two significant documents detailing the rebirth of the Section V code:

- From the National Board's thirty-ninth General Meeting held in 1970, "Panel Discussion on Section V, Nondestructive Testing, ASME Boiler and Pressure Vessel Code" led by E.C. Miller.
- From the National Board's fortieth General Meeting held in 1971, "Nondestructive Testing, Section V" led by R.C. Hudson and H.F. Jackson.

We trust you will recognize the valuable volunteer thoughts and efforts that went into the creation of the Section V NDE code which still resonates in the volunteer work being conducted today. Congratulations on this significant milestone and keep up all your good works!

Proceedings

FIFTIETH ANNIVERSARY
AND
THIRTY-NINTH GENERAL MEETING

THE NATIONAL BOARD OF
BOILER AND PRESSURE VESSEL
INSPECTORS

April 27-May 1, 1970

PANEL DISCUSSION ON SECTION V, NONDESTRUCTIVE TESTING, ASME BOILER AND PRESSURE VESSEL CODE

E.C. Miller

There was a bit of a misunderstanding yesterday. I was sitting in the back of the room when Mr. Harrison told about this session. He said I would be chairman of this panel.

This is a panel discussion on the proposed Section V, which will cover nondestructive testing. I would like to give you a bit of the history of this.

A good many years ago, probably 10 or 15 years, when the nuclear business started to occupy the concerns and interests of the Code, there was a special case, one of these famous or infamous N cases, dealing with nondestructive testing for nuclear applications. This material ultimately got into Appendix IX of Section III a few years back.

In the meantime, material, essentially the same, for ultrasound, magnetic particle, and penetrant inspection, also got into Section VIII, and some into Section I, as appendices. These were all essentially the same, that is, they all had the same derivation, generally for Appendix IX of Section III, except that the drafts of Appendix IX were changing so fast that when one of the other sections picked it up, by the time it was published, it wasn't quite the same as the one that ultimately went into Appendix IX of Section III.

In any event, it was later decided that rather than have essentially identical appendices describing nondestructive testing procedures—not acceptance standards—but procedures (although we may have some acceptance standards by error which we are still trying to correct) in several Code Sections, these should really be in one document. We, in the Subcommittee on Nondestructive Testing, were charged with bringing this material together into a single document suitable for reference in all Sections of the Code.

This is what we have tried to do. There have been several drafts. Most of them have been internal drafts or drafts that have been cir-

culated only to the Main Committee. However, a draft in January of 1970 was circulated to the entire distribution, some 500 or more including the Main Committee, the various subcommittees, and all persons who normally receive the minutes, the agendas, and what-not. That also included the Conference Committee membership.

I suspect that most of you have received copies of this January, 1970, draft. This was intended to be an appendix to the minutes of the January meeting of the Main Committee.

At the time we asked for comments, and hoped, but not with any great expectation, that we might have this adopted at the March meeting. This did not appear feasible. We did, however, receive quite a number of comments, more than we could possibly handle at the March meeting, so these were reviewed in the subcommittee.

Additional comments were received and resolved by various methods, largely by telephone, and put into so-called corrections which were distributed with the March minutes. We also asked at that time that everybody try to get his comments in two weeks after the Main Committee meeting.

Well, this was accomplished in part, although I have probably a half dozen letters that I got last week which represent comments. In any event, we are hoping to present this to the Main Committee on Friday along with some proposed changes that may have resulted from the comments we received subsequent to the time we sent out these correction sheets in the hope that they can approve the technical content of this, recognizing that still further changes can be accomplished at the June meetings. At the June meetings we hope to get it in a sufficiently final form that it can go to press, because it is rather important that this be coordinated with the drafts of Sections I, IV, III and VIII. We will probably be in considerable trouble if—and they will also be in trouble—if they don't have something to reference. So, I beg your cooperation in helping us to achieve these objectives.

Much of this is based on Appendix IX of Section III. I hope that doesn't frighten you too much because we have tried to take into account the requirements of other Sections of the Code, and have

incorporated the relevant appendices from Sections I and VIII.

I mentioned the fact that these might be slightly different in their content, but basically they have the same origin. We have deleted from that portion of Appendix IX material pertaining to the quality assurance (QA) program. This will remain, I believe, an appendix of Section III. I understand that each of the other Sections of the Code is considering at this time what they should do about QA programs.

There are a few other things that we are doing or trying to do. We have added a section on Scope and Responsibilities. These define the duties of the manufacturer and the authorized inspector, but only when a referencing section, that is a vessel section, invokes some particular part of Section V.

I think it is extremely important to remember that Section V is not mandatory. Section I or Section IV can completely ignore the existence of Section V if it appears appropriate that they do so, but they can also reference any part of it. We hope that they don't ignore it completely. It is entirely up to the vessel sections as to what portions they adopt. The vessel sections also will have quite a bit to do. They will determine the acceptance standards, based on the methods contained in Section V.

There have been some questions that have come up. One is a complaint that we should define what we mean by manufacturer when we say the "duties of the manufacturer" in the Scope. All I can say there is that that manufacturer referred to in the Scope of Section V is exactly the same fellow who is defined as the manufacturer in Section I, in Section III, in Section IV and in Section VIII. That is the vessel manufacturer, not the materials manufacturer. If the materials manufacturer or producer is brought into the picture, it will be clearly stated that this is the fellow we are talking about.

There has been quite a bit of confusion in some of the comments that we have received because there are many portions of this that are not applicable to the materials manufacturer, although some people have assumed that this does represent restrictions on the materials manufacturer contrary to the specifications. It is conceiv-

able that they could be but only if the referencing Code says that they should be.

You will note, in looking at this document, that there are two articles on radiography; one is Article 2, the other Article 3. Article 2 is essentially what has been taken from Appendix IX of Section III which is somewhat more detailed in its requirements on radiography for nuclear applications. On the other hand, Article 3 is intended to represent essentially the equivalent of what is now in, I believe, Par. PW-51 and UW-51, the only difference really being a change in the penetrameter requirements, to essentially equivalent Par. UW-51 and PW-51 penetrameter requirements.

We have, in this case, attempted something that I think we should have done long ago, and that is to establish a single set of penetrameters across the board. We have done this by using the so-called ASTM E 142 penetrameter, and selecting the appropriate reference hole for specific applications; in other words, a larger reference hole when this appears appropriate.

We have introduced some realistic pipe radiographic standards. This is something that wasn't necessary in the vessel specifications, but as we get into nuclear piping, it is necessary that we have something that is consistent and workable, and I think we have accomplished this in Article 2.

You may find in your copy an Article 4—a still higher level of radiographic quality. This we have deleted for the present. It will be left blank in the published version of Section III because I don't think we can resolve the problems in time to meet the publication deadlines.

There have been a number of questions regarding Article 5, particularly Article T-511. Perhaps some of our people will talk about this, but that is outside the scope of my discussion.

There has been a recommendation that we completely eliminate the business on visual examinations. I should like to make a special plea for the inclusion of visual examination in this document. I think this has been one of the shortcomings of the Code.

We have a great many requirements in various Sections of the Code that the welds shall have a certain contour, they shall be this, that and the other thing: quite accurate description of what the welds and the finished fabrication shall look like, but no requirements that anybody actually look at the thing to see whether this has been done.

What our people have done is to go through the various Sections of the Code, pick out everything that appears to require visual examination and have made more or less a check list of these items, indicating that there should be a written procedure, again if using the Code decides this is what they want. This written procedure need be nothing more than a checkoff list of the things that should be looked at, there should definitely be a requirement that things be looked at if there is a rule that they conform to certain requirements that can be established only by visual examination.

The objection, incidentally, I think was with reference primarily to visual examination of material product forms which don't fall within the scope of what we are trying to do anyway.

Another thing, the leak testing requirements in the January draft of Section V have been completely revised, and I believe copies were included in the correction sheet.

We have a few other things, but I think it is time for me to turn this over to the people who are going to tell you about the actual content of these various sections of the Code. Mr. Harry Jackson, who was the secretary of the Subcommittee on Nondestructive Testing for several years and did practically all my work as chairman of the subcommittee, is quite familiar with the material that has gone into this. He is going to talk about approximately half of it, I am going to turn this over to Mr. Jackson at this point.

H.F. Jackson

Gentlemen, I believe I was too long at Oak Ridge with Mr. Miller. He seems to have covered a lot of the material that I have in this document. I was getting concerned at first, but then after a little while when he started off on Gil's topic I said, "Well, he is not picking on me. He has both of us in mind."

Frankly, it is quite a pleasure for me to have an opportunity to talk about the proposed Section V because I have worked with it over quite a period of time and worked with these people who have really been the ones to do the work. They fed the information to me, and I put it into a document in the early stages. Then, as many of you know, I skipped out on the secretary's job.

As Mr. Miller mentioned, the first draft of the current Section V was distributed to the ASME Subcommittee on Nondestructive Testing for review in March, 1967. Prior to that time, there had been considerable discussion among the administrators of the ASME Code relative to the feasibility of having such a document. After careful study by the Executive and Main Committees, it was decided that such a document would be beneficial. As a result, the Subcommittee on Nondestructive Testing, under the chairmanship of Mr. Miller, was asked to develop it.

After study of the proposed document, its contents and a look at the work involved in writing the document, such that it would accommodate all Sections of the Code without penalty either by upgrading or downgrading the requirements of any Code Section, it was decided that the completion target date of June, 1967, could not be accomplished; as you can see, we are a little beyond that date. However, Mr. B.F. Langer, Chairman of Section III, Nuclear Vessels, requested that the Subcommittee on Nondestructive Testing divert their efforts for a short time and, if possible, adapt the proposed Section V for use by ASME Section III.

This diversion was accomplished and labeled Appendix IX of ASME Code Section III. The Subcommittee on Nondestructive Testing worked closely with Section III and helped in the writing of Article 6 to include repair and acceptance criteria for the Section III document. The task of adapting the proposed Section V for Section III use was completed and the nondestructive examination and quality assurance requirements were published in the 1967 Winter Addenda to the 1965 edition of ASME Code Section III, thereby becoming mandatory July 1, 1968.

