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## **APPLICATION OF PROPOSED ASME CODE CASES 2284, 2278 & 2290 FOR USE IN THE PROVINCE OF ALBERTA**

### **1.0 INTRODUCTION**

Proposed Code Case<sup>1</sup> 2284 allows for alternative maximum allowable stresses based on a factor of 3.5 for design and construction in accordance with ASME Section I and similarly, Code Cases 2278 and 2290 for ASME Section VIII Division 1. It is proposed that these Code Cases, when effective, will be acceptable for pressure equipment construction for use in Alberta under conditions listed hereunder. Because of the significant implications of these Code Cases, this information bulletin is provided for the pressure equipment industry, allowing for explanation and guidance to ensure uniformity of application of these Code Cases in Alberta.

### **2.0 TIME LINE FOR APPLICATION**

These Code Cases have been under review by the ASME Boiler and Pressure Vessel Code Committees for some time already. Code Cases 2284 and 2290 have just received the approval for publication through the Board on Pressure Technology Codes and Standards and are effective immediately. Proposed Code Case 2278 is still under review.

### **3.0 IMPLICATIONS**

The proposed Code Cases, allowing a design factor of 3.5, will generally provide for allowable design stresses 14.3% higher, or a reduction of 12.5% in the pressure vessel minimum required wall thicknesses. This reduction is significant, not only relative to material costs but there will be a significant corresponding reduction in all costs with respect to welding resources (consumables and manhours), transportation and handling and others. This may also result in possible savings in non-destructive examination, heat-treatment and other requirements.

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<sup>1</sup> Code Cases are not part of the Code. In accordance with ASME, Code Cases are formulated "to clarify the intent of existing requirements or provide, when the need is urgent, rules for materials or constructions not covered by existing Code rules...". Also, "Manufacturers and users of components are cautioned against making use of revisions and Cases that are less restrictive than former requirements without having assurance that they have been accepted by the proper authorities in the jurisdiction where the component is to be installed."

While there may be economic benefits, there may be situations that designs are not governed by the membrane stresses under the general ASME Code principles. Pressure equipment may be designed for process conditions where a lower stress level has to be maintained because of stress corrosion or other operational requirements. In those cases, it is the designer's responsibility to ensure that the equipment will have a sufficient safety margin for operation and the Code Cases may not be applicable. This is no different from some user requirements now which exceed Code requirements. It is worth noting that the "Foreword" of ASME Section VIII Div. 1 states that "The Code is not a handbook and cannot replace education, experience, and the use of engineering judgement. The phrase engineering judgment refers to technical judgments made by knowledgeable designers experienced in the application of the Code. Engineering judgments must never be used to overrule mandatory requirements or specific prohibitions of the Code".

It cannot be overemphasized that codes and standards are, as a rule, written in a form so as to provide for the "minimum" requirements or provisions. Users of all the codes and standards are cautioned that for certain applications, the use of values much more conservative than these minimums (whether it be the allowable design stress level, the minimum thickness, inspection opening diameters, NDT, treatment, ... etc) may be needed. Some cost saving may be achieved if only the minimum provisions are being applied, but good engineering with respect to the specific applications, may not necessarily be exercised and safety may be jeopardized.

#### **4.0 PROVISIONS OF THE CODE CASES**

Copies of the approved Code Cases may be obtained from the ASME. From information received so far, the provisions of the Code Cases may be summarized as follows:

##### **ASME Section VIII Div. 1 (Code Case 2278)**

- a) Materials for which a design factor of 3.5 may be used are limited to those listed under Tables UCS-23, UHA-23, UHT-23, ULT-23, UNF-23.1 to UNF23.5;
- b) Additional maximum temperatures are imposed;
- c) No increase of maximum allowable stresses above the maximum allowable stresses for the temperature range of 0°F to 100°F is allowed when the material is used at temperatures colder than 0°F (e.g. ULT-23 materials may be affected);
- d) Figure UCS-66.1 is replaced by another figure to compensate the reduced thickness when a factor of 3.5 is used in place of 4. Likewise, in certain paragraphs, the ratios of 0.4 and 2.5 have been replaced by 0.35 and 2.86.

- e) Maximum allowable stresses will be the lowest of (1)  $1/3.5$  times specified minimum tensile strength (SMTS) at room temperature (e.g.  $-10^{\circ}\text{F}$  to  $100^{\circ}\text{F}$ ); (2)  $1/3.5$  times the Section II Part D listed tensile strength at design temperature; (3)  $2/3$  specified minimum yield strength (SMYS); and (4)  $2/3$  of the Section II Part D listed yield strength at design temperature or for certain UHA-23 and UNF23.3 materials and only where slightly higher deformation is not in itself objectionable, 90% of yield strength; The calculated stress values for welded tube and pipe products shall be multiplied by 0.85.
- f) The Maximum allowable stresses obtained from the Code Cases are not recommended for flanges or other applications where slight distortion can cause leakage or malfunction;
- f) hydrostatic and pneumatic pressure test factors in UG-99, and UG-100 are reduced from 1.5 and 1.25 to 1.3 and 1.1 respectively;
- g) The Code Case number and an itemized list of the components for which it applies shall be shown on the data report and the itemized list shall include the name of the component, the material designation, the calculated allowable stress and the corresponding temperature;
- h) For materials with tensile and yield strengths not listed in Section II Part D, another Code Case is being developed to provide the needed values;
- l) All other requirements of the Code (including the external pressure charts etc) shall apply.

