



PROBAD

Code-based Strength calculations of Pressure parts



PROBAD Release April 2019 New Features and Improvements

The program system PROBAD is checked and modified continuously within the scope of the maintenance agreement.

List of innovations, improvements and corrections of the new PROBAD-Releases
ASME I and ASME VIII/1, Edition 2017
ASME B31.1 and ASME B31.3, Edition 2018,
ASME B31.3, Edition 2016,
and ASME-Piping Series

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Materials according to ASME II-D, Edition 2017:

Materials according to ASME B31.1, Appendix A, Edition 2018:

Materials according to ASME B31.3, Appendix A, Edition 2016:

Materials according to ASME B31.3, Appendix K, Edition 2016:

A complete documentation of all available ASME materials can be found on the PROBAD start interface in the folder 'Information' under the name 'ASME PROBAD Material Numbers'.

In this document for all materials the relevant codes including page references from ASME II-D, ASME B31.1, Appendix A and/or ASME B31.3, Appendix A or K are listed.

- ASME II-D: The following new materials have been entered into the PROBAD material file:

PROBAD Number	Nominal Composition	Product Form	Specific. No.	Type/Grade Class
No. 95	23Cr-4Ni-Mo-Cu-N	Plate	SA-240	S32304
No. 707	Carbon steel	Casting	SA-216	WCB
No. 708	Carbon steel	Casting	SA-216	WCC
No. 709/710	16Cr-12Ni-2Mo	Casting	SA-351	CF3M
No. 711/712	16Cr-12Ni-2Mo	Casting	SA-351	CF8M
No. 713/714	18Cr-8Ni	Casting	SA-351	CF8
No. 554/555	60Ni-23Cr-Fe	Seaml. Pipe&Tube	SB-167	N06601
No. 556/557	60Ni-25Cr-9.5Fe-2.1Al	Seaml. Pipe&Tube	SB-167	N06025
No. 120	16Cr-12Ni-2Mo	Bolting	SA-193	B8M, Cl.1
No. 121	53Ni-19Cr-19Fe-Cb-Mo	Bolting	SA-637	N7718
No. 122	70Ni-16Cr-7Fe-Ti-Al	Bolting	SA-637	N7750

- ASME B31: The following new materials have been entered into the PROBAD material file:

PROBAD Number	Nominal Composition	Product Form	Specific. No.	Type/Grade Class
No. 118/119	C-Mn-Si	Eff.welded Pipe	A671	CC60
No. 98	Carbon steel	Eff.welded Pipe	A672	C65
No. 96/97	16Cr-12Ni-2Mo	Welded Pipe	A358	316L
No. 707	Carbon steel	Casting	A216	WCB
No. 708	Carbon steel	Casting	A216	WCC
No. 709/710	18Cr-12Ni-2Mo	Casting	A351	CF3M
No. 711/712	18Cr-12Ni-2Mo	Casting	A351	CF8M
No. 713/714	18Cr-8Ni	Casting	A351	CF8
No. 715	Carbon steel	Casting	A352	LCC
No. 95	23Cr-4Ni-Mo-Cu-N	Plate	A240	S32304
No. 120	16Cr-12Ni-2Mo	Bolting	A193	B8M, Cl.1
No. 606	9Cr-2W	Fittings	A182	F92
No. 638	9Cr-2W	Plate	A182	F92

- ASME B31: The following materials can be found under a modified material number:

No. 339	C-Mn-Si	Seaml. Pipe&Tube	A333	6
No. 340	11/4Cr-1/2Mo-Si	Eff.welded Pipe	A691	11/4Cr
No. 341	11/4Cr-1/2Mo-Si	Eff.welded Pipe	A691	11/4Cr



ASME I, Edition 2017, Release 5.00

New User Interface:

In the new release (besides ASME B31.1 and ASME B31.3) the PROBAD module ASME I is now also available in the new user interface.

- The new user interface has been converted to control designs familiar from common Microsoft programs.
- All commands are explained in the program with the help of detailed tooltips.
- The management of orders, drawings and data records has been converted to a compact format of project files, which can manage several orders in one file.
- Any number of project files can be created at any location.
- Drawings of the 3 calculation modules ASME I, ASME B31.1 and ASME B31.3 can now be managed in one order.
- Licenses for the calculation modules can be assigned and released during the runtime of the program.
- PROBAD input data of the last release can be imported and migrated into the new format.
- Any number of orders, drawings and data records can be transferred into one project file.
- Orders, drawings and data sets from all 3 calculation modules can be migrated into a common project file.
- If possible, the inputs for an assembly were summarized on one screen page. Inputs for subordinate components (nozzles...) are each displayed on another screen page.
- Already during the input the user is informed about necessary inputs.
- Already during the input these are checked, and marked if necessary as incorrect, and provided with an explaining Tooltip.
- Text entries are now basically unlimited in length, if the calculation kernel cannot process the number of characters, it is indicated in the interface and a correspondingly shortened text is transferred to the calculation kernel.
- Reports (output data) can be generated in PDF and RTF (MS Word) format.
- Reports can be generated for individual components, entire drawings and the print parts list.
- The input and calculation of the data can be done in SI- and US-units, the choice of the units is possible for the input and calculation independently of each other.
- The user interface can be displayed in German and English.
- The dialog for selecting materials has been replaced by a fully filterable and sortable interface.
- For each material displayed in the material selection a material data sheet can be displayed and saved in PDF format.
- The material data sheet can be attached to the calculation report (PDF reports only).