After inclusion of the document in ASME Section III, the Subcommittee on Nondestructive Testing, along with other assignments re-

sulting from questions asked by many of you people of the various jurisdictions, went back to the task of developing an ASME Code Section V intended to be referenced by all Sections of the ASME Code that specify nondestructive examination. This document was written for use in a manner similar to ASME Section IX on welding. The idea was to have one document that included all of the nondestructive test methods with the responsibility for review and maintaining it assigned to one subcommittee—the Subcommittee on Nondestructive Testing.

As mentioned earlier, it was intended that this document be written in such a manner that it could be referenced by all Sections of the Code without upgrading or downgrading the requirements of any of them.

Section V in itself is not intended to be a Section of the Code that stands alone or that can be referenced in its entirety. It becomes a requirement when specific articles or nondestructive test methods are referenced by another Section of the Code.

One advantage in having all nondestructive examination methods included in one document is to reduce the length of the various Code Sections. For example, at present ultrasonic examination of welds is included in ASME Section I as Par. PW-52; Section VIII, Division 1 as Appendix U; Section VIII, Division 2 and Appendix 9, Article 9-3, and also it is included in Section III, Appendix IX, Par. IX-340.

We have two problems with writing an NDT method in its entirety in four places: one, it is repetitious and makes our Codes longer; and two, each group that rewrites a method which has been written by another group is inclined to make minor changes which, in many cases, are not technical changes, nor are they intended to be technical changes, merely a change in wording because it sounds better, or at least to the person doing the writing, it is more easily understood.

Sometimes, in our attempt to make the Code or the Section of the Code we are rewriting sound better to us, we cause it to have a different interpretation for someone else. This lack of uniformity

places a burden on at least two groups of people—the manufacturer and the inspector.

We have placed a burden on the manufacturer in that if he happens to work to more than one Section of the Code, he may find that in order to satisfy his client or the inspector, he has to write two or more procedures to perform an examination to basically the same standard. Consequently, he has to train his people to operate a little differently for each of the different Codes, even though the intent may well have been that all were expected to accomplish the same quality examination.

The other group that has the problem is the inspector who must interpret the Code. He has to study carefully each of the four sections and try to pick out the somewhat less-than-prominent changes that exist. He then determines whether the real intent of the group that made the changes was to change the requirements of the particular examination method or whether they intended that the requirements be essentially the same as included in the other Sections of the Code.

Section V is written for acceptance by all Sections of the Code as a basic document to reference. In this manner, the words used would be the same for each Code Section unless a specific exception is taken by the referencing Code. If the referencing Code wishes to take exception to any part of Section V, it is accomplished in the referencing Code itself so that it stands out prominently, and so there is no question about the intent. The manufacturer or the inspector working to Section VIII, III, or I can take the procedure developed to satisfy the Section V document and modify it as specifically stated in Section VIII, Section III, or Section I which will result in a procedure for that test method that will satisfy the applicable document.

Consequently, the Section V approach provides clarification as well as decrease in bulk. Another advantage is that the responsibility for Section V rests with one group. The input from the various referencing Code committees, manufacturers, inspectors and the jurisdiction people back to that group can help them to consistently develop it into a better document. This input is necessary. It's a

must that persons involved in the application of and the committees of the Codes that reference Section V advise the Subcommittee on Nondestructive Testing about the problems they encounter in using it.

As mentioned earlier, the intent of Section V is to give you a Code that has in it the parameters for the various types of nondestructive examination. You will notice that some nondestructive examination methods are for a particular product form. In the case of radiography, provision is made for levels comparable to that required by Section III and Section I or VIII. As presently written in Section V, Article 2 results in radiographic technique and reporting equivalent to that presently included in Section III, and Article 3 results in radiographic practice equivalent to that contained in Sections I and VIII.

Section V includes the method of examination and the parameters or limits of that method relative to density requirements, maximum kilovoltage, the minimum kilovoltage, the type of film to be used, placement of the penetrameters, number of penetrameters required, etc. The procedure written by the manufacturer has to be within the stated parameters included in Section V. The methods described in Section V are not intended to be procedures. You will find several options for a given method included in Section V.

For example, the liquid penetrant section includes two methods of penetrant examinations—color contrast and fluorescent—and for each method there are three types. For each type the manufacturer needs a procedure to assure that the examination is performed properly. A statement that penetrant examination was performed to comply with Section V would mean nothing. I might add that the same applies to the existing Code requirements for penetrant examination. To be meaningful, the report would indicate it was done to a specific procedure for a specific method and type of penetrant. The referencing Codes—Section VIII, Section III, or Section I—indicate that the examination is to be performed in accordance with a particular method included in Section V. Unless stated to the contrary, the manufacturer has the option of either method or type included, but his procedure should be for the particular method or type chosen.

The referencing Code, after designating the type of examination to be performed, must include the acceptance criteria for the method. An example of this approach is contained in Section III. Article 6 of Section III requires that a specific examination be performed in accordance with the requirements of Appendix IX and includes acceptance criteria and repair requirements whenever applicable.

To reference Section V for liquid penetrant examination, the referencing Code Section would state liquid penetrant examination shall be performed to the requirements of Section V, Article 6 and the following acceptance standards shall apply.

Then they would include the acceptance standards desired for that particular Code Section. Typical acceptance standards are as given below.

The following relevant indications are unacceptable:

1. Any cracks and linear indications.
2. Rounded indications with dimensions greater than $3/16$ in.
3. Four or more rounded indications in a line separated by $1/16$ in. or less edge to edge.
4. Ten or more rounded indications, etc.

Also, the referencing Code would specify what to do if an unacceptable situation were found such as, repairs shall be made in accordance with the requirements of a particular paragraph in the referencing Code.

For Section V to be mandatory, a reference Code must invoke it and specify when it is required. Also, the referencing Code must specify the acceptance standards that would apply and the repair requirements applicable in the event defects are detected. Acceptance standards and repair requirements are not included in Section V because these particular areas may differ in each referencing Code; therefore, greater flexibility is achieved by including them in the referencing Code.

Again I repeat, that the methods described in Section V are not intended as procedures. They are methods and in order for them to be applied properly, the manufacturer must develop a procedure

for application of the particular method that he wishes to use. We encourage the use of written procedures.

I envision that each Section would require the manufacturer to have written procedures, but some probably would not require that they be a part of the permanent file. Without written procedures, you have no guarantee as to the effectiveness or repeatability of the test. Without them you have lost one of the concepts of the Code: To establish some minimum requirements that can be applied across the board and used as a base to build upon.

The next area I would like to discuss is the use of ASTM standards. We refer to ASTM as a sister society and they are considered a standards-writing group. We have two volumes of their material standards included in Section II. They write both material and nondestructive examination standards. Many ASTM nondestructive examination standards are referenced in the various ASME Sections of the Code.

The chairman of the Subcommittee on Nondestructive Testing stressed throughout the writing of Section V that we use ASTM standards if acceptable ones existed and work closely with the ASME-ASTM Liaison Committee in an attempt to have them modify their standards, if necessary, so that they would be applicable for ASME Code use. ASTM has responded to our requests in several instances where we have asked for modifications.

Subsection B of Section V contains ASTM documents recommended for adoption by ASME. It is the recommendation of the Subcommittee on Nondestructive Testing that these documents be adopted in the same manner as material standards are adopted, i.e., adopt them as SA or SB specifications and include a note beneath the title in a manner similar to what is done on the material specifications. For example, ASTM A 577-68 would be adopted with a note saying, "Identical with ASTM Specifications A 577-68, except that Section V, Article 1, general requirements, also applies." In the case of ASTM A 578, the note would take exception to certain requirements included and read, "Identical with ASTM Specifications A 578, except that Section V, Article 1, General Requirements, applies and supplementary requirements S8 and S9 do not apply."

In this manner, we hope to adopt ASTM specifications for most nondestructive examination methods. Problems encountered in the use of the adopted ASTM documents will be submitted to the ASME-ASTM Liaison Committee for consideration by ASTM.

As I mentioned earlier, it has been the desire of our subcommittee and the chairman has stressed it many, many times, if there is an ASTM standard written that will serve our purposes, use it, do not write one. I think this approach will be of great assistance to the enforcement groups as well as the manufacturer, in that once you have centered on one standard to use as your guide, you do not have to try to pick out the slight differences or decide if the intent has been satisfied.

Briefly, let's look at the contents of this document called Section V. I realize that I have taken considerable time in giving the philosophy behind it, the history of it, how it is intended to be used, but without that I don't believe you could understand why it is organized as it is. Obviously, the content of the document is too great to try to give a detailed discussion of each part, but I will try to cover briefly the main topics of each type of nondestructive testing included in Section V. My discussion will be based on the document issued as a January, 1970, draft of Section V.

Since publication of the January draft, we have received many comments, some technical and many editorial. We have published supplements and modification sheets to accommodate the requests for technical and some editorial changes recommended by the various groups and individuals. The remainder of the editorial comments will be taken care of during an extensive editorial review before submission to ASME for publication.

I realize that some of you may not have had an opportunity to look at this document, and so I prepared a table of contents or an outline on slides such that you can see some of the content involved.

Fig. 1 is the cover page of the document we are talking about. This, of course, has “Draft” written all over it and at this time it is a draft, but we recommend it for adoption.

JANUARY 1970

DRAFT- NOT FOR USE AS CODE

SECTION V

ASME BOILER AND PRESSURE VESSEL CODE

NONDESTRUCTIVE EXAMINATION

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

JANUARY 9, 1970

DRAFT- NOT FOR USE AS CODE

Fig. 1 Section V--Nondestructive Examination

Fig. 2 is an introduction to the volume indicating how the paragraphs are organized, the Scope, what is covered and how it is intended to be used. An opening statement in this document included under the Scope is, "The rules of this Section of the Code constitute requirements for nondestructive examination methods. The requirements are applicable to the extent specified and referenced by other ASME Code Sections, hereinafter referred to as the referencing Codes. Nondestructive examination methods used to detect surface and internal discontinuities in materials and fabrications are included in this Section of the Code."

Radiographic examination, magnetic particle examination, liquid penetrant, eddy current examination, ultrasonic examination, visual examination, and leak testing are included. Special standards written by the ASME are included in Subsection A for those examination methods for particular applications where an adequate ASTM standard is not available.

