Lo nuevo en la versión 4.84

PASS START-PROF

Pipe Stress Analysis And Sizing

PASS / Start-Prof | Próxima Versión 4.84

Ha pasado aproximadamente un año desde nuestra última versión del software PASS / START-PROF

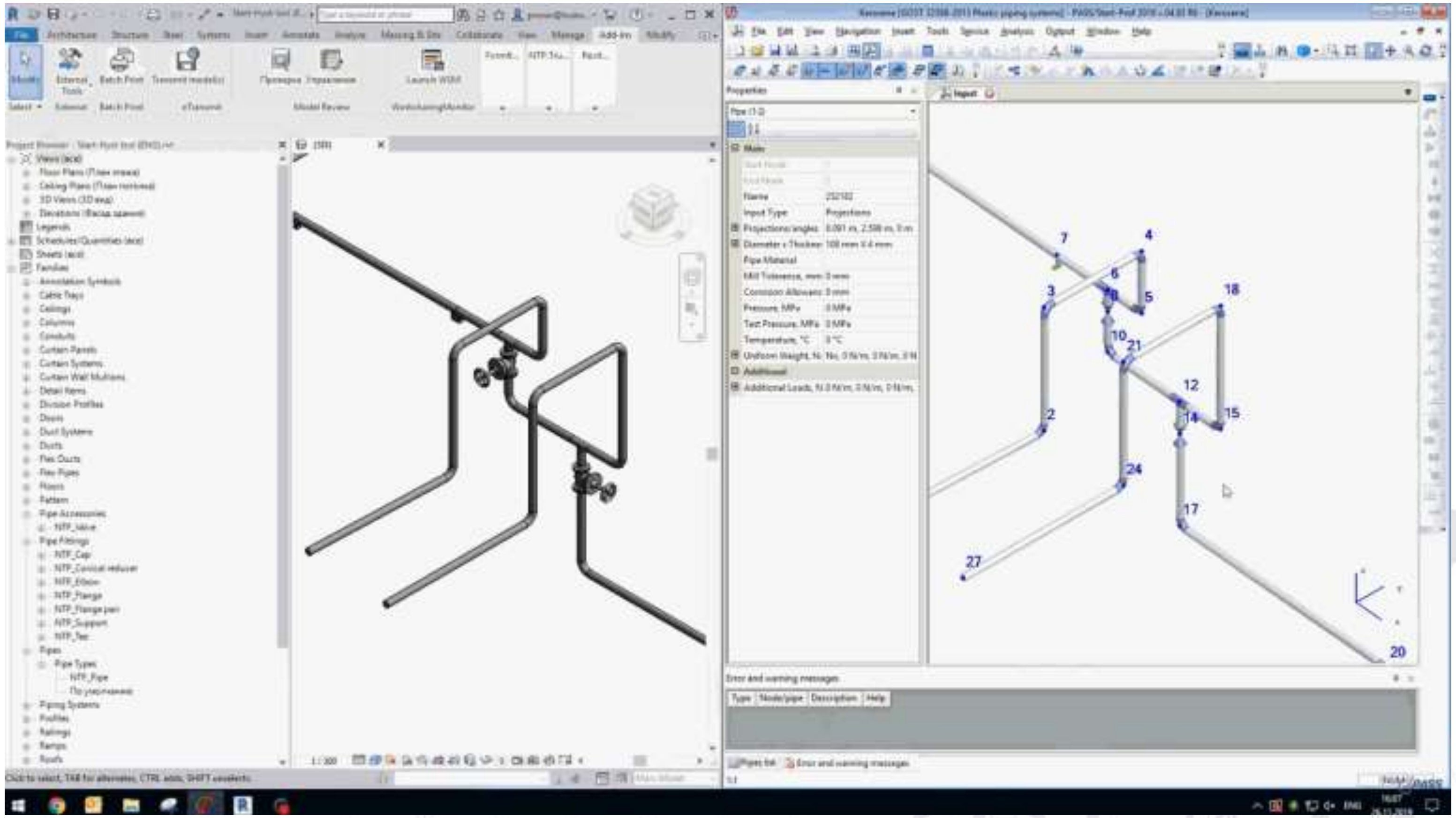
Nosotros trabajamos duro durante este tiempo

Mire qué hemos preparado para nuestros clientes

PASS
PIPING AND EQUIPMENT ANALYSIS & SIZING SUITE

PASS / Start-Prof | Interfaces Externas

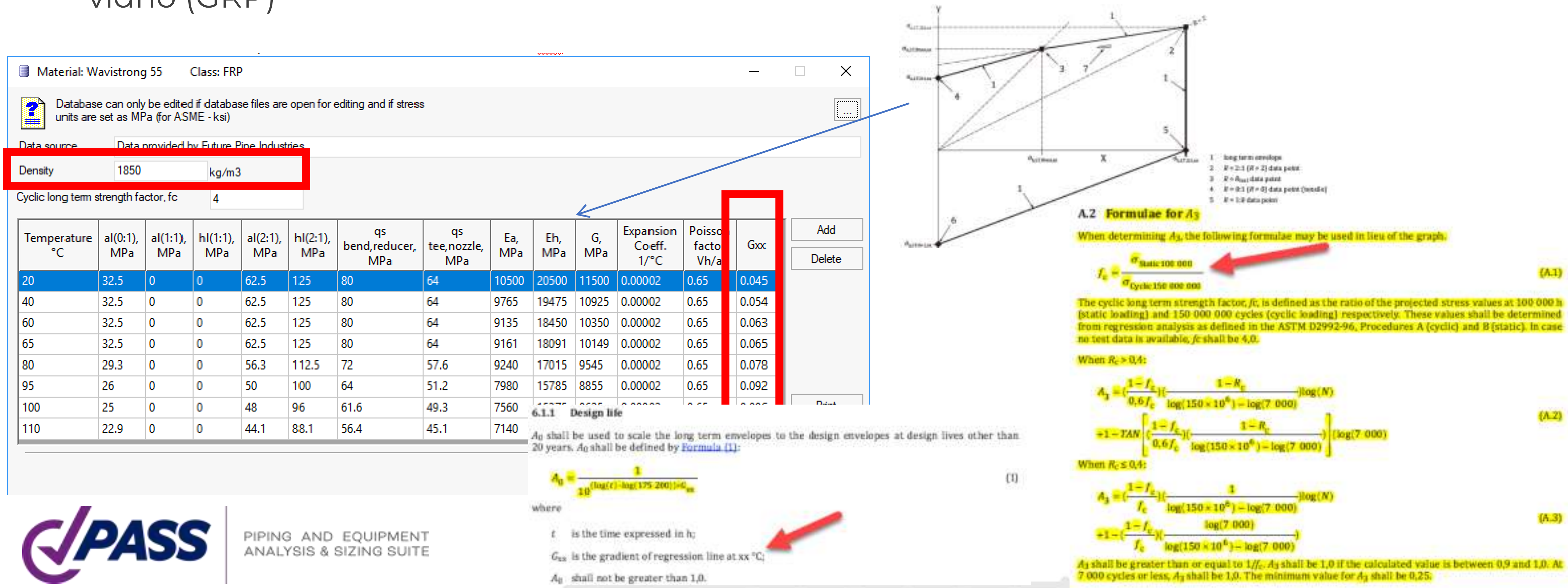
- Se agregó Exportación e importación desde AVEVA E3D versión 3.1
- Se agregó Exportación e importación desde AVEVA MARINE version 12.1SP4 and 12.1SP5
- Implementación de soporte para AVEVA MDS
- Se agregó la Importación desde Autodesk REVIT a START-PROF



PASS PIPING AND EQUIPMENT ANALYSIS & SIZING SUITE

PASS / Start-Prof | Actualizaciones de Códigos

- Se actualizó el Código ASME B31.9-2017 conforme al Building Services Piping (EE. UU.)
- Se actualizó el Código **ASME B31.4-2019 Sistemas de transporte por tubería para líquidos y lodos (EE. UU.)**
- Se actualizó la base de datos de la ISO 14692-2017. Tuberías de plástico reforzado con fibra de vidrio (GRP)



Temperature °C	al(0:1), MPa	al(1:1), MPa	hl(1:1), MPa	al(2:1), MPa	hl(2:1), MPa	qs bend,reducer, MPa	qs tee,nozzle, MPa	Ea, MPa	Eh, MPa	G, MPa	Expansion Coeff. 1/°C	Poisso facto Vh/a	Gxx
20	32.5	0	0	62.5	125	80	64	10500	20500	11500	0.00002	0.65	0.045
40	32.5	0	0	62.5	125	80	64	9765	19475	10925	0.00002	0.65	0.054
60	32.5	0	0	62.5	125	80	64	9135	18450	10350	0.00002	0.65	0.063
65	32.5	0	0	62.5	125	80	64	9161	18091	10149	0.00002	0.65	0.065
80	29.3	0	0	56.3	112.5	72	57.6	9240	17015	9545	0.00002	0.65	0.078
95	26	0	0	50	100	64	51.2	7980	15785	8855	0.00002	0.65	0.092
100	25	0	0	48	96	61.6	49.3	7560					
110	22.9	0	0	44.1	88.1	56.4	45.1	7140					

$$f_c = \frac{\sigma_{Static\ 100\ 000}}{\sigma_{Cyclic\ 150\ 000\ 000}} \quad (A.1)$$

$$A_3 = \left(\frac{1-f_c}{0,6 f_c}\right)\left(\frac{1-R_c}{\log(150\times10^6)-\log(7\ 000)}\right)\log(N) + 1 - TAN\left[\left(\frac{1-f_c}{0,6 f_c}\right)\left(\frac{1-R_c}{\log(150\times10^6)-\log(7\ 000)}\right)\right]\log(7\ 000) \quad (A.2)$$

$$A_3 = \left(\frac{1-f_c}{f_c}\right)\left(\frac{1}{\log(150\times10^6)-\log(7\ 000)}\right)\log(N) + 1 - \left(\frac{1-f_c}{f_c}\right)\left(\frac{\log(7\ 000)}{\log(150\times10^6)-\log(7\ 000)}\right) \quad (A.3)$$

$$A_0 = \frac{1}{10^{(\log(t)-\log(175\ 200))\times G_{xx}}} \quad (1)$$

PASS

PIPING AND EQUIPMENT ANALYSIS & SIZING SUITE

PASS / Start-Prof | Actualizaciones de Códigos

Las tensiones de flexión del anillo se calculan utilizando el método de elemento finito con no linealidad geométrica y se considera el efecto de rigidez por la presión.

7.8 Allowable stresses

The sum of the hoop stresses shall be defined by the following formulae:

$$\sigma_{h,sum} = \sigma_{hp} + \sigma_{hu} \qquad (10)$$

$$\sigma_{hp} = \frac{P \times D_{r,min}}{2 \times t_{r,min}} \qquad (11)$$

$$\sigma_{hu} = r_c \times D_f \times E_{hb} \times \frac{\Delta y}{D_{r,min}} \times \frac{t_{r,min}}{D_{r,min}} \qquad (12)$$

where

P is the internal pressure, expressed in MPa;

$t_{r,min}$ is the minimum reinforced pipe wall thickness, expressed in mm;

$D_{r,min}$ is the mean diameter of the minimum reinforced pipe wall, expressed in mm;

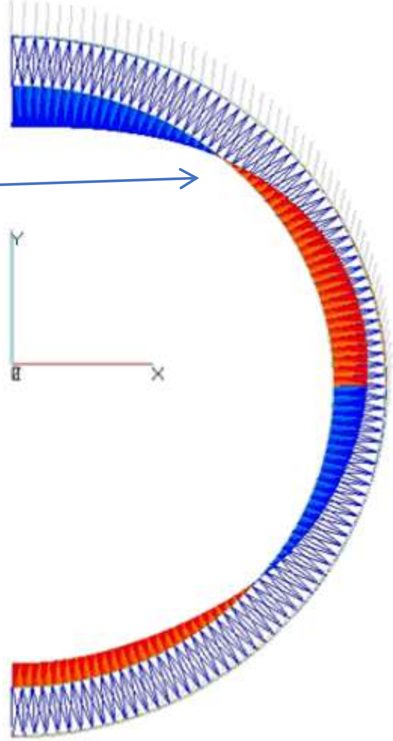
t_l is the internal liner thickness of the pipe wall, expressed in mm;

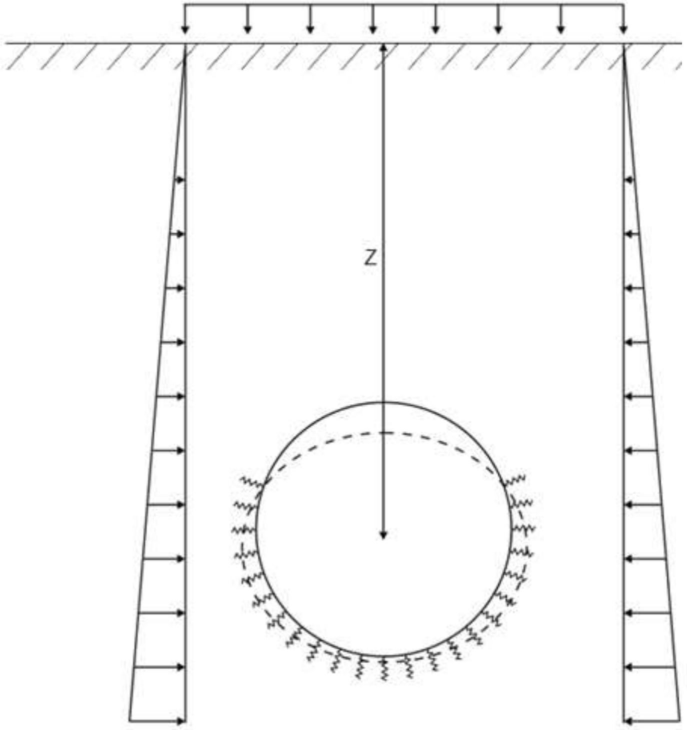
r_c is the rerounding coefficient, for $P \leq 3$ then $r_c = 1 - P/3$, for $P > 3$ then $r_c = 0$;

D_f is the shape factor, see AWWA Manual M45 (second edition), Table 1;

$\Delta y / D_{r,min}$ is the predicted vertical pipe deflection [see Formula (9)];

E_{hb} is the hoop bending modulus, expressed in MPa.

