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Supersedes
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Subsections NA and ND

RDT Standard

CLASS 3 NUCLEAR COMPONENTS (SUPPLEMENT TO ASME BOILER AND PRESSURE VESSEL CODE, SECTION III[1], SUBSECTIONS NCA AND ND)

JUNE 1978

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FOREWORD

This standard supersedes the March 1975 issue of RDT E 15-2ND-T and incorporates those editorial changes, such as changing paragraph designations from NA to NCA, that were necessary to update the standard to the Code. These and other editorial changes that were made during preparation of this revision are not identified.

CLASS 3 NUCLEAR COMPONENTS (SUPPLEMENT TO ASME BOILER AND PRESSURE VESSEL CODE, SECTION III, SUBSECTIONS NCA AND ND)

TABLE OF CONTENTS

CLASS 3 NUCLEAR COMPONENTS (SUPPLEMENT TO ASME BOILER AND PRESSURE VESSEL CODE, SECTION III, SUBSECTIONS NCA AND ND)

0. INTRODUCTION

0.1 Scope. This standard supplements the rules for the construction of nuclear components that are covered by Sucsections NCA and ND of the 1977 Edition of the ASME Boiler and Pressure Vessel Code (the Code), Section III. When this standard is invoked or referenced, the applicable subsections of Section III of the Code are also invoked or referenced. The user is responsible for obtaining and applying the edition and revisions of this standard that supplement the edition and Addenda of the Code that are in legal effect at the time of use.

0.2 Organization of the Standard. Section 0 contains requirements for using this standard as a supplement to the Code, and succeeding sections contain the supplemental Code requirements. The following paragraph designations are used in this standard.

0.2.1 Additions to Existing Code Paragraphs. Requirements which supplement an existing Code paragraph are designated by the Code paragraph number prefixed with an "A". For example, the addition to paragraph "NCA-4100" is designated "ANCA-4100".

0.2.2 New Paragraph Numbers. The requirements that are not added to existing Code paragraphs are designated as new Code paragraphs at the location of similar Code rules. These paragraphs are numbered using the next sequential Code paragraph number and prefixing it with an "N". For example, the new paragraph of this standard that is to be added to NCA-1140(e) is designated as "NNCA-1140(e)(1)". In the event Code Addenda are published that cause duplication of numbers, such as Code paragraph NCA-3280, the "N" prefix used in this standard indicates that no reference to the thus created Code paragraph is intended since such reference would be designated with the prefix "A".

0.2.3 Introductory Phrase. To clarify that the requirements of this standard are additional to and not replacements for the requirements of the applicable subsection of Section III, and that they are mandatory for RDT standard applications only, each entry in this standard shall be understood to be preceded by the phrase: "For RDT E 15-2ND applications."

0.3 Conflicts. Class 3 components shall be constructed in accordance with the rules of the Code, Section III, Subsection ND, including Addenda as specified in 0.1; applicable Code Cases as specified in NNCA-1140(e); and the supplemental requirements of RDT E 15-2ND. The requirements of this standard shall in no way be construed as relieving

any Code-designated party of his responsibility for meeting the requirements set forth by the Code.

Any requirement of this standard that conflicts with the rules of the Code shall be brought to the attention of the purchaser prior to any implementing action.

0.4 Definitions. The definitions of terms found in this standard are consistent with those employed by the Code. Terms not now defined by the Code are defined when first used in this standard, except that as used herein "Owner" is defined as the Owner or his designee.

0.5 Applicable Documents. The following documents are referenced in whole or in part by this standard and are necessary to the extent herein specified in meeting the requirements of this standard.

0.5.1 RDT Standards.

RDT F 2-2 Quality Assurance Program Requirements

RDT F 6-5T Welding and Brazing Qualifications (Supplement to ASME Boiler and Pressure Vessel Code, Section IX)

0.5.2 American Society of Mechanical Engineers (ASME) Code.

ASME Boiler and Pressure Vessel Code, Section III, Nuclear Power Plant Components

ASME Boiler and Pressure Vessel Code, Section V, Nondestructive Examination

0.5.3 American Society for Testing and Materials (ASTM) Publication.

ASTM E 45 Recommended Practice for Determining the Inclusion Content of Steel

SUBSECTION NCA
GENERAL REQUIREMENTS

NCA-1000 SCOPE OF SECTION III

NCA-1140 Use of Code Editions, Addenda, and Cases. Add:

NNCA-1140(e)(1) Code Cases. Only those Code Cases permitted by this standard, by RDT standards which invoke or are invoked by this standard, or by the Design Specification shall be used in the construction of components in accordance with RDT E 15-2ND.