"In Subsection B, ASTM standards covering nondestructive examination methods, where available, have been adopted as ASME standards. Standards for acceptance are specified in the other Sections of the Code which invoke requirements of this Code Section."

Of particular interest in this section is a statement similar to one that was recently adopted by ASME Section III:

"Nondestructive examination methods as described are applicable to most geometric configurations and materials encountered in fabrication and shall be applied for normal conditions; however, special configurations in materials may be encountered that require modified methods and techniques. Where such special conditions are encountered, the manufacturer shall develop special procedures equivalent or superior to the methods and techniques described in this Section of the Code and capable of producing meaningful examination results under the special conditions. Such special procedures may be modifications or combinations of methods described in this Section of the Code and shall be proven by demonstration to result in an examination capable of detecting discontinuities under the special conditions to the same extent that applicable normal techniques, as included in this Section, would result in detection of discontinuities under normal conditions. Such special procedures

shall be submitted to the inspection agency in written form for approval after which it may be adopted as part of the manufacturer's quality control system. Manufacturers shall be responsible for complying with all requirements of this Code made mandatory by a referencing Code."

Notice one again we are back to the same point—this document has to be referenced by another Code to have meaning. Next we have the duties of an authorized inspector.

Fig. 2 refers to the responsibility of the authorized inspector, but I believe the general terminology agreed to is that the manufacturer has the responsibility and the inspector has certain duties to perform.

Subsection T-150, Procedures, requires that all nondestructive examination performed under this Code shall be done to written procedures proven by actual demonstration to the satisfaction of the inspector. A section on records is included wherein it is specified that records shall be kept. Retention, location and availability will be as spelled out by the referencing Code.

ARTICLE 1- GENERAL REQUIREMENTS

SCOPE

PARAGRAPH REFERENCES

MANUFACTURER'S EXAMINATION RESPONSIBILITY

RESPONSIBILITY OF AUTHORIZED INSPECTOR

PROCEDURES

RECORDS

Fig. 2 Article 1 - General Requirements

Fig. 3 lists the items in the beginning of Subsection A, Nondestructive Methods of Examination. The methods in this subsection are those written by ASME. Subsection B still covers nondestructive methods of examination, but it relates to those methods covered by ASTM documents and adopted by ASME.

SUBSECTION A- NONDESTRUCTIVE METHODS OF EXAMINATION

ARTICLE 2- RADIOGRAPHIC EXAMINATION

SCOPE

GENERAL

INDUSTRIAL RADIOGRAPHIC FILMS, SCREENS, AND RADIOGRAPHS

SELECTION OF ENERGY OF RADIATION

SHARPNESS OF RADIOGRAPHIC IMAGE

IMAGE QUALITY INDICATORS

ADDITIONAL REQUIREMENTS FOR RADIOGRAPHY OF CIRCUM-
FERENTIAL BUTT WELDS IN PIPE, TUBING, FITTINGS, NOZZLES
AND SIMILARLY SHAPED CYLINDRICAL OBJECTS

PROCEDURE QUALIFICATION

QUALIFICATION OF RADIOGRAPHIC PERSONNEL

INTERPRETATION OF RADIOGRAPHS

CALIBRATION OF RADIOGRAPHIC EQUIPMENT

Fig. 3 Article 2 - Radiographic Examination

Another advantage of Section V is that all nondestructive methods are contained in one volume rather than several. This is one reason for the adoption of ASTM specifications and their inclusion in this document.

For radiographic examination, we have included Articles 2 and 3, Article 2 being comparable to what is included in Section III of the Code, and Article 3 (Fig. 4) being comparable to what is included in Sections I and VIII.

Our next speaker, Mr. Forrer, vice chairman of the Subcommittee on Nondestructive Testing, will present a further explanation of the radiographic sections.

ARTICLE 3- RADIOGRAPHIC EXAMINATION

SCOPE

REQUIREMENTS

Fig. 4 Article 3 - Radiographic Examination

There is no Article 4 at this time, and as Mr. Miller mentioned, there is some controversy as to how this should be handled.

Articles 2 and 3 include procedure qualification, qualification of radiographic personnel, interpretation of radiographs, and calibration of equipment.

Fig. 5 covers Article 5 on ultrasonic examinations. We have the scope and then ultrasonic examination methods described for the various types of product forms.

ARTICLE 5- ULTRASONIC EXAMINATIONS

SCOPE

GENERAL

ULTRASONIC EXAMINATION OF CARBON AND LOW ALLOY STEEL CASTINGS

ULTRASONIC EXAMINATION OF WELD DESPOSITED CLADDING

ULTRASONIC EXAMINATION, BOLTS AND STUDS

ULTRASONIC TESTING FOR THICKNESS DETERMINATION

ULTRASONIC EXAMINATION OF WELDS (UT)

Fig. 5 Article 5 - Ultrasonic Examination

In Article 5 there are general requirements dealing with the equipment; personnel qualification; examination standardization, which relates to the coverage of the examined section of the part being examined and specifies the amount of transducer overlap; rate of scanning speed, etc. Forms for ultrasonic examination of specific products are included in Section V.

In the January draft, we have ultrasonic examination of ferritic steel castings. However, it should be noted that the longitudinal examination of casting procedure has been deleted because ASTM A 609 is in the final stage of publication and is basically the same as that written in Section V. ASTM A 609 will be included in Subsection B for ease of reference. The Subcommittee on Non-destructive Testing felt that there was a need for an angle beam method for use on castings of odd configurations—configurations that did not lend themselves to meaningful examination by the straight beam method—and so an angle beam examination method is included in Section V, Article 5.

A special method was written in Section V for ultrasonic examination of weld-deposited cladding since an ASTM method was not available.

Also, a straight beam method is described for ultrasonic examination of bolts and studs. This method describes axial and radial scan on bolts and studs using the straight beam technique. Search unit size and calibration, calibration sensitivity, and examination procedure qualification and ultrasonic examination methods for various product forms are all included as part of Article 5. Ultrasonic examination for thickness determination is also included.

Ultrasonic examination of welds is included. As you read this, you will note that it is essentially the same as what is included in Section III, Appendix IX, Par. IX-340, which as I mentioned earlier, is comparable to Par. PW-52 of Section I and Appendix U of Section VIII, Division 1, and Appendix 9, Article 9-3 of Section VIII, Division 2.

Two significant changes in terminology have been made in Section V's presentation of ultrasonic examination of welds. The term "transfer mechanism" has been changed to "transfer method". It is a technique of assuring comparable sensitivity on the test piece as on the calibration standard and does not necessarily denote special equipment or mechanical equipment; therefore, the word "mechanism" was changed to "method". We have received many questions about this mechanism we referred to. Also, since we have succeeded in getting you to think in terms of "nodes" for sound paths in the material being examined using angle beam ultrason-

ics, we have changed our terminology, and now refer to the same condition as a “V” path. It is the same condition you hear referred to in many cases as skip distance.

Article 6 relates to liquid penetrant examination methods (Fig. 6). It is very similar to what is specified at present in Section III and Section VIII, Divisions 1 and 2. The general coverage includes scope, description of method, and notice we have our qualification procedures for nonstandard temperatures and evaluation of indications and procedure requirements. Once again, you will notice that we do not include acceptance criteria. We do have statements on evaluation of indications.

ARTICLE 6 - LIQUID PENETRANT EXAMINATION

SCOPE

DESCRIPTION OF METHOD

APPROVED METHODS

METHOD REQUIREMENTS

EXAMINATION

QUALIFICATION OF PROCEDURES FOR NON-STANDARD TEMPERATURES

EVALUATION OF INDICATIONS

PROCEDURE REQUIREMENTS

Fig. 6 Article 6 - Liquid Penetrant Examination

Article 7 covers magnetic particle examination methods (Fig. 7).

ARTICLE 7 - MAGNETIC PARTICLE EXAMINATION

SCOPE

GENERAL

METHODS

EVALUATION OF INDICATIONS

PROCEDURE REQUIREMENT

Fig. 7 Article 7 - Magnetic Particle Examination

For those of you who are familiar with the current requirements in Sections I, III, and VIII, you will find that the requirements in Section V are similar. However, some added requirements are included because of feedback from the field and questions asked during review of the document. These relate to magnetizing currents and temperatures for the part and the materials when you are doing dry powder and wet magnetic particle examinations.

The eddy current examination included in Article 8, (Fig. 8) relates to the testing of materials and is essentially the same as the requirements presently included in Section III, Article 3.

ARTICLE 8 - EDDY CURRENT EXAMINATION OF TUBULAR PRODUCTS

SCOPE

GENERAL

DESCRIPTION OF METHOD

REFERENCE SPECIMEN

EQUIPMENT QUALIFICATION

ACCEPTANCE STANDARDS

PROCEDURE REQUIREMENT

Fig. 8 Article 8 - Eddy Current Examination of Tubular Products

(Fig. 9) Visual examination is one of the most meaningful examinations that can be performed. It is one of the most widely used and as you read through the various Sections of the Code you find it requires that visual examination be performed much more frequently than any other type of nondestructive examination. However, there are at present no criteria for the performance of this examination. The visual examination section of Section V, Article 9, is an attempt to give visual examination the same status as other nondestructive test methods and require that it be conducted with some organized approach and a degree of thoroughness rather than be taken for granted. Section V indicates that it should be performed in accordance with definite procedures and take its place

in a status comparable to the other types of nondestructive testing. Both direct visual examination and remote visual examination are covered.

ARTICLE 9 - VISUAL EXAMINATION

SCOPE

GENERAL

WRITTEN PROCEDURE

REPORTS

Fig. 9 Article 9 - Visual Examination

It is also mentioned that various visual aids may be used in the performance of visual examination. It is expected that a written procedure for visual examination would indicate the times of examination and some of the kinds of conditions that should be observed by the manufacturer's inspector. You will observe that this is directed at the manufacturer's inspector.

It is described as a practical examination method and provision has been made for production workmen to perform visual examination in some areas. This is an examination that can and should be performed by all persons involved with the manufacture, inspection and acceptance of a given part.

Section V specifically states that there need not be documentation of each look or each dimensional check except where specified by the referencing Code.