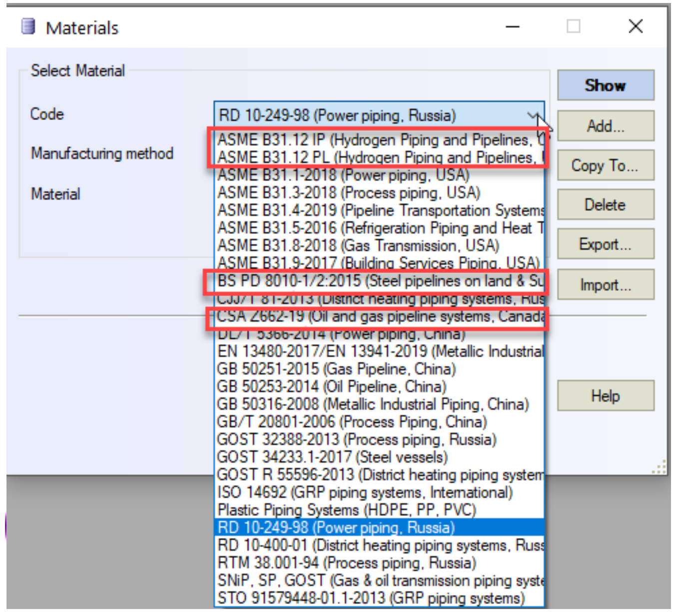


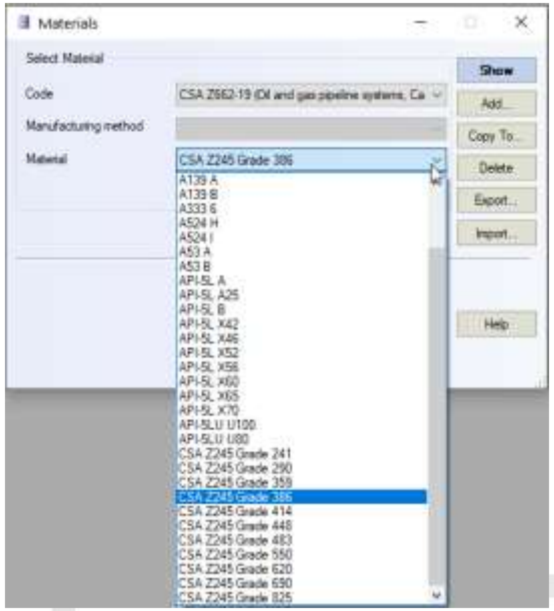


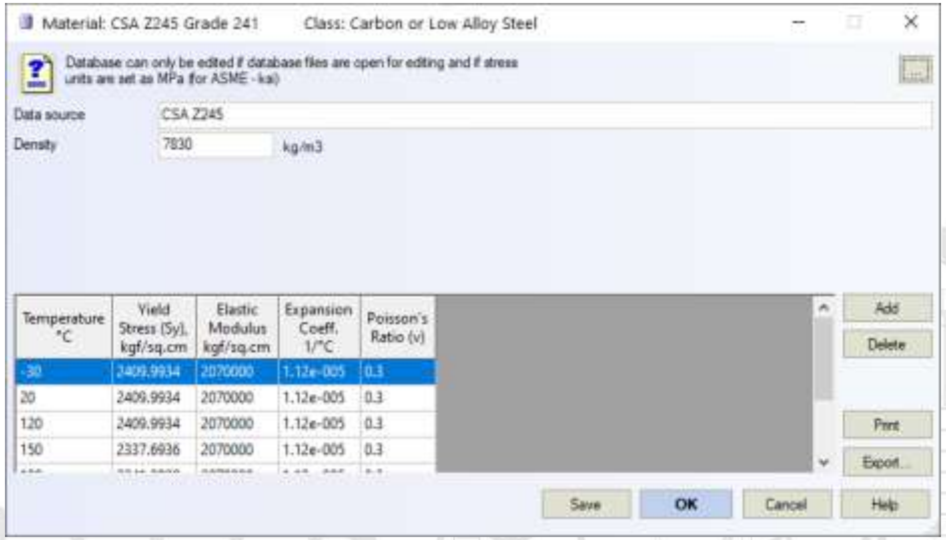
PIPING AND EQUIPMENT
ANALYSIS & SIZING SUITE

PASS / Start-Prof | Códigos nuevos

- ASME B31.12-2014 Tuberías y tuberías de hidrógeno (EE. UU.)
- BS PD 8010-1: 2015 Sistemas de tuberías - Parte 1: Tuberías de acero en tierra (Reino Unido)
- BS PD 8010-2: 2015 Sistemas de tuberías - Parte 2: tuberías submarinas (Reino Unido)
- CSA Z662 + Ch.11 Sistemas de oleoductos y gasoductos (Canadá)
- GOST R 55989-2014 Tuberías de transmisión de gas y petróleo para presiones mayores a 10 MPa
- GOST R 55990-2014 Tuberías de campo (Rusia)
- SP 284.1325800.2016 Tuberías de campo (Rusia)
- SP 33.13330.2012 Tuberías de acero (Rusia)
- Se crearon bases de datos individuales y se incluyeron las propiedades de Material para todos los códigos nuevos.

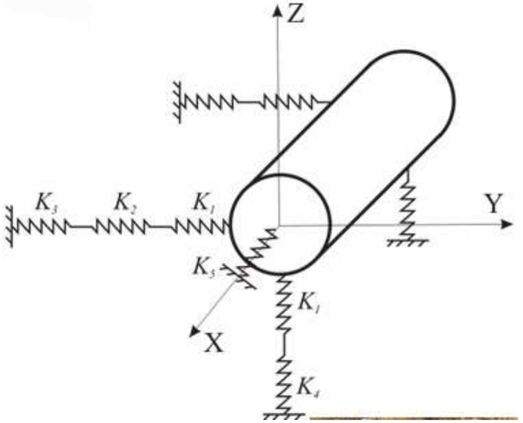






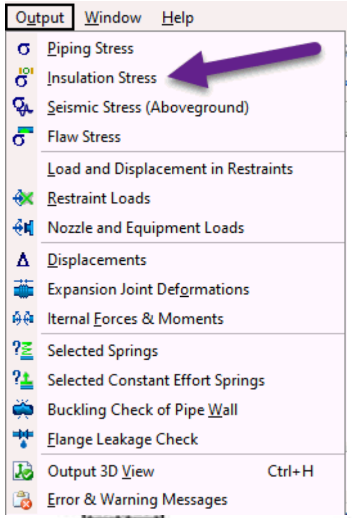
PASS/Start-Prof | Códigos nuevos

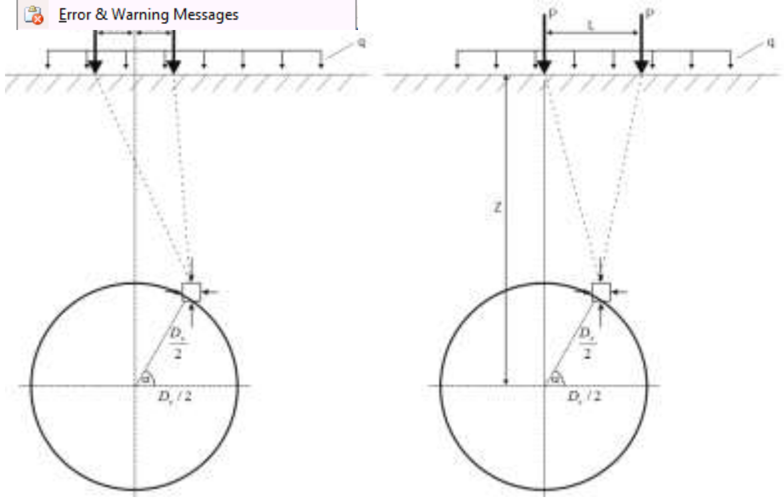
EN 13941-2019 Tuberías de calefacción urbana. Diseño e instalación de sistemas de tubería simple y doble con aislamiento térmico para redes de agua caliente directamente enterradas.

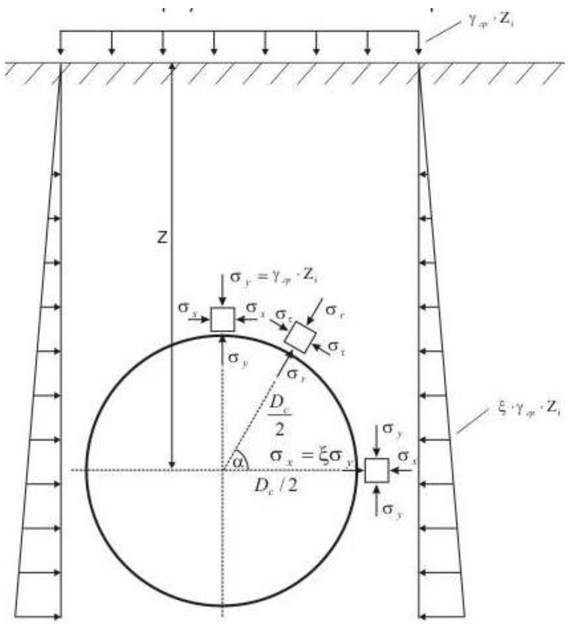


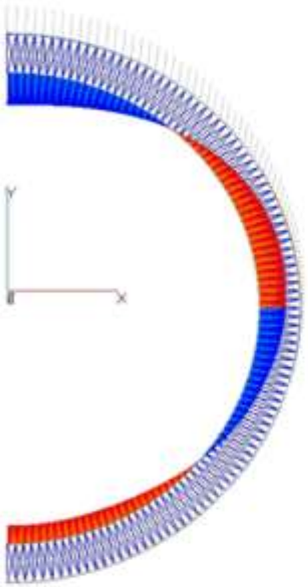
PASS/Start-Prof | Códigos nuevos

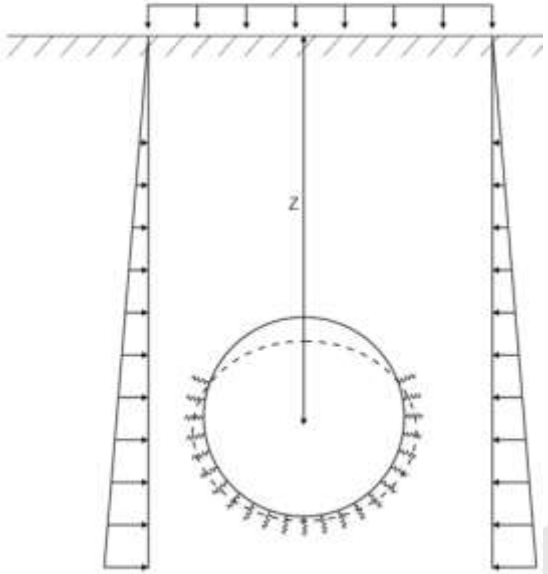
Calcula y verifica esfuerzos en aislamiento de Poliuretano (EN 13941 7.3.1, 7.3.2, EN 253). Y verifica los esfuerzos a partir de cargas por vehículos en la superficie.