NCA-3000 RESPONSIBILITIES AND DUTIES

NCA-3250 Provision of Design Specification. Add:

ANCA-3252 Contents of Design Specifications. The design requirements to permit periodic inservice examinations, testing, and maintenance shall be stated in the Design Specification.

ANCA-3255 Certification of the Design Specifications. A revised Design Specification shall be prepared by the Owner and certified by a Registered Professional Engineer when any change in the design conditions is made.

NCA-4000 QUALITY ASSURANCE

NCA-4100 Introduction. Add:

ANCA-4100 The quality assurance requirements of RDT F 2-2 shall be met in addition to those specified in NCA-4100. When duplicate quality assurance activities are specified, only one activity is required provided the minimum requirements of all applicable documents are met.

SUBSECTION ND
REQUIREMENTS FOR CLASS 3 COMPONENTS

ND-1000 INTRODUCTION

ND-1100 Scope. Add:

NND-1100(c) This standard is intended for applications which warrant a relatively high quality level within the Code rules for Class 3 construction. This standard is not intended for general application to Class 3 construction and specifically does not apply to atmospheric storage tanks and 0 to 15 psi storage tanks as described in ND-3800 and ND-3900. Whenever the requirements of RDT E 15-2ND differ from the requirements of Section III, a single operation may be performed, provided the requirements of both RDT E 15-2ND and Section III are satisfied.

ND-2000 MATERIALS

ND-2120 Pressure Retaining Materials. Add:

AND-2121(a) Materials conforming to specifications listed in Table I-8.1 are not permitted as pressure retaining materials.

NND-2128 Material Grain Flow Requirements. Whenever practicable, pressure boundary materials shall be fabricated such that the direction of grain flow is generally parallel to the pressure boundary surface. When this is not practicable, one of the following shall apply.

(a) The Component Manufacturer shall, subject to Owner approval, specify a limit on nonmetallic inclusion content of the steel as determined by ASTM E 45.

(b) The material area which has grain flow in a direction intersecting the pressure boundary, which could allow a path for leakage through the pressure boundary, shall be weld overlaid by the Component Manufacturer to a minimum depth of 20% of the base material thickness or 1/4 in. (6 mm) whichever is less.

(c) The question of acceptable and unacceptable character of grain flow shall be a subject of agreement between the Component Manufacturer and the Owner.

ND-2310 Materials to be Impact Tested. Add:

AND-2310 The Design Specification shall require impact testing of pressure retaining materials, subject to the material type and size applicability requirements of ND-2311.

ND-2500 Examination and Repair of Pressure Retaining Materials. Add:

AND-2550 Examination and Repair of Wrought Seamless and Welded (Without Filler Metal) Tubular Products and Fittings. Welded (without filler metal) tubular products and fittings shall be examined in accordance with the requirements of NC-2550.

AND-2560 Examination and Repair of Tubular Products and Fittings Welded with Filler Metal. Welded (with filler metal) tubular products and fittings shall be examined in accordance with the requirements of NC-2560.

AND-2570 Examination of Statically and Centrifugally Cast Products. Statically and centrifugally cast products shall be examined in accordance with the requirements of ND-2570.

ND-3000 DESIGN

ND-3350 Design of Welded Construction. Add:

AND-3352 Permissible Types of Welded Joints. Joints of Category A, B, C, and D shall be as specified in NND-4241(c), NND-4242(c), NND-4243(c), and NND-4244(h).

ND-3360 Special Vessel Requirements. Add:

NND-3366 Tube-to-Tubesheet Joints. Tube-to-tubesheet joints shall be welded and shall be of either the face joint or the butt joint type, and shall meet the requirements of ND-4350 and the following.

(a) Face joints may be welded with either fillet welds or fillet reinforced "J" groove welds. Unless otherwise specified in the Design Specification, the Manufacturer shall establish required average and minimum dimensions of welds based on ability of the weld joint to withstand all imposed forces. In determining weld joint strength, no credit shall be taken for tube rolling or for any increase in the strength of the weld material above that of the base material. Calculations supporting the selection of weld dimensions shall be submitted to the Owner prior to the start of fabrication.

(b) Butt joints shall be Type 1 and similar to Fig. ND-4244(a)-1 or Fig. ND-4244(c)-1, except that the dimensional requirements shall not apply.

Add: NND-3700 Additional Joint Limitations. Joint designs having internal crevices, such as backing strips which are not removed, socket welds, and threaded joints, shall not be used for components intended for liquid metal service. For any other service, backing strips which are not removed shall not be used without prior approval of the Owner.

ND-4000 FABRICATION AND INSTALLATION REQUIREMENTS

ND-4200 Forming, Fitting, and Aligning.