Various types of leak testing and the preparation of the part for leak testing are included in Article 10 (Fig. 10).

ARTICLE 10 - LEAK TESTING

SCOPE

PREPARATION

GAS AND BUBBLE FORMATION TESTING (NON-IMMERSION METHOD)

HALOGEN DIODE DETECTOR TESTING ("SNIFFER" METHOD)

HELIUM MASS SPECTROMETER TESTING (REVERSE PROBE "SNIFFER" METHOD)

HELIUM MASS SPECTROMETER TESTING (HOOD METHOD)

REPORTS

Fig. 10 Article 10 - Leak Testing

Some types of leak testing included are gas and bubble formation testing, halogen diode detector testing, and helium mass spectrometer testing using both the hood method and the reverse probe (sniffer) method. As with other nondestructive test methods, a report of the results is required. Keep in mind that the specification of acceptable standards, type of test and applicability are covered in the referencing Codes.

There is nothing mandatory about Section V until one of the Sections of the Code references it and specifies that specific examinations be performed in accordance with the requirements of Section V and spells out the acceptance criteria.

Next we come to Subsection B. You will find that this subsection is divided into articles covering the various types of nondestructive examination (Fig. 11).

SUBSECTION B - ASTM DOCUMENTS ADOPTED BY ASME
<u>ARTICLE 21- INTRODUCTION</u>
SCOPE
GENERAL
<u>ARTICLE 22- RADIOGRAPHIC STANDARDS</u>
<u>ARTICLE 23- ULTRASONIC STANDARDS</u>
<u>ARTICLE 24- LIQUID PENETRANT STANDARDS</u>
<u>ARTICLE 25- MAGNETIC PARTICLE STANDARDS</u>
<u>ARTICLE 26- EDDY CURRENT STANDARDS</u>
APPENDIX A - GLOSSARY OF TERMS IN NONDESTRUCTIVE TESTING
APPENDIX B- CHLORIDE ION CONTENT TEST USABLE ON PENE- TRANT INSPECTION MATERIALS

Fig. 11 Subsection B--ASTM Documents Adopted by ASME

Article 21 is an introduction which indicates that this subsection includes ASME methods for nondestructive examination that are either identical with ASTM standards or modified as indicated by appropriate notation. Further, it states that Article 1, General Requirements, of this Section of the Code shall apply unless specifically exempted by the referencing Code.

Article 22 covers radiographic standards. Under this grouping we have such documents as ASTM E 94, Radiographic Testing, ASTM E 142, Controlling Quality of Radiographic Testing, and E 71, E 155, E 186 and E 280 covering reference radiographs for castings.

Article 23 includes ultrasonic standards and in this group we have SA-388, Ultrasonic Testing Inspection of Heavy Steel Forgings; SA-577, The Ultrasonic Shear Wave Inspection of Steel Plates; SA-578, Longitudinal Wave Ultrasonic Testing and Inspection of Plain and Flat Steel Plates for Special Applications. Also included

are ASTM standards on resonance testing for thickness measuring and standards for ultrasonic inspection of metal pipe, tubing and other product forms.

Article 25 is magnetic particle standards, and here we have dry powder and wet magnetic particle inspection standards.

Article 26 includes eddy current standards of which we have several relating to tubular products made of different types of material.

Appendix A is a glossary of terms in nondestructive examination. It should be noted that this glossary of terms is an attempt to define only those words that are found in Section V and not usually available in a conventional dictionary.

Appendix B is a chloride ion content test for use with penetrant inspection materials. The reason for recommending Appendix B is because it is capable of detecting lower concentrations of chloride than the methods described in the ASTM D 808 document that is presently referenced in the Sections of the Code.

This gives you a thumbnail sketch of the contents of Section V, its history and its intended use, and why we feel it is a very worthwhile Section of the Code that should be part of the many nationally accepted Sections presently in existence.

Now I will turn the discussion over to Gil Forrer, vice-chairman of the Subcommittee on Nondestructive Testing, so he can discuss the radiographic examination sections of Section V, Articles 2 and 3.

Thank you for your attention.

G.R. Forrer

It is a real pleasure and an honor for me to be here with this group. I hope I can clear up some of the problems associated with penetrator sensitivity and how we arrived at where we are today with our penetrator and its quality levels.

I would like to say also that since the circulation of the proposed draft of Section V, the Subcommittee on Nondestructive Testing has received some scurrilous and gratuitous criticisms. If you don't

know what that means, look it up in the dictionary or ask Ed Miller after the meeting.

In line with this, I would like to go back to early 1950 at which time ASTM Subcommittee E-7 was doing a very exhaustive search on the penetrameter sensitivities and their response to changing parameters in the radiographic techniques. At that time we had every known penetrameter in the world in our collection. These were arranged in a radial fashion from the center outward with a centering pin in the center of this radial arrangement. They were circulated to various industries and subjected to various parameters of radiographic technique. Different thicknesses were interposed to show the change in sensitivity that resulted as an increase of thickness. Isotopes were used, Cobalt 60, radium, iridium, as well as various voltages of x-ray equipment up to and including 22-million-volt betatron.

It was obvious, after a review of the resulting radiographs, that certain of the penetrameters in existence at that time did absolutely nothing as far as assuring a certain minimum quality in that radiograph.

At that time some of you may remember, we in ASME had a steel plaque which had slots that were milled at various depths. We had a second penetrameter which was a laminated type that had the same size hole except that the laminations were in steps so that each hole was through a little thicker section. Those holes, as I recall, were about 3/16 in. in diameter.

Other penetrameters evaluated were the European wire types, also penetrameters with a single thickness with various hole sizes. As a result of all this work, Mr. O'Conner and Mr. Criscuola did an exhaustive study on the results and presented a paper which was published by ASTM as Bulletin No. 312, April 1956. The sense of their publication is the crux of penetrameter sensitivity that we must understand if we are to judge what is referred to as an equivalent sensitivity. I would like to go into that subject just a little bit.

I want to apologize for the chart shown in Table 1 because those in back will not be able to see it too well. I will try to describe it as

best I can so that you can understand it. I have about 100 copies of this chart, that you can pick up after the meeting if you so desire.

Penetrameter sensitivity, or the image quality represented by the resolution of the various holes in the ASTM penetrameter, is based upon an empirical assumption. Now, this is important. All equivalent penetrameter sensitivities are based upon this empirical assumption, and the assumption is: that if in a metal plaque 2 percent of the thickness of the material being radiographed, a hole two times the thickness of the plaque or 4 percent of the material being examined is resolved, that the equivalent sensitivity is 2 percent, i.e., 4 percent hole in a 2 percent plaque; the assumption is that the equivalent sensitivity is 2 percent. If we accept that assumption, then all things become relative to that. The plaque must be of a material radiographically similar to the material being examined.

From this the equivalent sensitivities of the various holes in a 2 percent penetrameter would be the 1T hole or 1.4 percent. The 2T hole would be 2.0 percent, and the 4T hole would be 2.8 percent.

From the chart that I have worked up here, I have tried to show Article 1-5 which is the present Section VIII requirements; Article 3, Table 320, which would be the equivalent in Section 5 of the present Section VIII requirements; and Article 2, T-261 which is Section III, Appendix IX requirements.

If we look across the top of this chart, on the extreme right we find that in Article 2 the minimum penetrameter thickness for zero through $\frac{1}{4}$ in. is 0.005 in. The requirement is that the 0.20-in. hole must be resolved. The 0.20 hole is not exactly a 2T hole because ASTM established the minimum hole sizes of 10, 20 and 40 thousandths, so we really won't reach a true 2T hole until we get up to $\frac{1}{2}$ in. in thickness.

Table 1 Equivalent Sensitivities

Thickness range, inches	Article 2 Table T-261(a)				Article 3 Table 320				Section VIII Article 1-5				Equivalent sensitivity			
	Penetrometer		Hole		Penetrometer		Hole		Penetrometer		Hole		T-261(a),		T-320,	
	thickness	diameter	thickness	diameter	thickness	diameter	thickness	diameter	thickness	diameter	thickness	diameter	percent	percent	percent	percent
$0\frac{1}{4}$	0.005	0.020	0.010	0.040	0.005	0.062	0.005	0.062	0.005	0.062	0.005	0.062	2.8	5.6	4.2	4.2
$<1/8$	0.0075	0.020	0.010	0.050	0.0075	0.062	0.0075	0.062	0.0075	0.062	0.0075	0.062	2.5	7.0	4.2	4.2
$<3/16$	0.010	0.020	0.015	0.060	0.010	0.062	0.010	0.062	0.010	0.062	0.010	0.062	2.0	5.6	4.2	4.2
$<1/2$	0.0125	0.025	0.015	0.060	0.0125	0.062	0.0125	0.062	0.0125	0.062	0.0125	0.062	—	4.2	3.5	3.5
$<5/8$	0.015	0.030	0.015	0.060	0.015	0.062	0.015	0.062	0.015	0.062	0.015	0.062	—	2.8	2.8	2.8
$<3/4$	0.017	0.035	0.017	0.070	0.017	0.062	0.017	0.062	0.017	0.062	0.017	0.062	—	2.8	2.6	2.6
$<7/8$	0.020	0.040	0.017	0.070	0.020	0.062	0.020	0.062	0.020	0.062	0.020	0.062	—	2.8	2.4	2.4
$<1\frac{1}{8}$	0.025	0.050	0.025	0.080	0.025	0.062	0.025	0.062	0.025	0.062	0.025	0.062	—	2.0	2.2	2.2
$<1\frac{1}{2}$	0.030	0.060	0.030	0.080	0.030	0.062	0.030	0.062	0.030	0.062	0.030	0.062	—	2.0	2.0	2.0
$<1\frac{3}{4}$	0.035	0.070	0.035	0.070	0.035	0.062	0.035	0.062	0.035	0.062	0.035	0.062	2.0	2.0	2.0	2.0

Note: Penetrometer sensitivity or the image quality represented by the resolution of the various holes in the ASTM penetrometer is based upon an empirical assumption. The assumption is, that if in a metal plaque 2 percent of the thickness of the material being radiographed a hole 2X the thickness of the plaque or 4 percent of the material being examined is resolved, the equivalent sensitivity is 2 percent. (The plaque must be of material radiographically similar to the material being examined.) From this the equivalent sensitivities of the various holes in a 2 percent penetrometer would be: $1T = 1.4\%$, $2T = 2.0\%$, $4T = 2.8\%$. (Ref.: ASTM Bulletin No. 213, April 1956, ASTM E 142-59T.)