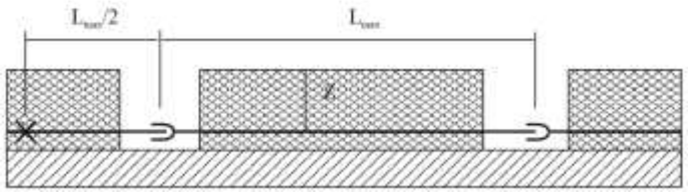


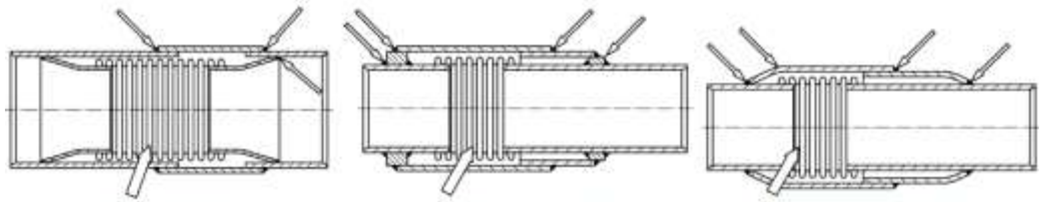




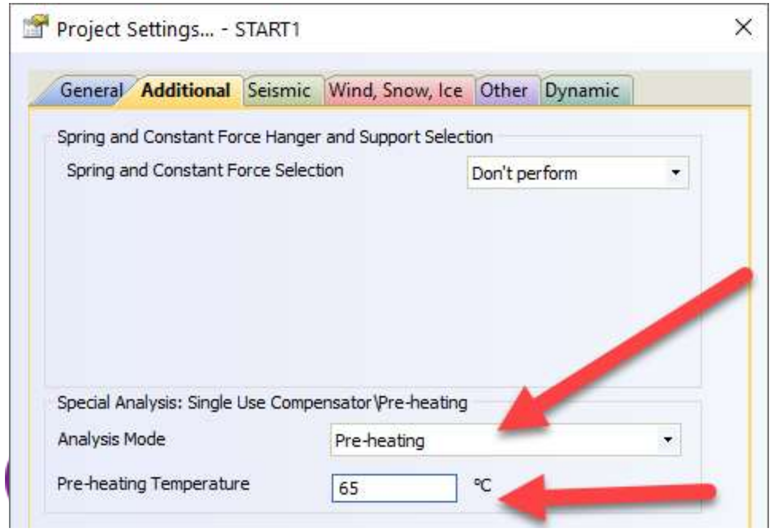
PASS/Start-Prof | Códigos nuevos

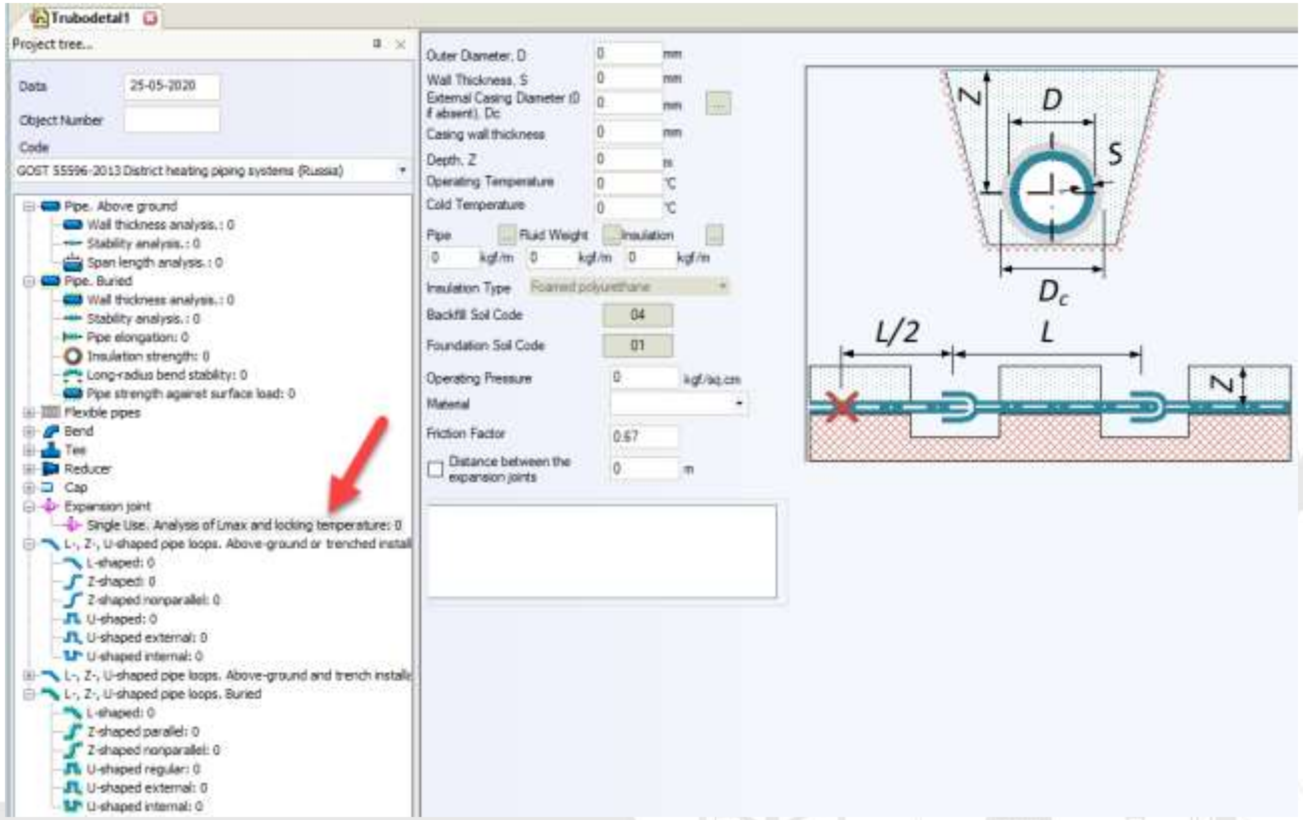
- START-PROF tiene todo lo necesario para análisis de redes de calefacción urbana y es ampliamente utilizado desde 1998.
- Análisis de Pre-Calentamiento
- Análisis de Compensadores de uso simple + base de datos + cálculo de distancia





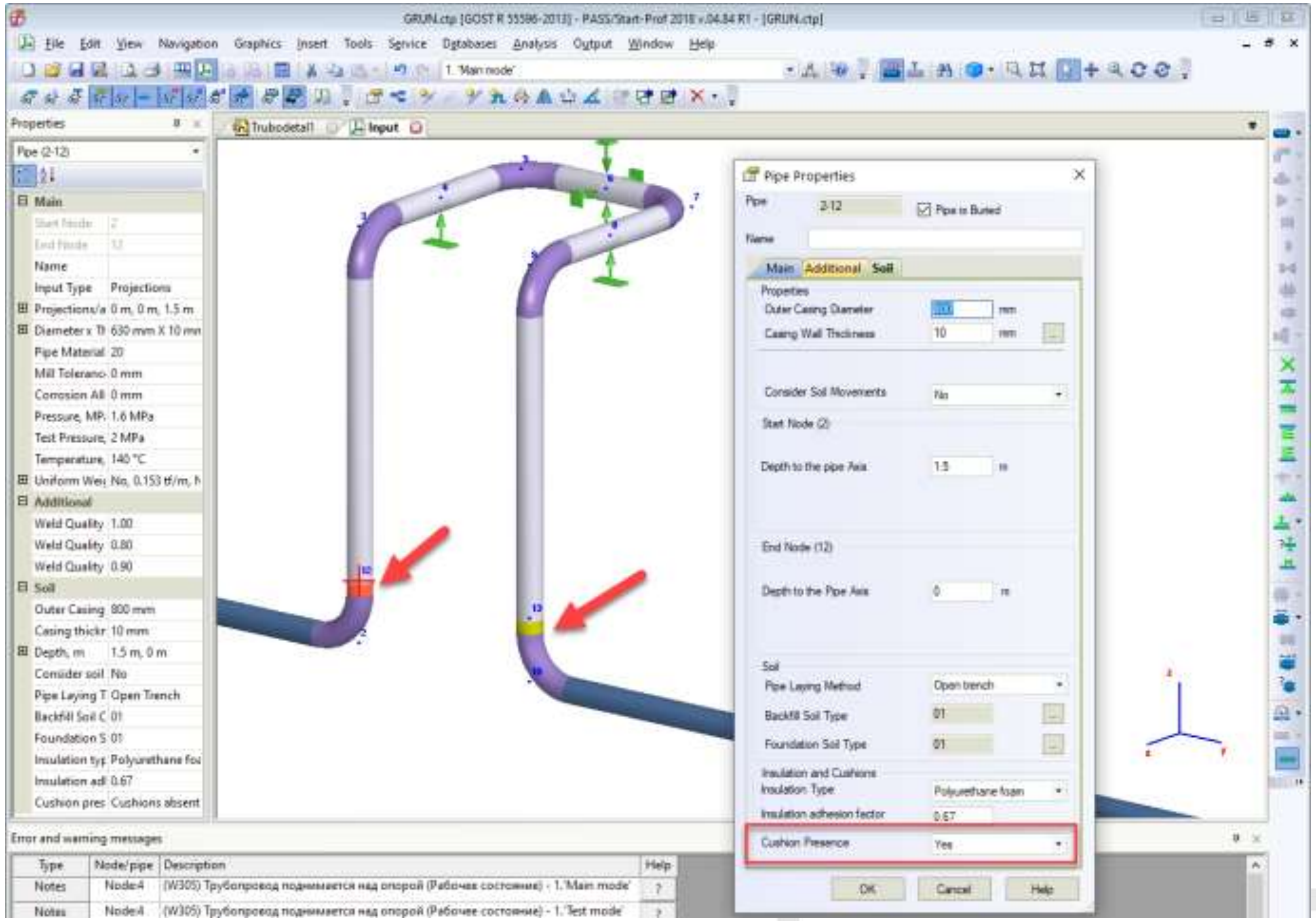
a) Single use Compensator Type 1 b) Single use Compensator Type 2 c) Single use Compensator Type 3

