

Information Bulletin No. IB23-046

October 26, 2023

Interpretation
Finite Element Analysis (FEA) Requirements
Regarding the Use of FEA to Support
a Pressure Equipment Design Submission

This information bulletin replaces IB09-009, which has been withdrawn.

Purpose

This Information Bulletin provides:

- requirements when FEA is used to support pressure equipment design where the configuration is not covered by the available rules in the code of construction; and
- notification that the document AB-520, titled "*Finite Element Analysis (FEA) Guidelines Regarding the Use of FEA to Support a Pressure Equipment Design Submission*," Edition 2, Revision 0 has been repurposed from the requirements document to the guidelines document.

General

Section 6 of the *Pressure Equipment Safety Regulation* (PESR) provides a list of codes and standards (hereunder referred to as codes) declared in force in Alberta. These Codes do not contain rules to cover all possible design and construction details. When detailed rules are not given, the intention is that the Manufacturer, subject to the acceptance of the Administrator or Safety Codes Officer, shall provide details of design that will be consistent with the rules of the Code of construction and that will provide an equal, if not greater, level of safety. [for example: see paragraph U-2(g) of ASME BPVC, Section VIII, Div. 1, or paragraph PG-16.1 of ASME BPVC, Section I].

FEA may be used to support pressure equipment design where the configuration is not covered by the available rules in the ASME code. We recommend that the designer check with ABSA whether the usage of FEA is necessary and acceptable.

Requirements

When FEA is used to support pressure equipment design, the FEA report shall:

1. be affixed with the stamp or seal of a professional engineer in accordance with Section 9 of PESR since conducting the FEA analytical method necessitates a deep knowledge of and experience with pressure equipment design, FEA methods, and proficiency in the relevant FEA software package;
2. comply with the requirements specified in CSA B51 Clause 4.1.10 and Normative Annex J titled *"Requirements regarding the use of finite element analysis (FEA) to support a pressure equipment design submission"*;
3. comply with the requirements of the code of construction (e.g. ASME BPV Code Section VIII, Division 2, Part 5); and
4. provide any other information in accordance with Sections 15(1)(j), 16(1)(i) and 17(1)(c) of PESR that is necessary for the Administrator or Safety Codes Officer to survey the design and determine whether it is suitable for registration.

Guideline Document AB-520

The document AB-520, titled *"Finite Element Analysis (FEA) Guidelines Regarding the Use of FEA to Support a Pressure Equipment Design Submission,"* Edition 2, Revision 0, has the primary purpose to serve as a supplementary resource to the established requirements outlined in CSA B51, providing essential guidance for the proficient execution of FEA and preparation of comprehensive FEA reports. The overarching objective of this document is to elevate the diligence, accuracy, and thoroughness of FEA practices within the context of pressure equipment design, thereby contributing to the enhancement of pressure equipment safety.

Designers are strongly encouraged to thoroughly review and incorporate the elements specified in

AB-520 into their FEA design analysis and report. Even though AB-520 is guideline document, the Administrator or Safety Codes Officer, according to Sections 15(1)(j), 16(1)(i) and 17(1)(c) of PESR, may request inclusion of the elements specified in AB-520 in the FEA report. This stems from the recognition that specific design scenarios may necessitate additional considerations and supplementary evaluations. When requested, designers should incorporate these elements into their FEA design analysis and report.

In some instances, certain aspects of this guideline could be regarded as excessive or non-applicable. In these cases, designers, subject to the acceptance of the Administrator or Safety Codes Officer, should provide a clear rationale for any identified exemptions from the guidelines in AB-520.

History of AB-520 and Repurposing Initiative

The first publication of AB-520 was issued as Revision 0 on November 23rd, 2009. The document was issued as requirements document because, at that time, there were no specific requirements in CSA B51 or codes of construction how to use FEA to support pressure equipment designs. IB09-009 provided that requirements of AB-520 are mandatory and shall be included in the design submission in accordance with Sections 15(1)(j), 16(1)(i) and 17(1)(c) of PESR.

Over the years, CSA B51 and codes of construction started introducing requirements for the use of FEA to support pressure equipment designs making situations that requirements in AB-520 overlap with the requirements in CSA B51 or codes of construction. For example, the 2014 edition of CSA B51 introduced Clause 4.1.10 and Normative Annex J. These requirements were very similar to the requirements in the first publication of AB-520.

In order to avoid the overlap, it was decided to develop a new edition of AB-520 and repurpose AB-520 from the requirements document to the guideline document. The Edition 2 of AB-520 is issued as the guideline document in 2023.

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