The present requirement in Article 3 of proposed Section V is that in a 0.010-in. thick plaque you must show a 0.040-in. hole. In Section VIII you have a requirement for 0.005-in. plaque with a 0.062-in. hole. Now, this is the important thing. A 0.062-in. hole in a 0.005-in. plaque versus a 0.040-in. hole in a 0.010-in. plaque indicates that you presently have an equivalent sensitivity in Section VIII of 4.2 percent at that thickness, while Article 3 permits you to have 5.6 percent. It is actually a relaxation in that thickness range over what is presently required in Section VIII. At 1/4 in. through 3/8 in. without going through all these numbers again, the equivalent sensitivity for the new Article 3 is 7 percent. At present, in Section VIII, it is 4.2 percent. At 3/8 in. to 1/2 in. the new requirement is 5.6 versus 4.2 that you have presently. At 1/2 through 5/8 it is 4.2 to 3.5. At 5/8 through 3/4 it is 2.8 to 2.8. At 3/4 through 7/8 it is 2.8 to 2.6. At 7/8 to 1 in. it is 2.8 to 2.4. At 1 in. to 1 1/4 in., it is 2.0 to 2.2, and the rest of the way it is 2 percent to 2 percent.

Now, this is the type of engineering approach, I think, that we must have before you can understand what the relationship is between hole diameter and plaque thickness. This is the important thing, that simply by reducing the hole size from a 0.062-in. diameter hole to a 0.040-in. hole does not mean that the specification has been tightened. At the same time, we have relaxed the thickness of the plaque and doubled the thickness to a 0.010-in. plaque. I hope that perhaps today we can clarify this point, thereby promoting a little better understanding of what we mean when we talk about equivalent sensitivity.

There has been much talk about 2 percent, and there are various other levels of sensitivity. For example, contrast sensitivity is 2 percent if you have 2 percent plaque, and see the outline of the plaque with no holes in it. That is contrast sensitivity. In our terminology the real crux of the requirement, as far as sensitivity goes, is the equivalent sensitivity as represented, by hole size and penetrometer thickness.

I would like to also mention something that Mr. Miller talked about briefly in his opening remarks, and that is Table 270 which is contained in the proposed draft of Section V.

Our first attempt to adopt the ASTM penetrameter was met with mixed emotions and mine were some of them. I had a strong feeling that the requirement to show the minimum hole size of 0.020-in. could not be met under all conditions. As a result we added a slit to the penetrameter. If I have been asked once, I have been asked 100 times where the slit came from.

I think I have to take the blame for the slit, but the reason it was put in there at that time was because a 0.010-in. slit having a length of $\frac{1}{4}$ in. could be resolved using iridium or some other limiting factors when making a radiograph, whereas, a 0.020-in. diameter hole could not be resolved. The mere fact that you had some length to this slit helped to overcome the unsharpness that was present in making radiographs under these limited conditions.

At that same point, in time the Section VIII people also came back to the Subcommittee on Nondestructive Testing and wanted to retain their $\frac{1}{16}$ -in. hole. Thus we wound up having two penetrameters in ASME, neither of which conformed to ASTM. So we hope that by getting some understanding of what we are talking about in the equivalent sensitivity here today, we can finally get all the Code groups to accept this penetrameter which will be a standard ASTM penetrameter.

In Table 270 we have taken care of the problems as regards the situations that I just mentioned. In addition to covering piping, the words in the heading of that table states, "Piping, nozzles and similar configurations" and this, I think, has been a real problem even in Section I work, where you had some nozzle configurations and so forth, that you simply could not resolve the regular penetrameter hole. So I think the new Section V document has vastly improved the Code in this regard and that we have a workable table now which covers the unusual situations encountered in piping radiography.

In general, I think that once Section V is accepted, the continuity and the continual upgrading of the nondestructive testing section of the Code will be much more simplified and much more workable. I think in time people will come to like this document because you will know exactly where to go to look for information regarding

nondestructive testing.

I think even the Section VIII people, who in certain areas have wanted to maintain their 1/16 in. minimum hole, also have to recognize that under Section VIII some pretty high-class vessels are constructed, and perhaps for those vessels they would want to specify Article 2 of Section V, whereas Article 3 would be specified for the more routine type of work.

I see no stigma attached to Article 3. I think that again is an engineering approach. We don't build all vessels out of Inconel simply because it is a fine, exotic material. We decide what type of material, what design, what the fabrication processing will be to finally fabricate a vessel that will withstand the service for which it was designed. I think, likewise, in selecting the level of radiography, or of penetrant inspection, or any of the other nondestructive tests, that again it should be an engineering approach.

Thank you.

Mr. Miller: Thank you, Harry and Gil.

I wish I had read Harry Jackson's manuscript before I started my discussion. I would have saved about ten minutes in the first place. However, I don't think there is any harm in redundancy on some of these points. As a matter of fact, I might even be redundant at the moment and mention one other thing.

One of the questions which has been addressed to me by people who have taken exception to some parts of our Section V has been that there is some confusion as to whether they should use the requirements contained in Section V with regard to radiography, ultrasonic examination, penetrant examination and magnetic particle examination, as opposed to the ASTM standards or standard procedures that we have also included in the document. I would like to tell you at least my interpretation of this, and I hope to get this resolved in the subcommittee on Thursday. We may have to do a little bit of editorial work to make sure that it is clearly understood, because I think some of these things were put in and then later taken out for no reason that I have been able to determine.

The ASTM documents, for the most part those that have emanated from Committees A-1 and A-10 and I believe B-2 has thrown one or two in there—whether we have those I don't know—will ultimately get into our document, I am sure. Those are generally aimed at very specific product forms. As such, they are perhaps not quite as generally applicable to the problems of the manufacturer of welded pressure-containing equipment as we might like. On the other hand, the E-7 documents very frequently are aimed at a much broader spectrum of things than just pressure-containing equipment. So, we have to eliminate portions of these documents in order to use them.

There is a statement that is, I think, still in Par. T-610 and T-710, to the effect that these methods, as described in Section V, shall be the controlling methods but that they require a definite written procedure or a definite procedure in any event, and that further details for these procedures can be found in the ASTM documents that are contained in Subsection B of Section V.

One other thing is, of course, that any referencing Code, any vessel Code that references this document or that calls for materials, can require the materials to be examined, nondestructively, in accordance with the appropriate ASTM procedures without necessarily referencing what we have in Section V, that is, in the body of Section V, in the way of descriptive material.

I think what we should recognize here is that what we have in Section V or what we hope to have there are descriptions of methods, not of procedures; the procedures must be developed by the vessel manufacturer himself.

With that one comment, which again may be something of a redundancy, I would like to open the floor for questions. If you have a question get to one of the microphones, identify yourself and state the question as clearly as possible, and loud enough so that everyone in the room can hear it.

I overlooked introducing the distinguished panel members who add a certain amount of luster and competence to our group.

Mr. Larry Chockie, a member of the Subcommittee on Nondestructive Testing. Mr. Bob Roehrs, also a member of the Subcommittee on Nondestructive Testing, who is largely responsible, as chairman of the task group, for the material on leak testing. Also, our esteemed friend, Mr. Charles Voelker, chairman of the Subgroup on Radiography. Of course, the three of us who have spoken are going to field all the questions to the three experts that I have just introduced.

Now I will entertain questions, I think I have one already back there.

Mr. Harold Hovland: Will the ASTM reference documents be included in Section V or merely referenced?

Mr. Miller: It is my understanding they will for the most part be included in there. I am a little bit disturbed at the bulk of some of them, not so much the ones we have at this time, but some I think are coming out. I don't know whether Mr. Green is going to stand for publication of this many pages, but does someone else have a comment on that, or do we have some other thoughts on that?

Mr. Jackson: I think one of the advantages of the document would be that people would have all the documents they expect to work with in one central location, so if it is possible to publish them in their entirety and keep it updated, I believe it would make a more useful Section of the Code.

Mr. Miller: I think that answers it. This is our intent. There is a possibility of making it so massive that we may not be able to do it, but this may just be a publication problem.

Are there other questions?

Mr. G.E. Fratcher: In line with that same question, how do you intend handling the so-called reference radiographs the ASTM has for castings?

Mr. Miller: Well, I doubt if very many people have bought all of the reference radiographs. I am sure we will not incorporate them in the book. We will have to incorporate them by reference, and I suspect that a great many people who use them may not have ever seen the

reference radiographs.

Is this correct, George?

Mr. Fratcher: I am afraid so.

Mr. Miller: I think we will simply have to be practical. They cost some \$300 or so, maybe more than that.

Mr. Jackson: We will put the basic document in, but not the reference radiographs.

Mr. Miller: As a matter of fact, even in the ASTM books they only include the basic documents. They don't put in the reference radiographs.

Are there any other questions?

Mr. A.I. Snyder: Mr. Chairman, is there provision in the document for qualification of the examiner?

Mr. Miller: Qualification of the examiner? This is a rather difficult point, and we are open to suggestions on this. We have simply accepted the SNT or ASNT requirement that the examiner be designated by his employer and that his qualifications be stated.

This is something that can be resolved in the case of a survey of a Section III type, but I don't know how you are going to resolve it in the others.

This is something that I frankly don't know the answer to. I wonder if Mr. Hovland might have a few comments as to how this might be resolved or what ASNT's thoughts are on this.

Actually, the requirements we have for the examiner—and when you say the examiner, you are talking about the level 3 individual—at this time is simply what ASNT requires. I admit that this leaves the door open for somebody to certify that a man is qualified who actually isn't.

Mr. Snyder: I realize this is covered in the survey of Section III, Mr. Chairman, but in the other sections, as I understand it, the inspection authorities are going to have to be the ones to determine

whether they are or are not, and if I recall reviewing this document, this point was not very clear to me anyway. I just wondered what the intent was.