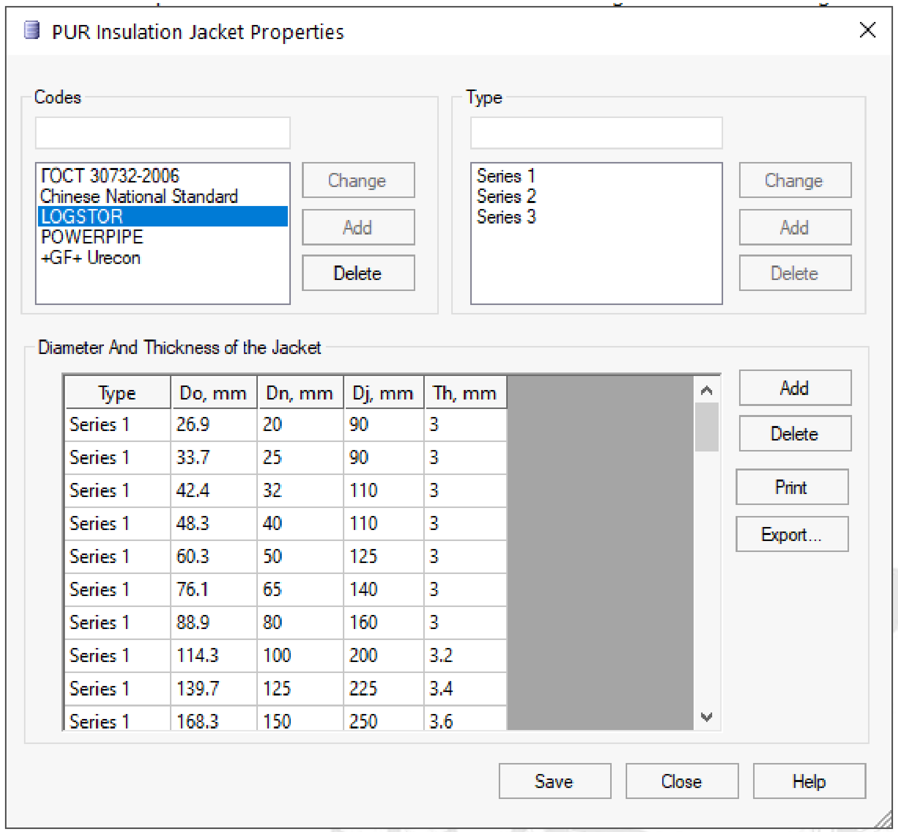




PASS/Start-Prof | Códigos nuevos

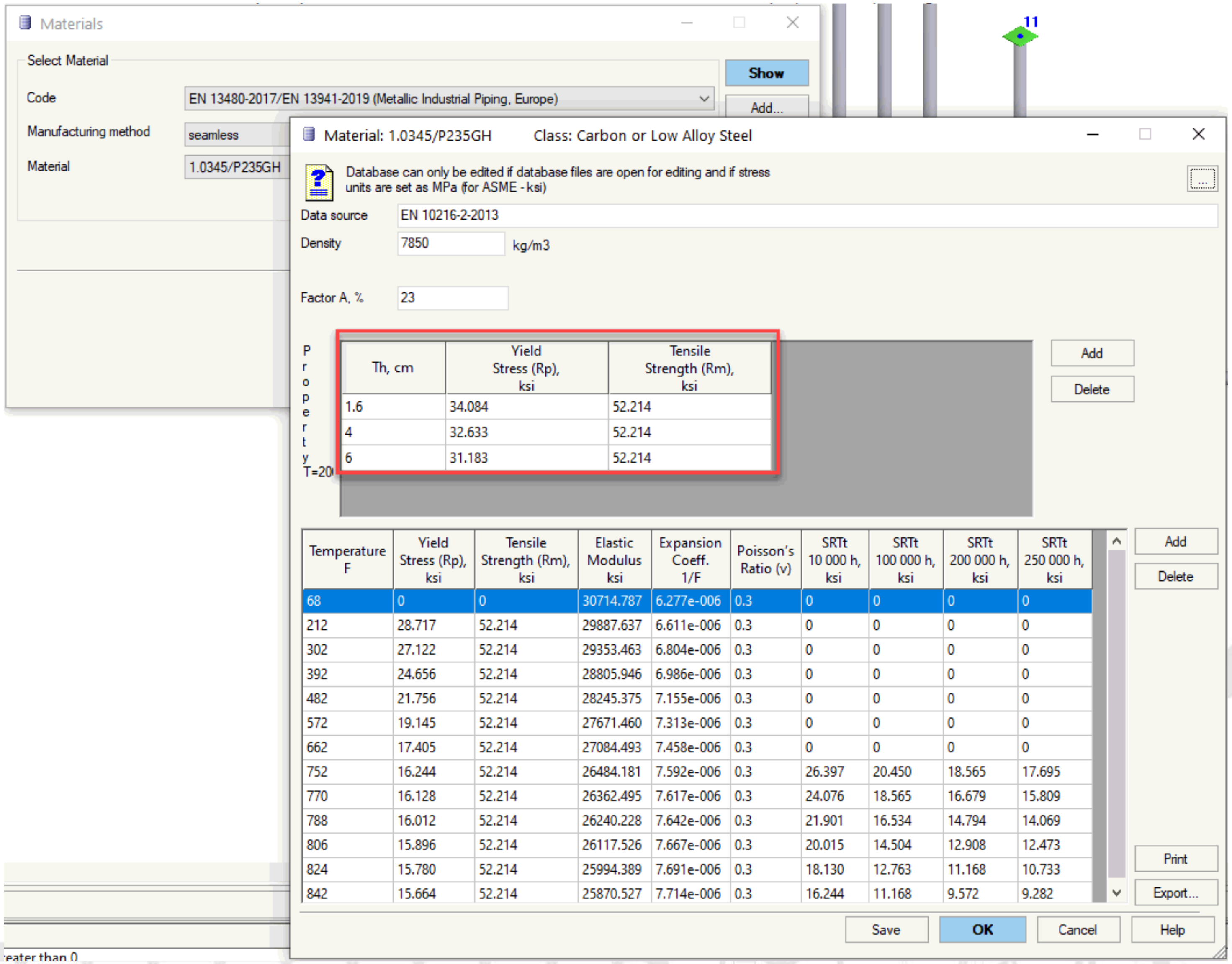
- Agregada base de datos de tamaños y espesor de camisa de tubería pre-aislada de poliuretano LOGSTOR, POWERPIPE, +GF+ URECON, para redes urbanas de refrigeración y calefacción
- Ahora se permite agregar cojines de expansión en tuberías verticales





PASS/Start-Prof | Actualización de códigos

Se actualizaron las bases de datos de Material
EN 13480/EN 13941.
Se adicionan todos los materiales de tubería para
EN 10216-1-2013, EN 10216-2-2013, EN 10216-3-2013, EN 10216-4-2013, EN 10216-5-2013, EN 10217-1-2019, EN 10217-1-2019, EN 10217-2-2019, EN 10217-3-2019, EN 10217-4-2019, EN 10217-5-2019, EN 10217-6-2019, EN 10217-7-2014, EN 10220-2002 (2007), EN 10253-2-2007.
Se adicionan la selección automática de propiedades de materiales dependiendo del espesor de pared y la opción propia de con o sin costura



PIPING AND EQUIPMENT ANALYSIS & SIZING SUITE

PASS/Start-Prof | Nuevas funciones

Se adiciona cálculo de Temperatura Mínima de Metal en el Diseño (MDMT) de acuerdo con ASME B31.3-2018 323.2.2 (a), (b), (d), (e), (f), (g), (h), (i), (j). Lo anterior fue Incorporado en la base de datos de materiales.

PASS/START-PROF calcula el MDMT de acuerdo con figura 323.2.2A y figura 323.2.2B dependiendo de la relación de esfuerzo calculado si el usuario selecciona la opción apropiada en los "settings" del proyecto, considerando los requerimientos de código 323.2.2 (g), (h), (i).

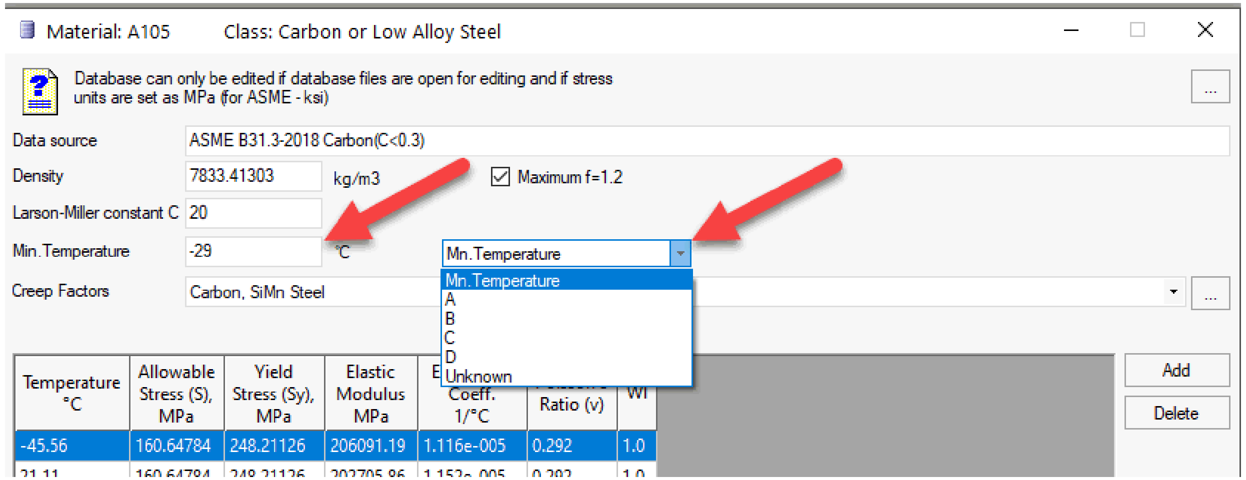


Table A-1 Basic Allowable Stresses in Tension for Metals (Cont'd)

Numbers in Parentheses Refer to Notes for Appendix A Tables; Specifications Are ASTM Unless Otherwise Indicated

Material	Spec. No.	Type/ Grade	UNS No.	Class/ Condition/ Temper	Size, in.	P-No. (5)	Notes	Min. Temp., °F (6)	Specified Min. Strength, ksi: Tensile	Yield	Basic Allowable Stress, S, ksi, at Metal Temperature, °F [Note (1)]: Min. Temp. to 100	200	300
Carbon Steel — Pipes and Tubes													
A285 Gr. A	A134	...	...	...	...	1	(8b)(57)	B	45	24	15.0	14.7	14.2
A285 Gr. A	A672	A45	K01700	...	...	1	(57)(59)(67)	B	45	24	15.0	14.7	14.2
Butt weld	API 5L	A25	...	...	...	1	(8a)(77)	−20	45	25	15.0	15.0	14.7

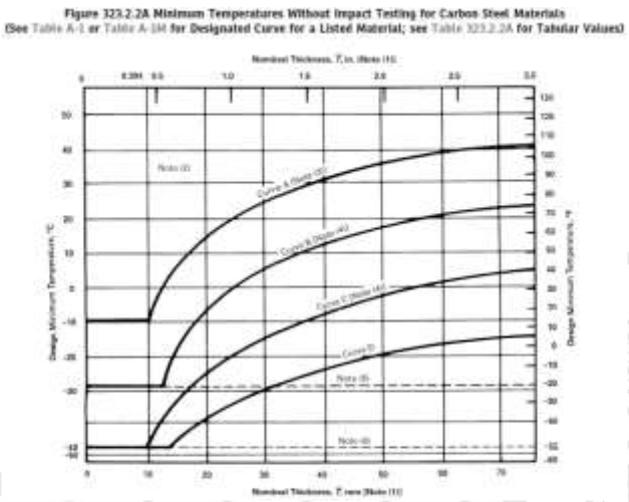
PIPING AND EQUIPMENT ANALYSIS & SIZING SUITE

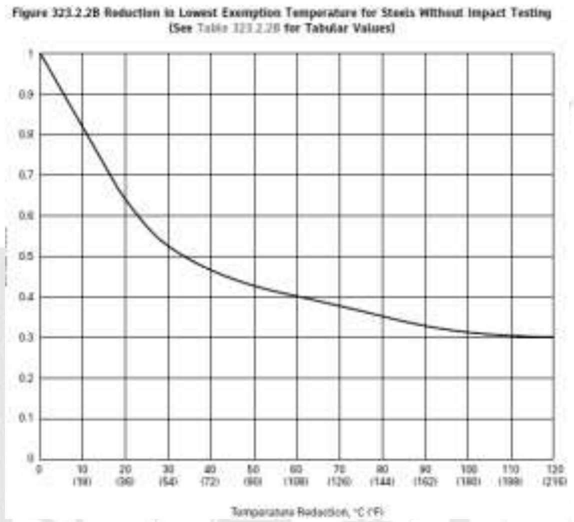
PASS/Start-Prof | Nuevas funciones

Tras el análisis se obtiene la tabla del reporte. Para cada tubo START-PROF muestra si la prueba de impacto se requiere o no.

Input | MDMT

Object	Start End node	Thickness, cm	Material	Stress Ratio, r	Tmin, °C	MDMT, °C	Output
Above ground pipe	3,Restrained	0.600	A106 B	0.294	-40	-48	OK
Above ground pipe	23	0.600	A106 B	0.395	-40	-48	OK
	5,Bend	0.600	A106 B	0.840	-40	-37.869	Impact Test
Above ground pipe	6,0 Flange	0.600	A106 B	0.436	-40	-48	OK
	24	0.600	A106 B	0.400	-40	-48	OK
Above ground pipe	6,0 Flange	0.600	A106 B	0.342	-40	-48	OK
	8	0.600	A106 B	0.373	-40	-48	OK
Above ground pipe	8	0.600	A106 B	0.317	-40	-48	OK
	25	0.600	A106 B	0.283	-40	-48	OK
Above ground pipe	27	0.600	A106 B	0.430	-40	-48	OK
	9	0.600	A106 B	0.951	-40	-31.783	Impact Test
Above ground pipe	8	0.600	A106 B	0.330	-40	-48	OK

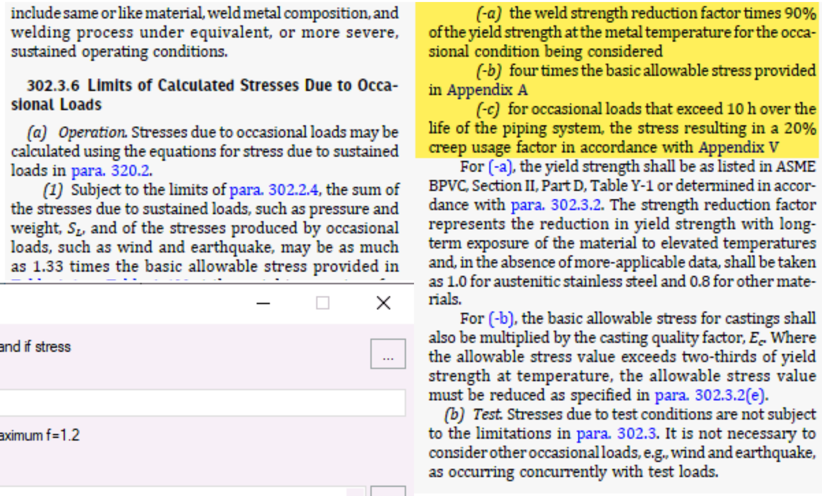




PIPING AND EQUIPMENT
ANALYSIS & SIZING SUITE

PASS/Start-Prof | Nuevas funciones

Actualizadas las las librerías de materiales, incluyendo los factores de reducción por soldadura para ASME B31.3-2018.
Se adicionó cálculo del esfuerzo permisible para fluidos de servicio a alta temperatura conforme al ASME B31.3-2018, 302.3.6 (2)
Se agregó el Apéndice V. Se agregaron opciones de "Duración de tiempo", "Ocasional alternativa" al editor de modo de operación. Se Agrego la constante "C" de Larson-Miller en base de datos de material del ASME B31.3



include same or like material, weld metal composition, and welding process under equivalent, or more severe, sustained operating conditions.

302.3.6 Limits of Calculated Stresses Due to Occasional Loads

(a) Operation. Stresses due to occasional loads may be calculated using the equations for stress due to sustained loads in para. 320.2.

