

## **DESIGN FACTOR OF 3.5 AND THE ASME CODE 1998 EDITION WITH 1999 ADDENDA FOR USE IN THE PROVINCE OF ALBERTA**

### **1.0 INTRODUCTION**

The 1999 Addenda of the ASME Code incorporated ASME Code Cases 2278, 2284 and 2290 into the main text of the Code. This allows for maximum allowable stresses based on a factor of 3.5 instead of the traditional design factor of 4.0. The addenda are acceptable for pressure equipment construction for use in Alberta under conditions listed hereunder. Because of the significant implications of the Code revisions, this information bulletin is provided for the pressure equipment industry, allowing for explanation and guidance to ensure uniformity of application of the Code in Alberta.

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

The application of the 1999 Addenda of the Code will be mandatory for Code stamped equipment six months after publication, i.e., January 1, 2000. However, equipment complying fully with the Code and the Addenda may, in accordance with ASME, be Code stamped upon publication of the addenda.

### **3.0 IMPLICATIONS**

With a design factor of 3.5, in comparison with a design factor of 4.0, an increase of 14.3% increase in the allowable design stresses, or a reduction of 12.5% in the pressure vessel minimum required wall thicknesses may be achieved. 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.

While there may be economic benefits with a reduction of the design factor, 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, cyclic loading 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 higher allowable design stresses 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 judgement refers to technical judgements made by knowledgeable designers experienced in the application of the Code. Engineering judgements must never be used to overrule mandatory requirements or specific prohibitions of the Code"*.

It cannot be over emphasized 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 minimum requirements (whether it be the allowable design stress level, the minimum thickness, inspection opening diameters, NDT, heat 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 BOILER AND PRESSURE VESSEL TECHNICAL COUNCIL DECISION**

Before the publication of the Code Cases, the Technical Council met on November 13, 1997, and resolved that when published by ASME, the Code Cases would be accepted for use in Alberta subject to certain provisions (see Information Bulletin No. IB98-005 Rev.1). In the Technical Council's meeting of June 3, 1999, the proposed ASME Code Addenda incorporating the design factor of 3.5 was reviewed in detail and the following actions were approved:

- a) For pressure equipment in toxic, lethal or flammable service, when ASME Code Appendix 2 is used in the design of large flanges, Appendix S is to be made mandatory as a Directive from the Administrator. This will apply to all flanges 1016 mm (40 inch) internal diameter or larger used in services other than water or air (or fluid not more hazardous than water or air).
- b) The Technical Council's decision of November 1997 will be rescinded after January 1, 2000 (as the Code Cases will no longer be applicable with the publication of the Code Addenda of July 1, 1999) or upon the annulment of the Code Cases by ASME whichever come first.

The proposed action a) above is taken because of the possibility of leakage when large diameter flanges are designed to ASME Section VIII Appendix 2 with an increase in design stresses and the significant consequences should leakage occurs. Also, the proposed action takes into consideration the cautionary statement in the Code Cases noting that *"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"*.

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In the case of vessels for export, designers/manufacturers should note that the latest Code changes 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 without the additional conditions imposed relative to large diameter flanges by the Boiler and Pressure Vessel Technical Council.

## **5.0 EXISTING CODE DESIGN FACTOR**

It must be realized that continued application of existing published code rules without utilizing the change of design factor is a valid option available and indeed, for some applications may be a more suitable engineering option. It should not be inferred from this information bulletin that there is any promotion or discouragement of the use of the proposed Code revisions relative to the design factor of 3.5.

## **6.0 EXISTING EQUIPMENT**

ASME Code 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 the proposed design factor change in the Code.

## **7.0 CODE CHANGES 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 the design factor change, because of the significant differences in requirements, the design change submission will be reviewed as a new design submission with a 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 should contact the Design Survey Section of ABSA in order to have the registration review proceed effectively.

K. T. Lau, Ph.D., P.Eng.  
Chief Inspector and Administrator