Mr. Miller: Well, I believe this comment was contained in the letter that you sent me recently.

Mr. Snyder: I believe I assumed it got in too late to be included in the last document.

Mr. Miller: It hasn't gotten through the mill. It has been a continuing problem, and I don't really know the answer. I am sure it has also been a problem to the people in the American Society for Nondestructive Testing.

This procedure, of course, is a carry-over from the military procedures for the qualification of these people. They had a very nice setup whereby the military inspection authorities could send teams around, who could administer the examinations and what-not to the level 3 or examiner personnel. But we have not reached what I would consider a completely satisfactory answer to that.

Mr. Snyder: I have another question if I may, while I am here. As I recall the outline that Mr. Jackson showed in his slides, is it not intended that there be any record kept of the results of the examination other than radiographic? In other words, in the *E* documents is it intended that there be a document prepared to show the results, where they are located and so forth?

Mr. Miller: I confess I don't know the details of that well enough. I will leave it up to the other members of the panel to answer that question.

Mr. Jackson: I am not certain how it is covered in the *E* and NDT methods. Each NDT method references the general requirements, and under general requirements you will find that it specifies records and indicates that they shall be retained in accordance with the requirements of the referencing Code. So this would be part of what would be written in the referencing Code as to how much of this documentation was to be retained.

It was rather hard to cover this and leave out acceptance criteria. This is one of the reasons.

Mr. Snyder: I understand that. My only problem was I didn't see where they had to repair one. If they don't have to repair one, I find it difficult to know how you are going to retain it.

Mr. Miller: I might add again, of course, Section III has provisions somewhat indirectly for it in that one of the requirements is that there be a traveler accompanying the piece being fabricated, and makes provisions for checkoff of these various methods. I don't know if that is entirely satisfactory from your point of view.

Mr. Jackson: I think in answer to Mr. Snyder's question, that we probably will go to the T-160, which says the record shall be maintained of all nondestructive examinations and pressure leak tests performed, including procedures, with additional data necessary to permit the examination to be repeated at a later date. Examination results and examination data, such as radiographs, chart recordings, etc., would apply to all of the nondestructive test methods. Then we say time of retention, location and availability of records shall be in accordance with the requirements of the referencing Code, so it is a general requirement that would apply to all of it.

Mr. Snyder: I must have overlooked that when I read it. Thank you very much.

Mr. Miller: Mr. Forrer has a comment on your first question, and I believe he was one of the people responsible for the origin of ASNT TC-1-A.

Mr. Forrer: I would like to say this. In looking at the makeup and the structure of groups, technical societies such as ASNT, ASTM or even your ASME group, the requirements for certification by examination of a level 3 man are something that most people would not touch with a 10-ft pole. For example, I would disqualify myself from sitting with such a group because I might unknowingly be passing judgment on someone who works for a subsidiary of our competitor or something of this nature. This is one reason why it was decided to have the employer do the certification, but he should certify that the level 3 does meet the background require-

ments as spelled out in ASNT TC-1-A.

Now it might be in the province of a group, such as the National Board where there is no conflict of interest, that if it is desirable that certification be done by examination, I think it would have to come through such a Board.

Mr. Charles Voelker: May I say something? Art, to go a little further, the format for radiography in Articles 2 and 3 is that Article 3 takes exception and no exception was taken for the qualification of the examiner. So this is a very important point for this group to consider because the Subgroup on Radiography is actually promoting the idea that people who are not qualified should not be doing radiography. This would be a great help to the National Board inspector.

Now it is not clear throughout the document, as Ed has said, but in regard to radiography, the feeling is very strong in this regard.

Mr. Jackson: On Art's first question, I can understand his concern there, if this isn't something that is somewhat in the manner it is handled in Section III. It really comes under the quality assurance program requirement. You will notice that it is conspicuous by its absence in the nondestructive testing Section V. It may be that with the work going on in the different Sections of the Code as to quality assurance requirements, something could be spelled out in this area. So I agree it is certainly something that the best source would be to go back to ASNT and see what could be done with the document that we are referencing.

Mr. Miller: Mr. Roehrs.

Mr. R. Roehrs: I might mention also that the manner of personnel qualification, when it was stated that the military does have a system, is only in respect to one type of product like the Navy nuclear program. When you talk about the other military programs, you will find that the level 3 man is also qualified and certified by the manufacturer. So that this is not just a problem that we are having in the ASME. This matter of the level 3 man; he is qualified, certified by the manufacturer in almost every case except Section III of ASME and the Navy nuclear program. They have a separate program and

do not necessarily relate to ASNT TC-1-A.

Mr. Snyder: Mr. Chairman, with regard to certifying Section III, maybe I am mistaken, but I understood that this document was going to be usable by Sections VIII, I, IV and so forth. While I certainly agree the surveys of Section III cover this point, my question was directed toward the other Sections of the Code. It is my understanding that some of the NDT examinations are no better than the examiner, and that is why, to me at least, this was an important problem. I think there should be some guidance if we adopt the Code.

Mr. Miller: We accept and recognize your concerns on this point. I would emphasize, however, that the Section III requirement was not considered to be the answer to this; it simply indicates that one answer to this has been achieved in one Section of the Code.

I would like to have the opinions of the other potential referencing Sections of the Code. They may or may not want to go through this business. I don't believe this is entirely the responsibility of the Subcommittee on Nondestructive Testing because I think the other Sections of the Code should indicate to us or in their own documents how they would like to have this accomplished.

I am not trying to beg the issue because we are looking at it, and we hope to get assistance from the American Society for Nondestructive Testing on this matter.

Are there any other questions?

Mr. Voelker: On this same matter that Art brought up, we have been talking about the level 3 man here, but it is perfectly possible for an authorized inspector to inspect for a level 1 and level 2 documentation. This is spelled out adequately in the ASNT and is quite different from the other in that you have a certain number of questions for which you have documented answers, and certain programs that are supposed to be complete. So the man that, let us say, is doing the interpretation of the test can be proctored by examination of paper documents in the manufacturer's files.

Do you agree with that? I would be interested in your thinking.

Mr. Snyder: If I hear you correctly, you are saying you would expect the authorized inspector to act as the level 3 man. Now I know they are smart men, all of them, but I wouldn't qualify myself as the level 3 man, and if I wouldn't, I couldn't expect my field man to.

Mr. Voelker: I don't really see that. It seems to me, when there is a specific list of definite things that you have to put down on a piece of paper to have a record of this and that, any clerk can read that, not a level 3 man. A level 3 man is the man who designs the suitability of the examination. These have to do with reliability of procedures that the manufacturer uses. The level 2 man really interprets the results. It seems to me that this reached a place where it would take someone with much less capability than National Board inspectors or authorized inspectors to notice whether these papers existed and whether the right things were in them.

Dr. Gerold Tenney: I would like to bring up my own comments on this subject, not only as a member of the Subcommittee on Nondestructive Testing, but also having been quite active in the work of the American Society for Nondestructive Testing.

I would like to say my personal opinion is that I would like to compare your proposed Section V with the Constitution of the United States. If the Constitution had been perfect at the beginning, we would not need a United States Congress to improve our laws. In other words, what I want to say, we have established a first base toward a unification in this respect. In talking about the various problems as level 3 and so on, we know that we have one major problem to take care of which has not been resolved as yet, and it is, for instance, the state certification of commercial nondestructive testing laboratories.

If you want to have a level 3 laboratory, well, who is going to certify a whole laboratory? A laboratory is a body, is an enterprise, but people come and go in this laboratory also, so, therefore, I would say what one has to do now is to make one step after another to improve the present document.

Mr. Miller: Thank you, Dr. Tenney. I guess the next step is for us to generate a Bill of Rights to go with this constitution.

I might add, with regard to the certification of laboratories, having been on one or two of the surveys, in one case I know the fabricator farmed out a substantial amount of his nondestructive testing to a commercial laboratory. A representative of the commercial laboratory was certified as the level 3 man for that particular fabrication plant, but when they came around to certifying another fabricator who used the same commercial laboratory, they had to go back and review the qualifications all over again. In other words, it did not certify the laboratory per se for each and every application, but only for the performance of work for a particular fabricator. Whether or not this is the right approach, I don't know.

I am just adding this as a matter of general information, not as a recommendation.

Mr. Snyder: Mr. Chairman, I don't want to monopolize the discussion. I think the biggest mistake I made was to read the document. If I hadn't, then I wouldn't have had so many questions. Also, I want to apologize because my comments are probably too late to be considered in this last draft.

The thing that bothers me is that, as I recall the document, and it has been a month or so since I read it, in most cases the acceptability of imperfections is the decision of the examiner, not the inspector. Yet, if I hear correctly, you say the inspection is upon the examiner.

Also, I don't recall that if you are going to put this out to a commercial laboratory, and most of them will, there is no provision that even the commercial laboratory have a level 3 man. So that all you need to do is raise a couple of thousand dollars and buy an ultrasonic machine which will make you an expert and not even be questioned. This is the thing that I find difficult to understand in the document. I am only asking if this is to be permitted.

Mr. Miller: All of your comments have been referred to the various subgroups and will be considered.

On this particular point, I suppose we do have loopholes, but I confess I would have to read the document again to satisfy myself as to whether we had or had not included some of the things. I

know that as I have received comments and gone back through the document, I have found that in several cases we have overlooked something. These things will be taken into account, hopefully, at the meeting on Thursday. Most of them, I think, have already been considered to some extent, at any rate, by the chairman or members of the various subgroups.

It is going to be a little difficult because we won't have any subgroup meetings. With a half day to go, we will have some difficulty doing subgroup work in the subcommittee. It is hard enough to get agreement in the subgroup, let alone in the subcommittee on these things.

Mr. Roehrs: Again back to your comment, Art, I think that frankly the ASNT document does cover the level 2 and level 1 individuals. The weak spot that you are picking out is the level 3. Basically, the requirement of ASNT TC-1-A is the acceptance criteria. The matter of accepting or rejecting discontinuities in part lies with this level 2 man. He has to have the ability to discriminate between good and bad to evaluate that total examination, recognizing that in level 3 there is some weakness in some respects, and that we do not have some stringent requirements about who will or will not certify or qualify an individual. We still do have the level 2 man's responsibility pretty well tied down.