(1) Subject to the limits of para. 302.2.4, the sum of the stresses due to sustained loads, such as pressure and weight, S_L, and of the stresses produced by occasional loads, such as wind and earthquake, may be as much as 1.33 times the basic allowable stress provided in

(-a) the weld strength reduction factor times 90% of the yield strength at the metal temperature for the occasional condition being considered

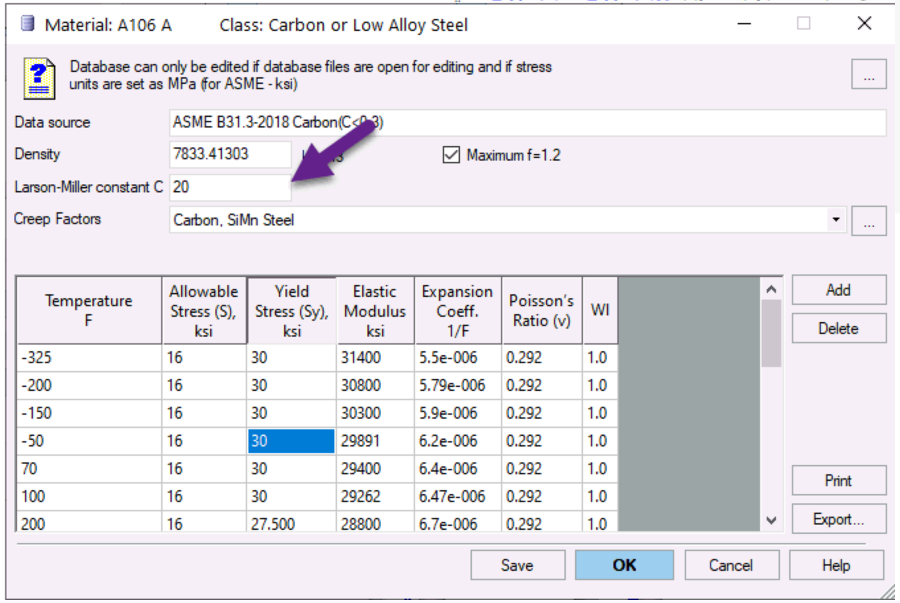
(-b) four times the basic allowable stress provided in Appendix A

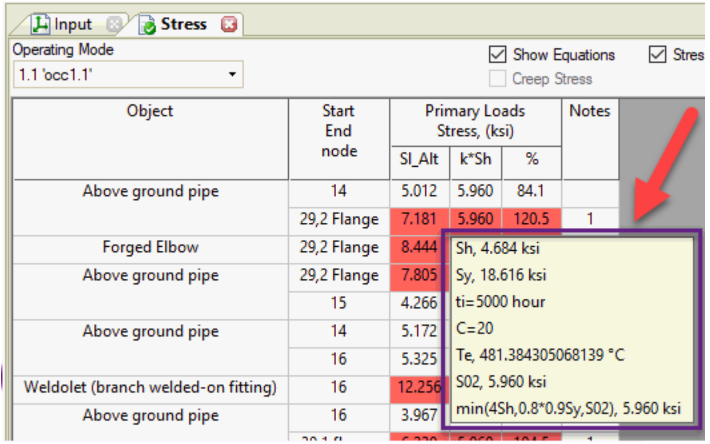
(-c) for occasional loads that exceed 10 h over the life of the piping system, the stress resulting in a 20% creep usage factor in accordance with Appendix V

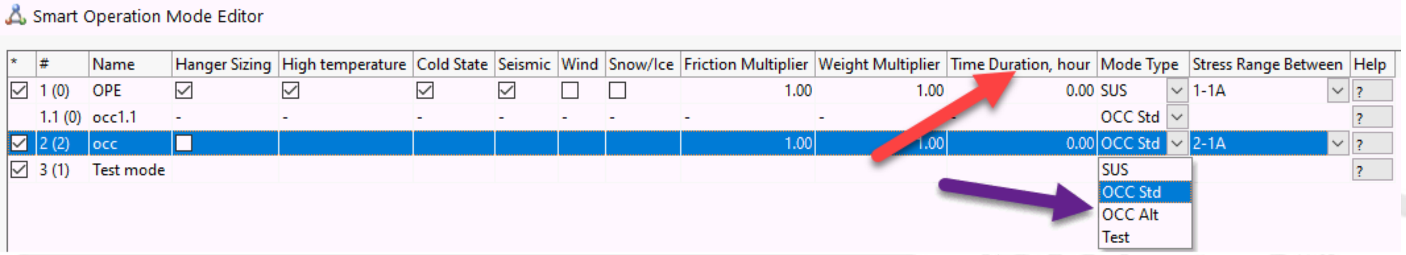
For (-a), the yield strength shall be as listed in ASME BPVC, Section II, Part D, Table Y-1 or determined in accordance with para. 302.3.2. The strength reduction factor represents the reduction in yield strength with long-term exposure of the material to elevated temperatures and, in the absence of more-applicable data, shall be taken as 1.0 for austenitic stainless steel and 0.8 for other materials.

For (-b), the basic allowable stress for castings shall also be multiplied by the casting quality factor, E_c. Where the allowable stress value exceeds two-thirds of yield strength at temperature, the allowable stress value must be reduced as specified in para. 302.3.2(e).

(b) Test. Stresses due to test conditions are not subject to the limitations in para. 302.3. It is not necessary to consider other occasional loads, e.g., wind and earthquake, as occurring concurrently with test loads.

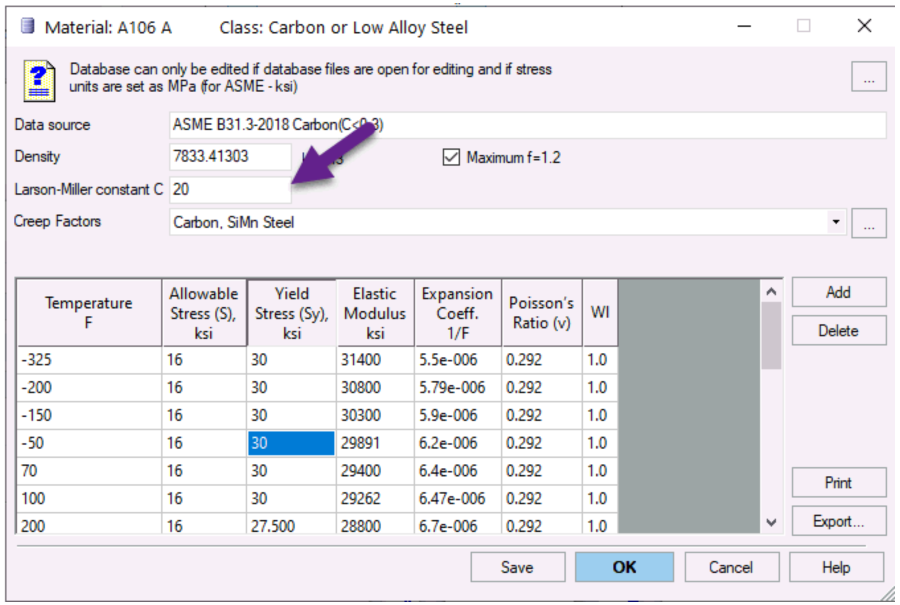






PASS/Start-Prof | Nuevas Funciones

Se agregó el cálculo automático de factor de uso de ruptura por fluencia de acuerdo con ASME B31.3-2018 Apéndice V (V303.1-V303.3)



Temperature F	Allowable Stress (S), ksi	Yield Stress (Sy), ksi	Elastic Modulus ksi	Expansion Coeff. 1/F	Poisson's Ratio (v)	WI
-325	16	30	31400	5.5e-006	0.292	1.0
-200	16	30	30800	5.79e-006	0.292	1.0
-150	16	30	30300	5.9e-006	0.292	1.0
-50	16	30	29891	6.2e-006	0.292	1.0
70	16	30	29400	6.4e-006	0.292	1.0
100	16	30	29262	6.47e-006	0.292	1.0
200	16	27.500	28800	6.7e-006	0.292	1.0

V303.2 Determine Creep-Rupture Usage Factor

The usage factor, u, is the summation of individual usage factors, t_i / t_{ri}, for all service conditions considered in para. V303.1. See eq. (V4).

$$u = \sum (t_i / t_{ri}) \qquad \text{(V4)}$$

where

i = as a subscript, 1 for the prevalent operating condition; i = 2, 3, etc., for each of the other service conditions considered

t_i = total duration, h, associated with any service condition, i, at pressure, P_i, and temperature, T_i

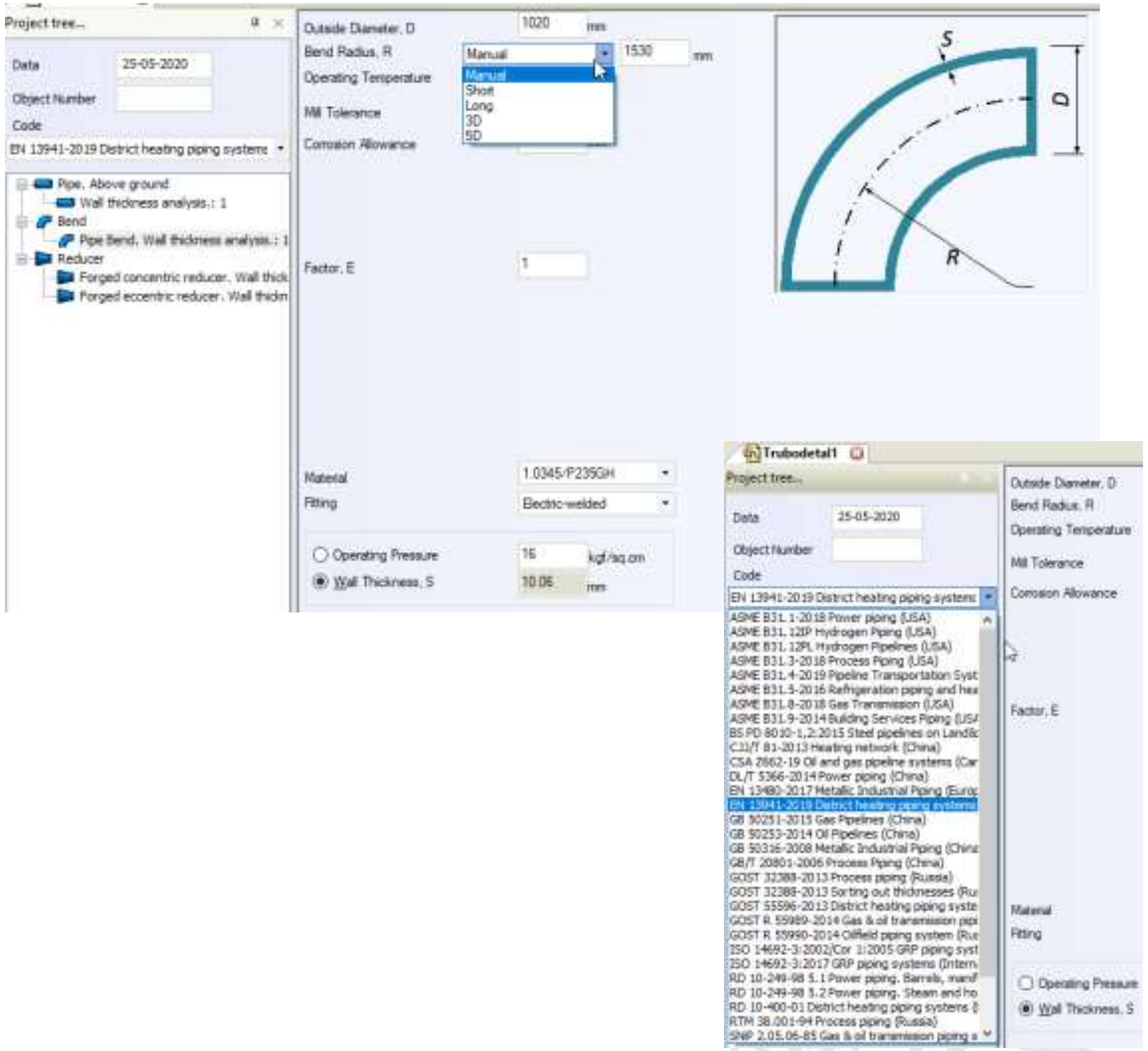
t_{ri} = as defined in para. V303.1.4

V303.3 Evaluation

The calculated value of u indicates the nominal amount of creep-rupture life expended during the service life of the piping system. If $u \leq 1.0$, the usage factor is acceptable including excursions. If $u > 1.0$, the designer shall either increase the design conditions (selecting piping system components of a higher allowable working pressure if necessary) or reduce the number and/or severity of excursions until the usage factor is acceptable.