### **ASME Section VIII Div. 1 (Code Case 2290)**

This code case provides for a table of the maximum allowable stresses for materials with tensile and yield strengths not listed in Section II Part D. For the convenience of Code users, this Code Case also provides for the maximum allowable stresses for some common materials which have listed tensile and yield strengths listed in Section II Part D. All other conditions of Code Case 2278 apply and are detailed in this Code Case.

### **ASME Section I (Code Case 2284)**

- a) The Code case is limited to materials listed under paragraphs PG-6 to PG-9 and with maximum allowable stresses as provided in this Code Case.
- b) A table provides for the maximum allowable stresses of the materials allowed under this Code Case. (The maximum allowable stresses are established on the basis of being the lowest of (1)  $1/3.5$  times specified minimum tensile strength (SMTS) at room temperature; (2)  $1/3.5$  times the Section II Part D listed tensile strength at design temperature; (3)  $2/3$  specified minimum yield strength (SMYS); and (4)  $2/3$  of the Section II Part D listed yield strength at design temperature. In addition, other

considerations were also given to other material property conditions in the derivation of the maximum allowable stresses listed in the table);

- c) C factors in PFT-25 have been modified from 2.1 and 2.2 to 1.8 and 1.9 respectively for flat plates;
- e) All other requirements of Section I shall apply and the Code Case Number and the materials for which it applies shall be shown on the Manufacturer's Data Report.

The significant differences between the proposed Code Cases between Section VIII Division 1 and Section I being that for Section I, (1) there is no change in the pressure test factor from the existing Code rules and (2) there is no Code Case requirement with respect to listing all the components, material designation and allowable stresses and temperature in the data report.

A proposed Code Case 2274 would have, among other conditions, allowed the users to establish the maximum allowable stresses to be used in ASME Section I construction from tensile and yield strengths listed in Section II Part D. This Code Case has been withdrawn from consideration as the Code Committee membership felt that Code Case 2284 covers sufficient materials used in ASME Section I construction.

## **5.0 BOILER AND PRESSURE VESSEL TECHNICAL COUNCIL DECISION**

During the Technical Council's meeting of November 13, 1997, the Council resolved that these Code Cases, when published by ASME, be accepted for use in Alberta. This acceptance will be for the construction of pressure equipment for export (when allowed for use in the jurisdictions of installation) as well as for pressure equipment for use in Alberta. However, the acceptance of these Code Cases for pressure equipment for use in Alberta will be restricted to the following conditions:

- a) the acceptance of the use of the Code Case(s) by the owners/users in the case of custom-fabricated units as part of the design submission;
- b) the acceptance of the Code Cases by the manufacturers concerned with multiple stock items when the manufacturers act as the agents of the owner/users (see paragraph U-2(a) of Section VIII Div. 1);
- c) the use of the Code Case(s) will not be applicable to large diameter body flanges and other components where the use of the factor 3.5 may create a concern, without proper justification.

## **6.0 APPLICATION IN ALBERTA**

As directed by the Technical Council, in addition to the normal design review procedure, acceptance of use of the proposed Code Cases in Alberta will be subject to the following condition:

*There is a written acceptance of the Code Case(s) by the owners/users in the case of custom fabricated units with the design submission or (ii) the written acceptance of the Code Case(s) by the manufacturers concerned for multiple stock items or other cases when the manufacturers act as the agent of the owner/users (see paragraph U-2(a) of Section VIII Div. 1);*

In the case of vessels for export, designers/manufacturers should note that the Code Cases may not necessarily be accepted automatically by the jurisdiction(s) of installation. However, unless otherwise advised by jurisdiction(s) of installation with special construction conditions, ABSA will apply only the requirements of the Code Cases without the additional conditions imposed by the Boiler and Pressure Vessel Technical Council.

## **7.0 EXISTING CODE DESIGN FACTOR**

It must be realized that continued application of existing published code rules without utilizing these Code Cases is a valid option available and indeed, for some applications may be a more suitable engineering option. It should not be inferred from this that there is any promotion or discouragement of the use of these Code Cases.

## **8.0 EXISTING EQUIPMENT**

ASME Code Section I and Section VIII Division 1 and if approved, these Code Cases, are applicable to the construction of new pressure equipment. There is no provision in Alberta for recertification of existing equipment, new or in operation, built to existing code rules using design factors of 4 with the application of these Code Cases.

## **9.0 PROPOSED CODE CASES AND REGISTERED DESIGNS**

In accordance with Section 11(1) of the Alberta Design, Construction and Installation of Boilers and Pressure Vessels Regulations, "changes to a design that has been approved and registered" shall be submitted for approval to do so (see also Clause 4.1.4 of CSA B51).

For an existing design to be revised to utilize either one of these proposed Code Cases, because of the significant differences in requirements, the design change submission will be reviewed as a new design submission with new Canadian Registration Number (CRN) given if accepted for registration. This procedure will also allow for the elimination of any confusion in the field for similar equipment built to different code/code case requirements.

Individuals who would like to have a large number of registered designs revised utilizing the proposed Code Cases should contact the Design Survey Section of ABSA in order to have the registration review proceed effectively.

## **10.0 FUTURE OUTLOOK**

It is believed that there will be a continued trend for a lowering of all design factors throughout most Code Sections in the future. An ASME taskforce is reviewing the issues involved in reducing the design factors further. Should that happen, it is believed that more significant technical requirement revisions will be introduced in the Code to accompany any such changes. However, this is not expected to occur in the very near future.

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