The ASNT TC-1-A document was written as a guideline in essence and not to be some pure document to be used by everybody with one governing agency.

Now if the ASME Code so desires and the National Board would like to have an examining group to handle the level 3, that is fine, but ASNT could not cover this in a document. So I think we should have some feeling by the group here.

Do you, in fact, wish to set up yourselves as a certifying or qualifying agency? That really is the question. Without that I think we have to live with the document as it stands today until such time as we can resolve this type of problem.

Mr. Miller: I think this is a problem that should be referred to the Ad Hoc Committee that has been formed to determine what sort of

quality assurance programs should be incorporated into Section I, Section IV and Section VIII, because this is definitely a matter of concern to them.

Mr. Hovland: I would like to say that it was my privilege last year to review the operations of a Japanese plant. The Japanese Society for Nondestructive Inspection initiated their personnel qualification program about the same time we did, but largely patterned on ours. They did one thing differently. The society over there did take on the job of examining and holding these examinations periodically in different places in Japan for what they called their level S, which is equivalent to our level 3.

The interesting thing to me was that in auditing or surveying a plant for the ability to comply with the provisions of Section III, it was just as necessary to go through the complete personnel dossier of the level S certificated people as it was the level 3 people in this country.

I am sure that a level 3 man who is certified for satisfactory background, education and experience, for instance, in the aerospace industry would not necessarily be satisfactory for one in the nuclear manufacturing business or pressure vessel business. I don't think that problem, is, therefore, that simple.

I know that on your own subcommittee, Mr. Miller, you have a pretty good cross section of opinions on this subject. I don't think there is an easy out. I do think the survey program we have on Section III certainly has not presented any problems in determining whether a level 3 manufacturer was indeed qualified for his job. Remember that the level 3 person is an administrative person representing the employer. Most manufacturing enterprises to become at all successful are not too lacking in intelligence.

It has been our experience that the level 3 people we have encountered, with the exception of one or two cases, have indeed been qualified by any yardstick you use for the work that they are doing in their plant. That is about all we are interested in.

Mr. Miller: Thank you, Mr. Hovland.

Mr. Snyder: I wouldn't want to leave the impression that I think the document is not good. I do. I think it is a very good document. You have taken steps in the right direction, but I do think this one appears to me to be a weakness. Maybe I am just not knowledgeable enough about the subject.

I also agree with the gentleman here. If I am going to buy a suit of clothes, I have to put it on and see how it wears perhaps and then make some adjustments. I just didn't want to leave the people with the opinion that I thought the document was not good.

Mr. Miller: We are grateful for that kind comment. I wish I had more comments like that.

Mr. Voelker: I think, being chairman of the Subgroup on Radiography, my central interest is in this. We took advantage of the Boston meeting to introduce the concept of geometrical unsharpness which was a major shortcoming of the photographs. We talked to the National Board people and as a result of their conversation we introduced this sometime after the Boston meeting.

Now you have heard here what is being introduced to the National Board people as a new concept. It was described to you by our vice-chairman. I want to repeat that what we are interested in having the National Board people know about it is that when the radiographic quality is measured by a penetrometer, if you make the hole small enough, you can get the same result as if you make the plaque thicker, and vice versa. It is as simple as that. Or if you make the hole bigger you can make the plaque bigger. It is a simple concept.

We want you to know this is a new idea for National Board inspectors that when we make the hole smaller, we make the plaque thicker and the result comes out the same. It can be proved mathematically by several expressions. We have proved it experimentally. We are going to publish the mathematics and a simple monograph in ASTM so you all understand how we calculate this. It is the thing that the radiographic group is promoting to the National Board inspectors this year at the Seattle meeting, i.e., that if the hole gets smaller, the plaque gets thicker and the result is the same. We hope

you all leave with this clearly in mind.

Mr. James S. Clarke: I am a bit shook up by what I just heard about the definition of a level 3 man, that is, he was primarily an administrative character. That is contrary to the understanding which I have had at least up to this very moment. My understanding has been he did have administrative responsibilities, but that as far as experience, technical capabilities and what-not and so on, he was superior, far superior to the level 1 man and somewhat conspicuously superior to the level 2 man.

Now is this a later twist that is a more recent picture than the older one that I have? I would not like to leave this session myself without a word or two of clarification on that point, if you will do so, please, Ed.

Mr. Roehrs: Let me read this for you, Jim. This is the actual wording out of the ASNT TC-1-A document for a level 3:

An NDT level 3 individual shall be capable of establishing techniques, interpreting specifications and Codes, designating, predict test methods and techniques to be used and interpreting the results. He shall be capable of evaluating the results not only in terms of existing Codes or specifications but he also should have sufficient practical background in applicable materials to assist in establishing test and acceptance criteria when none are otherwise available. It is desirable that he have general familiarity with all other commonly used NDT methods. He shall be responsible for conducting examinations of level 1 and level 2 personnel.

Mr. Miller: I don't think there has been any basic change from the original intent of the SNT document.

Our time has expired, however. I am afraid that Mr. Chockie might either be offended or pleased that he hasn't had any questions referred to him. I am going to give him a chance to say something if he feels he has a word or two of wisdom or that he has any comments on anything. We didn't get anything to you on the panel, and I am apologetic for that.

Mr. Chockie: Ed, you are very kind and I thank you very much for giving me a chance. I think I am in general agreement with what

we have done and attempted to accomplish in Section V. I hope that as time progresses our procedures do form the basis for the actual detailed, written procedures that the manufacturers will be using. We hope also that in time we will even get this level 3 situation settled, and whether or not it applies across the board to all Sections of the Code. I am glad you didn't call on me because sometimes I don't like to have to speak, and this morning was one of them.

Mr. Miller: I should offer this prediction that if this document is approved at the meeting on Friday, or with modifications at the meeting in June, the next pink sheet addenda will be a pretty substantial one.

With that in mind, I will turn the meeting back to Mr. Parker. I am sorry we ran over our time by seven minutes.

Chairman Parker: Thank you, Mr. Miller. I would like to thank you and the panel for the fine presentation of the section.

(A short recess was taken)

Proceedings

FORTIETH GENERAL MEETING

THE NATIONAL BOARD OF
BOILER AND PRESSURE VESSEL
INSPECTORS

May 2-7, 1971

NONDESTRUCTIVE TESTING, SECTION V

R.C. Hudson¹ and H.F. Jackson²

Mr. R.C. Hudson: Good afternoon, Members of the National Board of Boiler and Pressure Vessel Inspectors and the ASME Boiler and Pressure Vessel Committee: We keep losing a few bodies, as I look out over the audience. I cannot blame them being in Miami. It is a wonder we have anyone in here attending lectures rather than being on the beach or maybe at the race track; but to paraphrase Jackie Gleason probably, at least in Miami, the National Board is the greatest and most attentive audience in the country.

Mr. Harrison announced this morning that Section V, which is handled by the Subcommittee of Nondestructive Testing, would not be meeting on Thursday. I thought I would add a word of explanation. The Subcommittee on Nondestructive Testing (SCNDT) is presently being reorganized. We just did not have a program plan formulated enough to justify calling a meeting during Code week here.

As most of you know, we have a new Section of the Code coming out, Section V on Nondestructive Examination. I will give a brief report, mostly recapping the status of Section V, particularly the events within the past year, and explain how we have arrived at Section V, 1971.

At last year's meeting in Seattle, Mr. Ed Miller reviewed how some 10 or 15 years ago, as nuclear energy business became a Code concern, nondestructive testing requirements emerged as an N Code case. These requirements evolved into Appendix IX of Section III (adopted, winter 1967). Essentially with time, the same fundamental NDT requirements for ultrasonic, magnetic particle, and penetrant examinations were included as appendices in Section VIII and, to some degree, in Section I.

The Subcommittee on Nondestructive Testing was charged with the task of incorporating the procedural aspects of the NDT requirements into a single document as a suitable reference for all Sections of the Code.

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In January, 1970, after several years and numerous internal review drafts, a draft of Section V was circulated to the Main Committee and ASME distribution as an appendix to the minutes of the January meeting (some 500 copies to the Main Committee, Subcommittees and others receiving Code data).

Comments were received from other Code Sections (particularly Section VIII) which were rather extensive, from Section I and about half a dozen other interested reviewers. These comments were thoroughly reviewed, item by item, by the Subgroups and resolved by SCNDT during the March and April Code Committee Meetings. The Main Committee approved Section V and its "technical content" at the May 1, 1970, meeting.

Mr. Ed Miller undertook doing the editorial review of Section V. We were a little pressed for time to try to meet publication schedules. At Oak Ridge National Laboratory we have an IBM magnetic typewriter. It is really a rather expensive electric eraser, but it permits you to make corrections to draft data rather easily, and each of the articles in Section V underwent at least a half dozen typings before Mr. Miller was anywhere near satisfied with his editorial polishing.

This became the June, 1970, draft which received the full ASME distribution. This draft was also made available to the general public by reference in the July, 1970, issue of *Mechanical Engineering*. Some comments were received (from within the Code Committee membership) relative to this draft and also some oral comments concerning forthcoming data included in the rewrite of Section III pertaining to Section V; to my knowledge, no comments were received as a result of the public announcement. These comments were summarized, reviewed and resolved by SCNDT at the September, 1970, meeting and were approved by the Main Committee. This final, editorially correct draft was approved at the September Main Committee meeting, with the Administrative Committee's concurrence, for the staff to proceed with the publication of Section V, 1971. The point is that Section V has received a rather thorough review from outside the SCNDT over a period of six to eight months.

The ASME staff put together a polished version of this draft, including corrections through September, which was to be used as a basis for preparing the copy for the printer. This was reviewed and approved by Harry Jackson and myself in October, 1970.

This effort finally culminated in Section V, 1971. It is expected to be ready possibly by this meeting. If not, it is, as I understand, scheduled to be the next Code Section available after Section III.

Section V was developed mostly from Section III, Appendix IX; however the other Code Sections requirements have been incorporated. One notable exception remaining under Section III are the QA program requirements.

You recall Otis Carpenter was emphasizing quite a bit on QA programming. Some of the other Code Sections may ultimately develop some QA program plans. If so, then Section V, under SCNDT possibly, may end up incorporating some of this type of program.