PASS/Start-Prof | Nuevas funciones

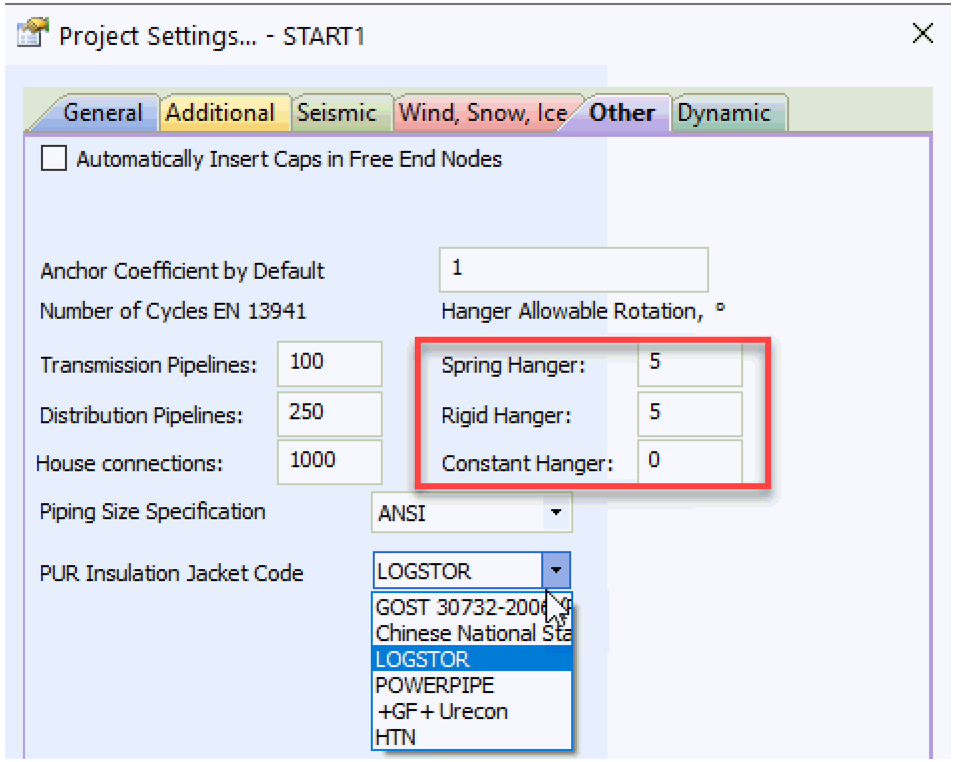
Se agregó el cálculo de espesor de pared del tubo y dobleces para todos los nuevos códigos como ISO 14692-2017, EN 13941, ASME B31.12, BS PD 8010, CSA Z662, GOST R 55989, GOST R 55990, SP 284.1325800.2016, SP 33.13330.2012. Y por supuesto, todos los espesores de pared de accesorios y tubería son revisados automáticamente antes de cada corrida del análisis de esfuerzos de acuerdo con el código seleccionado



PIPING AND EQUIPMENT
ANALYSIS & SIZING SUITE

PASS/Start-Prof | Nuevas funciones

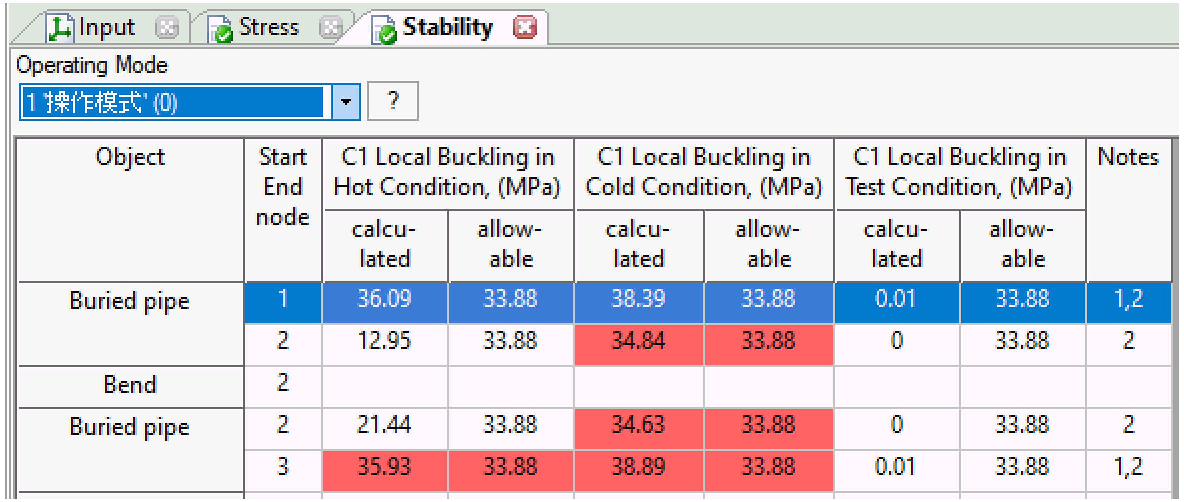
Se agrega la habilidad de introducir el ángulo permisible de giro del soporte para diferentes tipos de resortes colgantes. START-PROF revisa automáticamente el ángulo de giro del soporte y muestra mensaje después del análisis en el caso donde la restricción no cumple.



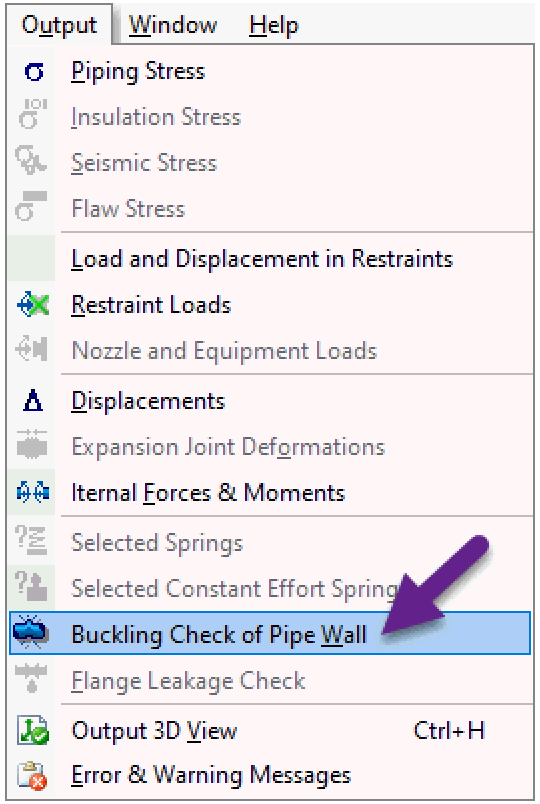
PASS PIPING AND EQUIPMENT ANALYSIS & SIZING SUITE

PASS/Start-Prof | Nuevas Funciones

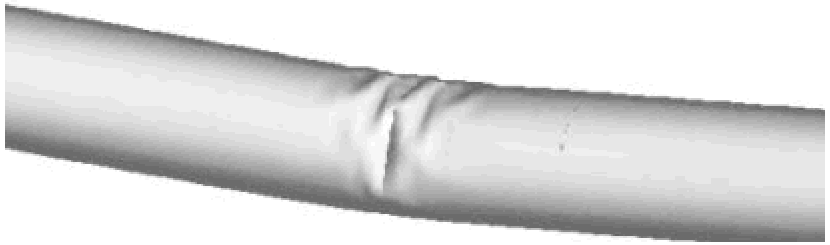
- Se agrego la verificación automática de deformación de pared en el tubo conforme al ASME B31.8-2018
- EN 13941-2019 7.2.4.2



Object	Start End node	C1 Local Buckling in Hot Condition, (MPa)		C1 Local Buckling in Cold Condition, (MPa)		C1 Local Buckling in Test Condition, (MPa)		Notes
		calcu-lated	allow-able	calcu-lated	allow-able	calcu-lated	allow-able	
Buried pipe	1	36.09	33.88	38.39	33.88	0.01	33.88	1,2
	2	12.95	33.88	34.84	33.88	0	33.88	2
Bend	2							
Buried pipe	2	21.44	33.88	34.63	33.88	0	33.88	2
	3	35.93	33.88	38.89	33.88	0.01	33.88	1,2

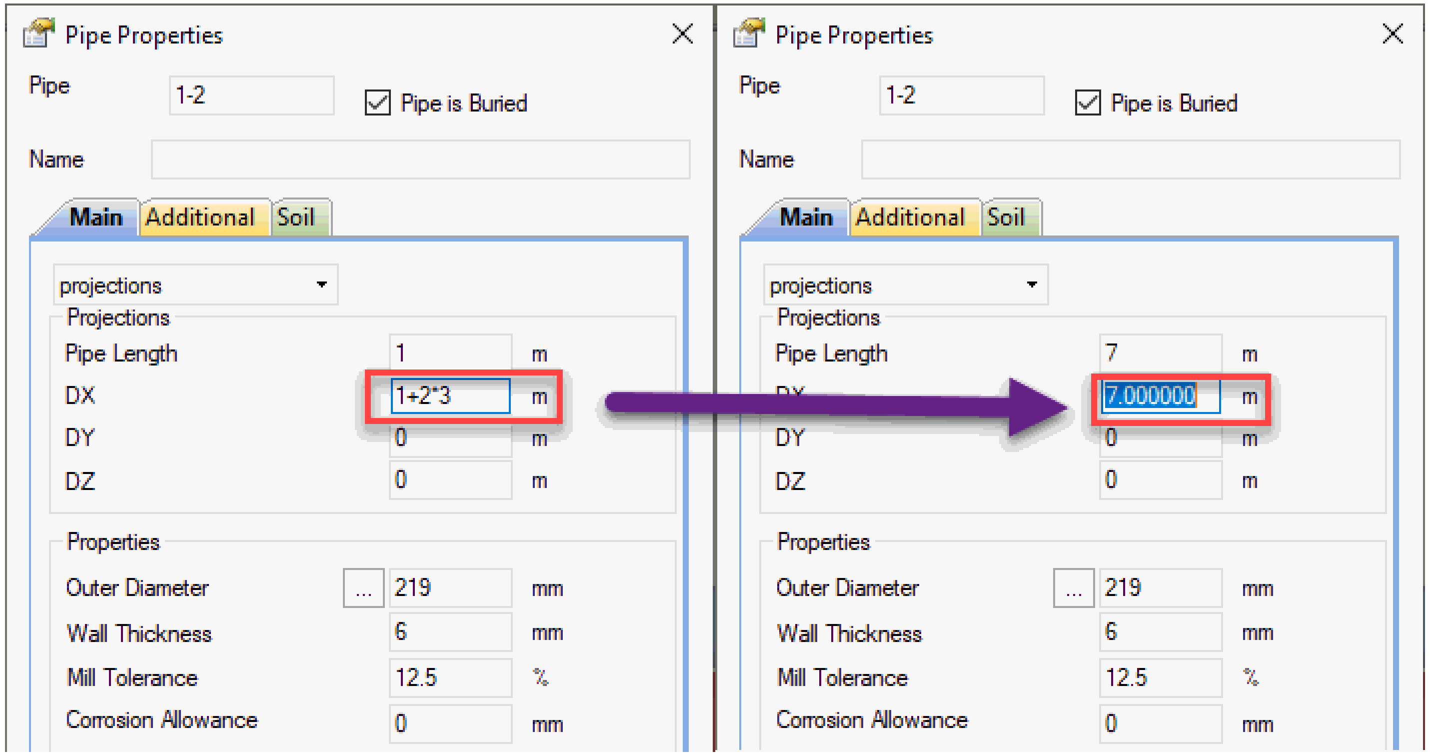


- For $(D_o - t_n)/(2t_n) \leq 28.7$
$$S_{st} = 0.0016E$$
- For $(D_o - t_n)/(2t_n) > 28.7$
$$S_{st} = (0.0458 \cdot 2t_n/(D_o - t_n) + 0.00003)E$$