ND-4241 Category A Weld Joints in Vessels and Longitudinal Weld Joints in Other Components. Add:

NND-4241(c) Category A weld joints in vessels and longitudinal weld joints in other components shall be Type 1 or Type 2 (see NND-3700).

ND-4242 Category B Weld Joints in Vessels and Circumferential Weld Joints in Other Components. Add:

NND-4242(c) Category B weld joints in vessels and circumferential weld joints in other components shall be Type 1 or Type 2 (see NND-3700).

ND-4243 Category C Weld Joints in Vessels and Similar Joints in Other Components. Add:

NND-4243(c) Category C weld joints in vessels and similar weld joints in other components shall utilize full penetration welds.

ND-4244 Category D Weld Joints in Vessels and Branch Connection Weld Joints in Other Components. Add:

NND-4244(h) Category D weld joints in vessels and branch connection weld joints in other components shall utilize full penetration welds when the nozzle or connection is greater than 2 in. nominal pipe size.

ND-4300 Welding Qualifications.

ND-4350 Special Qualification Requirements for Tube-to-Tubesheet Welds. Add:

AND-4351 General Requirements. Procedure and performance qualifications for tube-to-tubesheet welding shall be in accordance with RDT F 6-5, except that Section V of the Code shall apply for nondestructive examinations.

ND-4600 Heat Treatment. Add:

NND-4600.1 Procedure Approval. Owner's approval shall be required for heat treating procedures to be used for components, or parts thereof, constructed of austenitic stainless steel or nonferrous materials.

ND-5000 EXAMINATION

ND-5100 General Requirements for Examination.

ND-5120 Time of Examination of Welds. Add:

NND-5120(a)(1) Radiographic Examination. Radiographic examination of welds in all components constructed of austenitic steels or high nickel alloys, regardless of thickness, shall be performed on welds in the final heat treated condition. Radiographic examination of welds in all components constructed of ferritic steels, regardless of thickness, shall be performed on welds in the final surface condition and after an intermediate or final postweld heat treatment. Such examination of ferritic steel welds may be performed after an intermediate postweld heat treatment only if that heat treatment meets the holding time requirements of Table ND-4622.1-1 and the holding temperature is as high as or higher than any subsequent temperature to which the weld will be subjected. Ferritic steel welds which are to be covered with weld overlay cladding shall be examined by radiography prior to weld overlay cladding.

ND-5200 Examination of Welds.

ND-5210 Category A Vessel Weld Joints in Vessels and Similar Weld Joints in Pipe, Pumps, and Valves. Add:

AND-5210 All Category A weld joints in vessels and similar weld joints in piping, pumps, and valves shall be fully radiographed and shall be examined by either the magnetic particle or liquid penetrant method on all accessible finished surfaces.

ND-5220 Category B Vessel Weld Joints and Circumferential Weld Joints in Piping, Pumps, and Valves. Add:

AND-5220 All Category B weld joints in vessels and circumferential weld joints in piping, pumps, and valves shall be fully radiographed and shall be examined by either the magnetic particle or liquid penetrant method on all accessible finished surfaces.

ND-5230 Category C Vessel Weld Joints and Similar Weld Joints in Piping, Pumps, and Valves. Add:

AND-5230 All Category C weld joints in vessels and similar weld joints in piping, pumps, and valves shall be examined as follows.

(a) All welds shall be examined by either the magnetic particle or liquid penetrant method on all accessible finished surfaces.

(b) Butt welds shall be fully radiographed.

(c) Full penetration welds shall be either fully radiographed or examined progressively by the magnetic particle or liquid penetrant method. When progressively examined, the increments of examination shall be the lesser of each one-third of the thickness of the weld or each 1/2 in. (13 mm).

ND-5240 Category D Vessel Weld Joints and Similar Joints in Piping, Pumps, and Valves. Add:

AND-5240 Category D vessel weld joints and similar joints in piping, pumps, and valves shall be examined in accordance with the requirements of AND-5230 and the following.

(a) Non-full penetration welds shall be examined progressively by either the magnetic particle or liquid penetrant method. The increments of examination shall be the root layer and the lesser of each one-third of the thickness of the weld or each 1/2 in. (13 mm).

ND-5270 Special Welds. Add:

AND-5273 Hard Surfacing. Liquid penetrant examination is required for hard surfacing on valves of all sizes.

NND-5278 Other Special Welds. Fillet welds, socket welds, and permanent structural and nonstructural attachment welds made to pressure retaining material, such as shown in Fig. ND-4433-1, shall be examined by either the magnetic particle or liquid penetrant method.