There are several points concerning Section V that I would like to emphasize, but I will leave it to Harry Jackson to explain the relationship of Section V to other Code sections.

Firstly, Section V is not intended to be a Code that stands by itself, nor can it be used by a single all-inclusive reference to it. Section V is written for acceptance and use with any Code Section as a basic document to reference for specific NDT examination requirements. Two advantages that it does offer are:

1. All of the Code nondestructive examination method requirements are included in a single document.
2. All of the ASTM nondestructive examination reference documents (except the radiographs, of course) used by the Code are included as an integral part of Section V. The combination of these two points will hopefully minimize the need to accumulate various reference documents.

Secondly, Section V, under Scope and Responsibilities, defines the duties of the manufacturer and the authorized inspector, but only when a referencing Code section invokes the use of Section V, and these duties are the same as the other Code sections (vessel

manufacturer or authorized inspector). If it becomes the materials manufacturer, it will be clearly defined.

Thirdly, two Articles are included in Section V that are attempts to better define various aspects of NDT programs:

Article 9, Visual Examination: This article requires the manufacturer to establish a visual examination program—to detail when and where the check points are to be conducted, and to maintain some degree of documentation.

Article 10, Leak Test: We have included an article on various leak test methods. This article, I believe, is one of the first more or less specification to establish leak test procedural method requirements (at least within ASME).

The Subcommittee on Nondestructive Testing was discharged by the Main Committee in January, 1971, after fulfilling its original charge.

A new committee, under B.W. Bace, has been established to maintain liaison with the other Code Sections on NDT examination requirements and to maintain Section V.

Finally, I would like to remind you that Section V, like other new Code Sections, will undergo a shakedown period. It is not too late to submit suggestions and comments that will help make Section V a more practical and workable document.

I will close with the only slide I have (Fig. 1).

I realize that the authorized inspector does not necessarily conduct these examinations, but this slide does represent the state of the art of knowledge of NDT examination methods that today's authorized inspectors must have. He has come a long way from the old hammer test and oil and whiting test method. The Code requirements and advancing technology have caused him to become a rather sophisticated technologist. But he cannot rest on his laurels. The requirements of inservice inspection and the new technologies, such as acoustic emission, ultrasonic spectroscopy, acoustical holography and other new NDT techniques, all place further demands

on his talents and capabilities. I don't believe that he is ever going to be able to say that "I've finally arrived or that I've got it made."

Thank you very much.



Mr. H.F. Jackson: If we had another speaker, he would be up here by himself. It is getting close to the hospitality hour, so I am not going to take any chances of offending those of you who are left. I will not run overtime and compete with the 5 o'clock bar opening upstairs.

You have had the privilege of hearing some excellent speakers this afternoon. I now have the privilege of following some excellent speakers, but it really is not much of a privilege when you have to follow people like Otis Carpenter and Gene Bailey.

Mr. Hudson has given you a general review of how Section V was

developed with comments reviewed and incorporated in the final proof draft. Now it is at the printer, and we hope it will be available this month.

I am not going to repeat what I said last year because I know many of you heard it. I will place a draft copy of Section V on the ASME Exhibit Table in the event any of you want to review the format and get better acquainted with what is in the book. Feel free to pick it up and look it over, and maybe in that way it will not come as a surprise to you when it is published.

When it is issued, as I understand it, it will have a bright yellow cover. I don't know whether that is supposed to be symbolic, or telling us anything, or not considering some of the requirements we wrote into it. We were scared of Section X as a title because "X" is used to denote an unknown quantity. Now we get a yellow cover. I think ASME is working on our book.

As Mr. Hudson indicated in his talk, there is still work to be done. There are changes to be made, certainly not immediately, but in the not-too-distant future consideration will be given to inclusion of some of the so-called new nondestructive examination methods.

Also there is plenty of room for improvement on the conventional methods. Let's not stop working with those, because, as Mr. Bailey described to you, when you try to follow an ultrasonic test with a second ultrasonic test, you can see that there is lots of room for trying to work out your problems if you wish to repeat what you did before.

Mr. Hudson made a point in his slide that the authorized inspector is not going to be able to say, "I've finally arrived," or that "he has it made." I believe we should expand that statement to apply to all inspectors working on ASME Code fabrications. Authorized inspectors, company inspectors, and very definitely members of the Subcommittee on Nondestructive Examination, SC V, whatever is selected as the new title of the reorganized group, will not be able to sit still and feel that they have it made.

It was also mentioned that with the new book out you are going to have many questions.

I didn't know whether either of the people are in here, but we now have a new chairman. Mr. B.W. Bace, Bernie Bace as he is known, is sitting back over here. Bernie, would you rise so they can see who is going to be involved with Section V? That is appreciation for being left on the committee.

The assistant chairman or vice-chairman, the man in charge of the vice for the group, is Gil Forrer. Ray Hudson, the previous speaker, is the secretary.

The committee has been reorganized in an attempt to make this Section V committee truly work as a service committee with good liaison with the other Sections of the Code.

ASME does not want us going off in our "longhair" ways of writing the ultimate of what we think is needed in nondestructive examination and handing it to them with nobody being able to use it. We have to stick to the practical side and write those things that can actually be applied in service and get meaningful results.

We are working in that direction and trying to get better personnel liaison between the other Sections of the Code or construction Sections of the Code and Subcommittee V, Subcommittee on Nondestructive Testing.

Relative to the general outline of this book, I will not review it since you can look at it and tell what it contains. I will review its general requirements.

You have two articles on radiography; one is intended to be basically the ASME Section III level or radiography; the other one is intended to be Section I and Section VIII radiography. I had the pleasure of sitting in with a task group about three weeks ago that was trying to adopt Section V. We did not make the grade altogether in writing up just what the requirements were for Section I, Section VIII, or Section III, but these people are doing a fine job of reviewing our book, writing down what has to be done in order that it reflect the same quality level or the same requirements that they presently have in their Code.

The members of the task group at the meeting I attended did a very

thorough study. I think we will see Section V referenced in the near future by at least one group. We hope all groups will work and tell us where our shortcomings are and let us, in turn, modify Section V, as necessary, so that you, as inspectors and as manufacturers' representatives, can have one book to refer to for the procedural type or parameters required for nondestructive testing.

We want to be sure that we make one thing clear to everyone, especially the inspector. The acceptance and rejection requirements for the nondestructive test, the acceptance criteria, will always be in the referencing Code.

Section V will not attempt to write acceptance criteria. The referencing Code, such as Section I, Section VIII, Section IV or any other Code, will state that you shall perform radiography, ultrasonic, penetrant or what-not in accordance with the specific article in Section V, and it will specify the acceptance criteria. In this way there is greater flexibility. If one Section wishes to have real stringent requirements, fine, it can have them; the others can have less stringent acceptance criteria.

That is one of the points you need to keep in mind. The other point to keep in mind is that Section V is a service Code. Unless it is specified in one of the other Codes that the requirements of a certain article in Section V apply, then it is just another book. We want to get Section V out of the business of just being another book on the rack. We hope every Section of the Code will make reference to it and give us the information we need to see to it that we are serving your needs.

Now hurriedly, there were two areas added in this Code that I think deserve some mention. *Visual Examination Requirements*: This, I think we will find, is probably the most called-for nondestructive examination in any of the Codes, but it has received less attention so far as establishing any procedure or any requirements as to how it is to be performed or how the results will be reported.

As written in Section V, the part on visual examination is intended to relate to the manufacturer's inspectors and the procedures to be established by the manufacturer. However, it certainly can be of great assistance to the authorized inspector if the manufacturer has a specific procedure reference wherein he says he is going to do a visual examination using certain types of materials and make certain reports of the results.

As you go along through the operations on shop travelers, if you are talking Section III, and I think we will soon see travelers and quality control-type checklists in some of the other Sections of the Code, it will be quite helpful to you to know how a manufacturer plans to conduct visual examinations. It will help you to assure yourself that the component meets the requirements of the Code so you can sign the data report.

Leak Testing: We are hearing a lot of talk about the possibility of some of the gas leak tests, such as helium leak testing, halogen leak testing, being used in certain instances as a substitute for the pressure leak test. I say we are hearing talk about it. It is not official at this time that it will come to be, but certainly people are giving consideration to the use of leak tests for some applications.

Leak testing is specifically mentioned in Section III relative to personnel qualifications. The manufacturer must establish a training program comparable to that spelled out in the American Society for Nondestructive Testing (ASNT) documents, the SNT-TC-1A documents for radiography, penetrant, and so forth. He must use qualified personnel equivalent to those described by the ASNT documents.

As I understand it from some people in ASNT, they are presently working toward writing a personnel qualification requirement book similar to what they have for ultrasonic, radiography, penetrant, and so forth, to apply to leak testing. I believe this document will be available when ASME starts making reference to specific types of leak testing other than our present hydrostatic and pneumatic tests.

While we have written a complete section on leak testing in Section V, we hope we can wipe it out by incorporating a section from

ASTM. We have a leak test group in ASTM that has been active in writing standards for leak testing and are doing a fine job.

I guess as ASTM committees go, for the time they have been in existence and the amount of standards they have produced, they probably have about as good a record as anybody in ASTM right now. ASTM is working toward writing suitable standards and we, as a group, are working toward adopting any ASTM standards that are suitable for use under the ASME Boiler and Pressure Vessel Code.

As Mr. Hudson mentioned, we have included in Section V many ASTM standards. They are in Section V either because they are referenced by ASME as a requirement that must be satisfied or they are included because they have very useful information to help the manufacturer develop written procedures required under Section III.

Now without repeating what we said last year, I would like to close by saying that we, as a group, in Section V are anxious to work with the book committees. We are anxious to see our book being used in the way it was intended. The only way we can really see that we have a useful document is for each of the subcommittee chairmen, the various book committees, the Conference Committee members and others to advise us of our shortcomings. Please submit your comments in writing so that we can consider them as we go to work on our document to make it serve the purpose for which it was intended. I thank you.

Chairman Parker: Thank you, Mr. Jackson.

That concludes our program for today.

(The meeting recessed at 4:20 p.m.)