PASS/Start-Prof | Nuevas Funciones

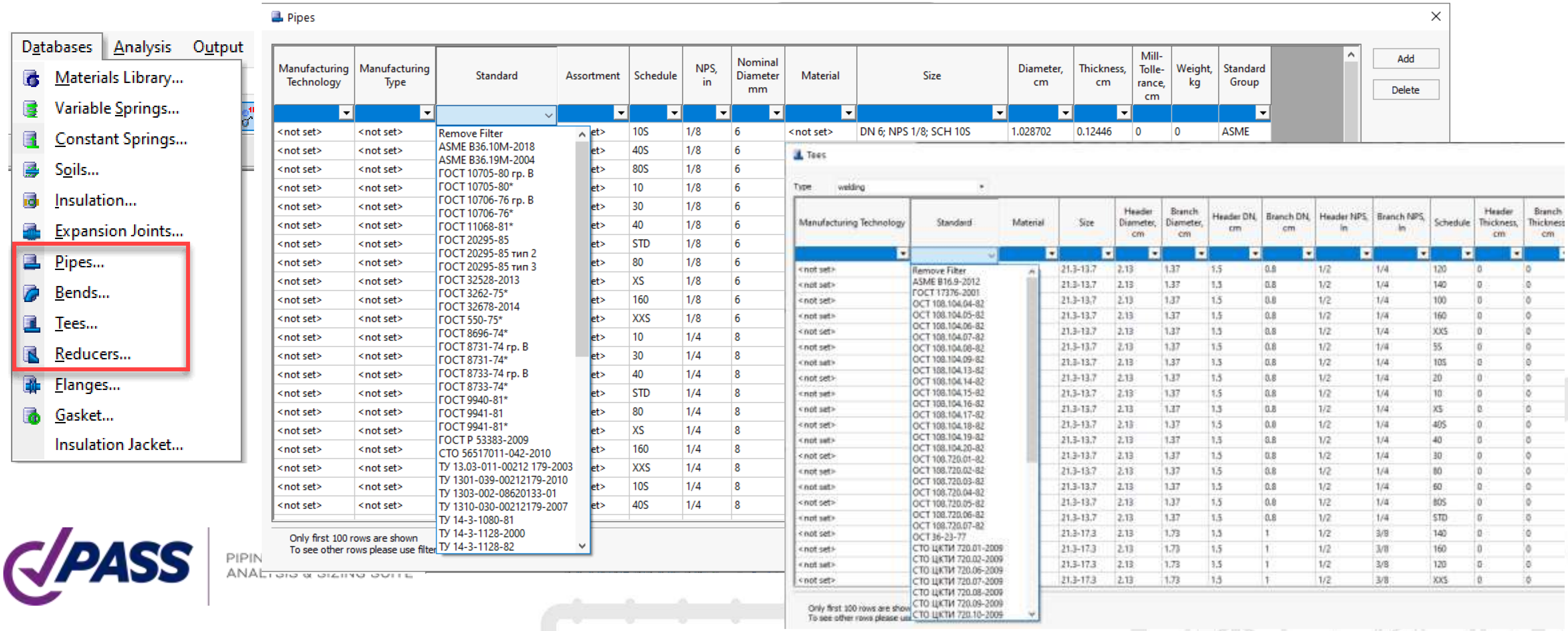
Se adicionó la capacidad de calcular (operaciones básicas) en algunos campos de entrada de datos



PASS
PIPING AND EQUIPMENT ANALYSIS & SIZING SUITE

PASS/Start-Prof | Nuevas Funciones

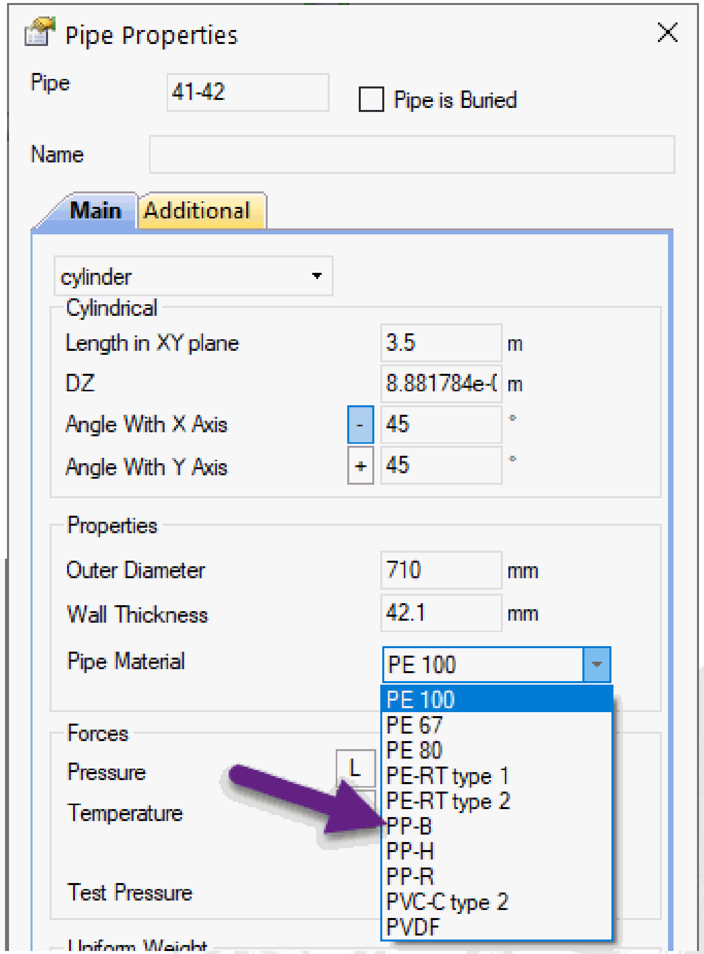
- Se actualizaron las bases de datos del ASME B36.10M-2018
- Se agregó más de 140 nuevos estándares en tubos, tees, codos, y base de datos de reducciones, incluyendo ASME B16.9 y muchos en códigos rusos GOST, OST, RD, TU

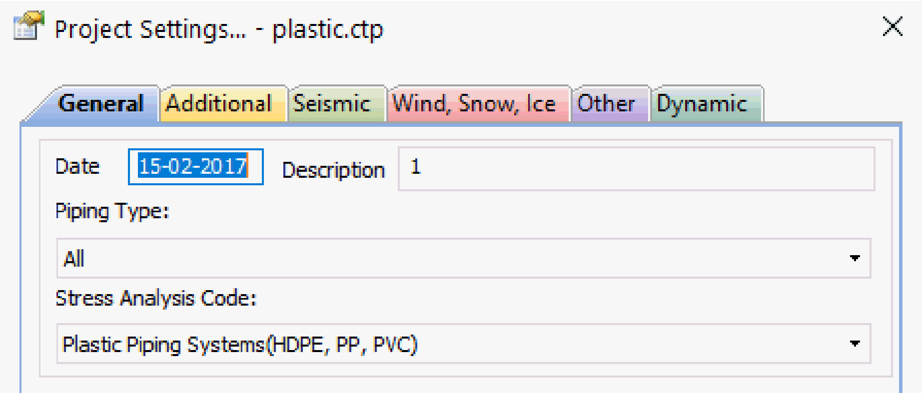


PASS

PASS/Start-Prof | Nuevas Funciones

Se agregó el material Polipropileno "PP-B" en la base de datos de material. Datos tomados desde DVS 2205, EN 1778, y DIN 8078



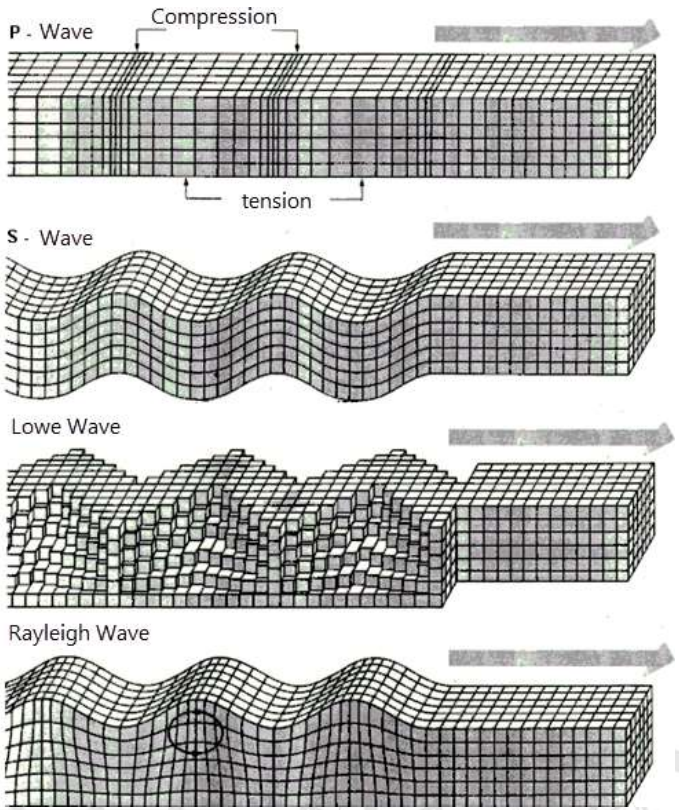


PASS PIPING AND EQUIPMENT ANALYSIS & SIZING SUITE

PASS/Start-Prof | Nuevas Funciones

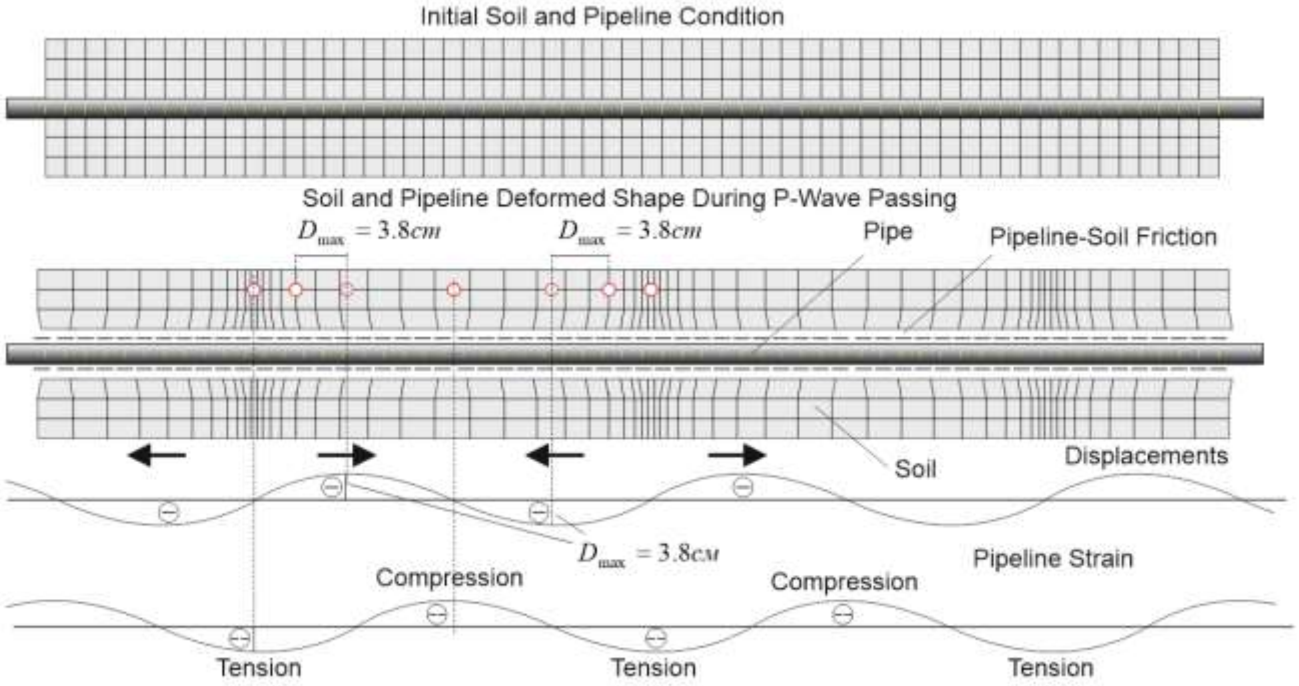
Se agregó el análisis de propagación de la onda sísmica para tuberías enterradas. START-PROF calcula el esfuerzo y tensión en líneas enterradas causadas por propagación de onda sísmica y verifica que esfuerzos y tensiones estén de acuerdo con