Simplified Input for Nipple Fields:

In the new release nipple fields may be entered much easier now:

- The selection field 'Nipple field configuration' is omitted.
- Now the total number of nipple rows (incl. displaced 2nd rows) has to be entered.
- In case of displaced 2nd rows now the actual with longitudinal offset between the nipples of the base row and the nipples of the 2nd row has to be entered.
- The input of the 'Number nc2 of 2nd rows in circumferential direction' and also the 'Offset in circumferential direction' is omitted.
- Now nipple fields with rhombus pattern can be defined.



Relevant maximum Usage Ratio:

In the first table of results below the allowable pressure we document the component, which was relevant for this value (e.g. ,Pipe connection - Nozzle 2').

If this component differs from the location of maximum usage ratio, the location of maximum usage ratio is documented additionally.

Welds connecting Nozzles and Shell:

Up to now the load W of the welds connecting nozzle and shell according to ASME I, PW-15 and PW-16 were taken into account during the determination of the allowable pressure, but were not regarded during the determination of the maximum usage ratio. Now the ratio $W / W_{allowable}$ is taken into account additionally determining the maximum usage ratio.

An entered or determined weld thickness between nozzle and shell enters into the reinforcement calculation without allowances. For this reason these thicknesses are documented as ,net thicknesses' in the results.

Component in Creep Range:

If the allowable design stress S of a component results from creep rupture strength values, this is documented in the results by a ,CR' in front of the correspondent allowable design stress S .

Tubular Reinforcement of Nozzles:

If in case of dimensioning the nozzle thickness at the shell is designed with greater wall thickness than at the pipe connection, a correspondent hint is displayed now.

Loadcase Test: Allowable calculation stress:

In the test loadcase the safety factor for the yield strength value is now documented in the results in front of the allowable calculation stress of the main shell (e.g.: ,0.9 SY')

Input of Medium Temperature:

In the new release the temperature of the medium may now be entered.

An entered value is documented in the results additionally.



ASME VIII/1, Edition 2017, Rel. 7.08

Flange: Required Bolt Torque:

In the new release the required bolt torque T_b is now determined according to ASME PCC-1, Appendix O, formula (O-2): $T_b = W * K * d_b / n_b$

with: W = Design bolt load according to ASME VIII/1, App. 2-4, formula (5)
 d_b = Nominal bolt diameter
 n_b = Number of bolts
 K = Nut factor

By default a nut factor $K = 0.2$ enters into the determination to take into account the bolt material and the temperature. Differing values must be entered.

Flange: Usage Ratio of Bolts:

In the new release the usage ratio of the bolts is now documented in the results:

Usage ratio - operation = required cross-sectional area A_{m1} / actual cross-sectional area A_b

Usage ratio - assembly = 0.5 (required cross-sectional area $A_{m2} + A_b$) / actual cross-sectional area A_b

Flange: External Bending Moment:

Up to now an external bending moment M was converted to an additional axial force F by the formula $F = 4 * M / G$, where G = mean gasket diameter.

On the basis of EN 1591-1, formula (96) and AD-B7, 7.1.2.1 this now happens uniformly in all PROBAD modules via the formula: $F = 4 * M / C_e$

where C = Bolt circle diameter

n_B = Number of bolts

$C_e = C * (1 - 2/n_B^2)$ = effective bolt circle diameter

Relevant maximum Usage Ratio:

In the first table of results below the allowable pressure we document the component, which was relevant for this value (e.g. ,Pipe connection - Nozzle 2').

If this component differs from the location of maximum usage ratio, the location of maximum usage ratio is documented additionally.

Loadcase Test: Allowable calculation stress:

In the test loadcase the safety factor for the yield strength value is now documented in the results in front of the allowable calculation stress of the main shell (e.g.: ,0.9 SY')

Welds connecting Nozzles and Shell:

Up to now the load W of the welds connecting nozzle and shell according to ASME VIII/1, UG-41 and UW-15 were taken into account during the determination of the allowable pressure, but were not regarded during the determination of the maximum usage ratio. Now the ratio $W / W_{allowable}$ is taken into account additionally determining the maximum usage ratio.

An entered or determined weld thickness between nozzle and shell enters into the reinforcement calculation without allowances. For this reason these thicknesses are documented as ,net thicknesses' in the results.

Tubular Reinforcement of Nozzles:

If in case of dimensioning the nozzle thickness at the shell is designed with greater wall thickness than at the pipe connection, a correspondent hint is displayed now.



ASME B31.1, Edition 2018, Rel. 4.01 ASME B31.3, Edition 2016, Rel. 2.01

ASME B31.1, Edition 2018:

ASME B31.1, Edition 2018 compared with Edition 2016 contains the following modifications:

- Section 102.4.5: Bending:
The subsections are now numbered by lowercase letters a) ect..
Table 102.4.5 was renamed to Table 102.4.5-1
- Section 104.1: Straight Pipe
Subsection 104.1.4 incl. formulas (11) – (12) is omitted.
The input panels, helps and result documentation were revised.

Graphic Helps:

As input for the ‚Angle β to circumferential tangent‘ values between 0° and 180° are allowed in ASME B31.1 and B31.3. The correspondent graphic help was corrected.

ASME-Piping Series, Release 1.09

Non-standard diameters:

In the new release of PROBAD-Piping series non-standard diameters can now be calculated for ‚straight pipes‘, ‚branches‘ and ‚bended pipes‘.

Selecting a dimensions standard, which doesn't contain standard diameters (e.g., ‚1.0 mm round-off‘ or ‚1/32 inch round-off‘), the required diameters can now be entered explicitly.

If no wall thickness is entered, the correspondent nominal thicknesses are determined according to the selected dimensions standard in full, half or tenth millimeter steps.

Results as Excel tables:

For several years the results of piping series calculations are available as CSV files for the import to Excel in the data directory.

Here in certain circumstances the sequence of the nozzle table differed from the correspondent result table. In the new release the CSV files now has the same structure as the result display