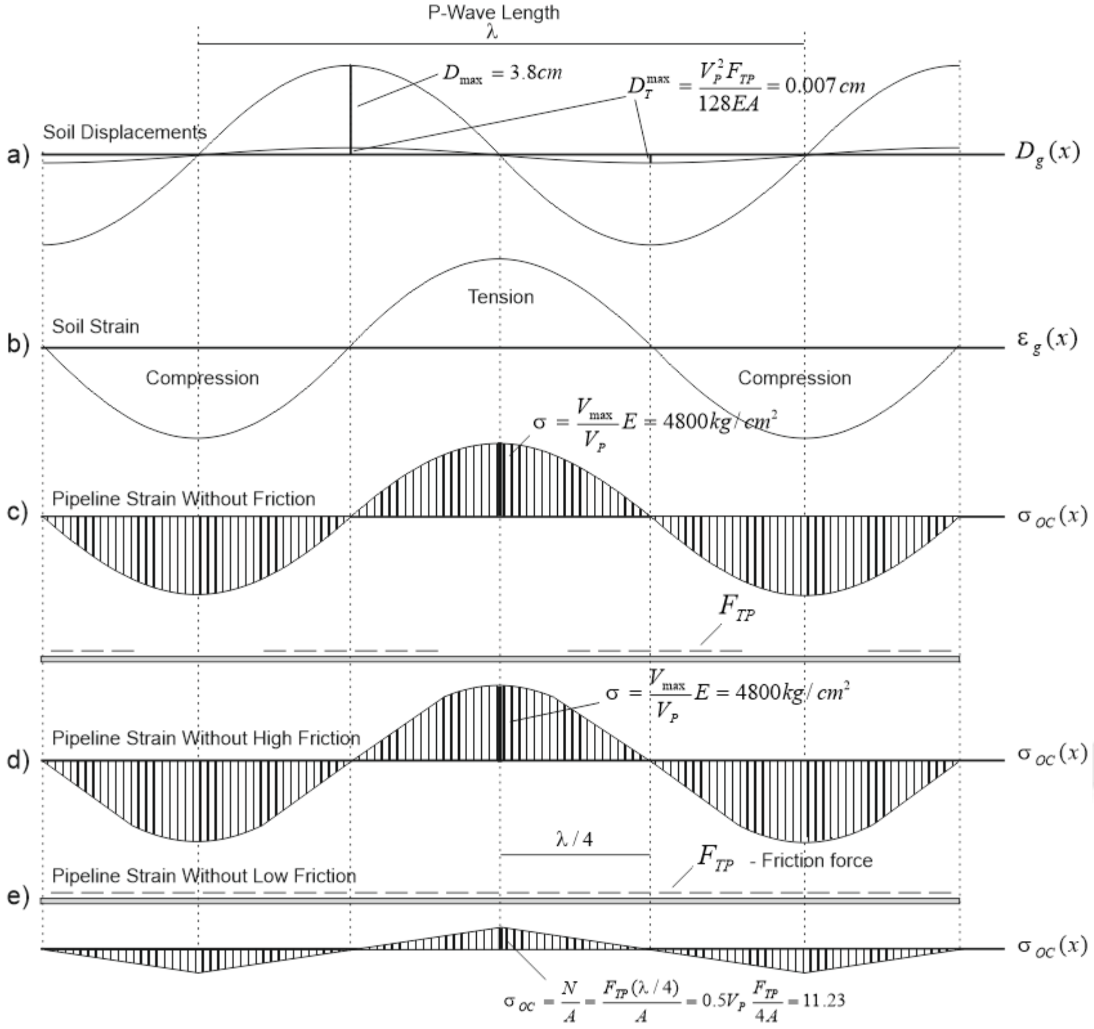
- ASCE 2001 Guidelines for the Design of Buried Steel Pipe (American Lifelines Alliance). Mejorado por los autores de START-PROF, agregando el efecto cortante de onda
- GB 50032 (China)
- GB 50470 (China)
- SNiP 2.05.06-85 (Rusia)
- SP 36.13330.2012 (Rusia)
- GOST R 55989-2014 (Rusia)
- GOST R 55990-2014 (Rusia)
- SP 284.1325800.2016 (Rusia)
- SP 33.13330.2012 (Rusia)



PASS
PIPING AND EQUIPMENT ANALYSIS & SIZING SUITE

PASS/Start-Prof | Nuevas Funciones

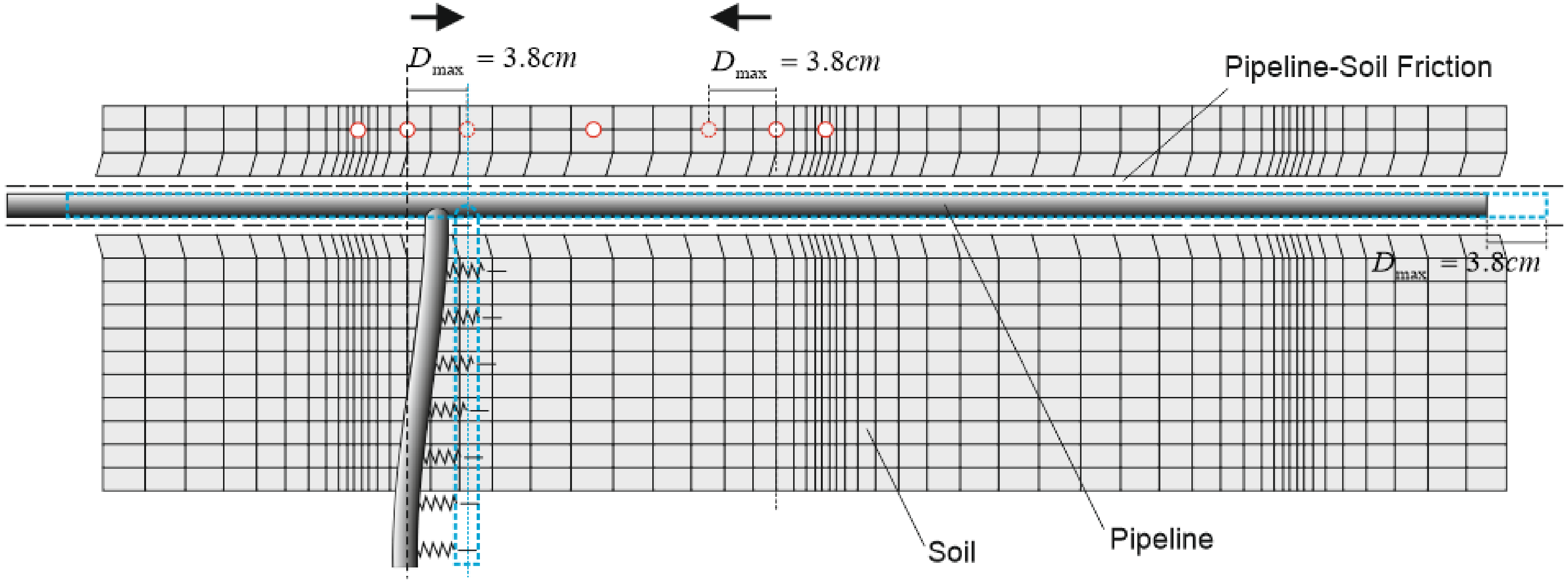




PASS
PIPING AND EQUIPMENT
ANALYSIS & SIZING SUITE

PASS/Start-Prof | Nuevas Funciones

Cada ramal, giro o ancla de la tubería causa grandes esfuerzos axiales y de flexión



PASS/Start-Prof | Nuevas Funciones

Axial seismic strain due to wave propagation is calculated using equation:

$$\varepsilon = \pm max\left(min(\varepsilon_a, \varepsilon_{fr}); \frac{D}{2}\rho_{max}\right)\cos\omega$$

Actually, pipe curvature can cause only the bending moments, but we convert it into equivalent axial strain to simplify the stress analysis procedure in START-PROF software.

ω – Incline angle of the pipe. 0 for horizontal pipe, 90 for vertical pipe

D – Pipe diameter, m

ε_a – Maximum axial strain from P-, S-, R-waves

$$\varepsilon_a = max\left(\frac{V_g}{C_p}; \frac{V_g}{2C_s}; \frac{V_g}{C_R}\right)$$

Maximum strain from P-wave friction forces is

$$\frac{T_u\lambda}{4EA}$$

λ –Wave length, m

$$\lambda = 0.5C_p$$

So maximum strain caused by friction from P-, S-, R-waves is

$$\varepsilon_{fr} = max\left(0.5C_p\frac{T_u}{4EA}; 0.5C_s\frac{T_u}{4EA}; 0.5C_R\frac{T_u}{4EA}\right)$$

ρ_{max} – Maximum curvature from P-, S-, R-waves

$$\rho_{max} = max\left(\frac{0.385A_g}{(C_p)^2}; \frac{A_g}{(C_s)^2}; \frac{A_g}{(C_R)^2}\right)$$

V_g – Peak ground velocity, m/s. Specified by user in pipe properties

A_g – Peak ground acceleration, m/s2. Specified by user in pipe properties

A – Pipe cross-section area, m2

T_u – Peak friction force, t/m

$$T_u = \tan(n_m \cdot \varphi)\left[\gamma_a Z\pi D_c\left(\frac{1+K_0}{2}cos^2\alpha - K_0\sin^2\alpha\right)\right] + \pi D_c\omega c$$

$$\omega = 0.608 - 0.123c - \frac{0.274}{c^2+1} + \frac{0.695}{c^3+1}$$

c – Soil cohesion

C_p – Apparent P-wave propagation velocity, m/s. Specified by user in START-PROF pipe properties. Default value 2 km/s

C_s – Apparent S-wave propagation velocity, m/s. Specified by user in START-PROF pipe properties. Default value 1 km/s

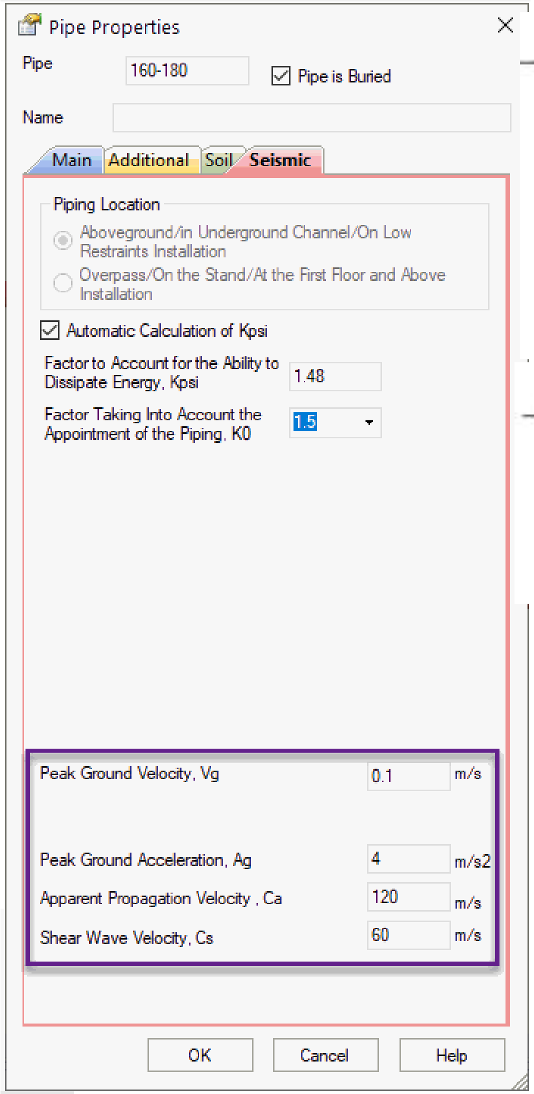
C_R – Apparent R-wave propagation velocity, m/s

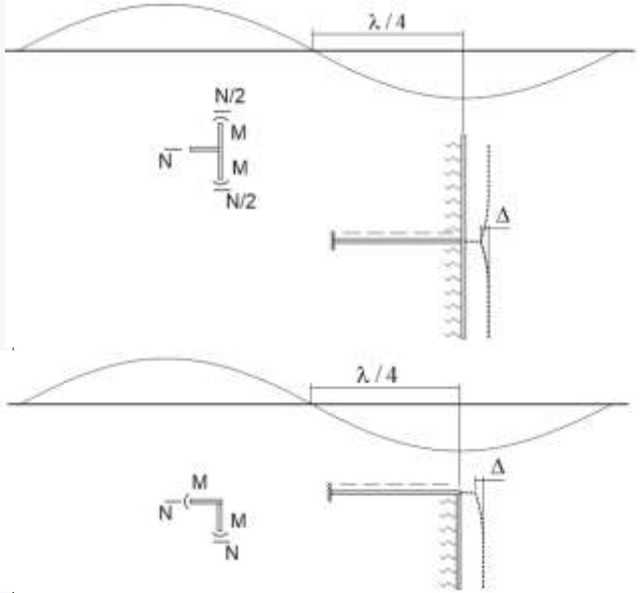
Rayleigh wave velocity is equal to $C_R = kC_s$, where k is obtained from the equation

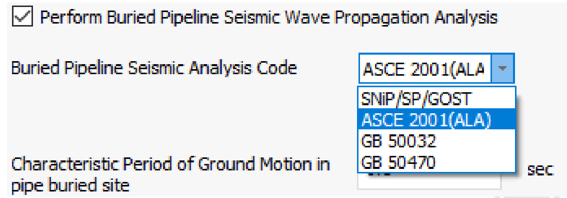
$$\frac{1}{8}k^6 - k^4 + \frac{2-\nu}{1-\nu}k^2 - \frac{1}{1-\nu} = 0.$$

Depending on Poisson's ratio values the k values are within $0.92 < k < 0.95$ We approximately assume that $k = 0.92$

$$C_R \approx 0.92C_s$$







PASS/Start-Prof | Nuevas Funciones

Se adicionó verificación de deformación de acuerdo con códigos ASCE 2001 Guidelines for the Design of Buried Steel Pipe (American Lifelines Alliance), SNiP, SP, GOST, GB

Input | Stress

Operating Mode: 1.1 'Soil Seismic Wave Propaga

☑ Show Equations ☐ Stress Range from Operation to Cold ☐ Add Axial Force and Torsion Stress ?

Object	Start End node	Buried piping Seismic Check, (MPa)			Buried piping Seismic Check, (%)			Notes
		SI	Allow	%	Σ	Allow	%	
Buried pipe	9	515.60	965.27	53.4	0.2009	0.2939	68.4	
	3	515.58	965.27	53.4	0.2009	0.2939	68.4	
Buried pipe	8	510.81	965.27	52.9	0.1985			
	9	515.60	965.27	53.4	0.2009			
Buried pipe	7	490.91	965.27	50.9	0.1884			
	8	510.81	965.27	52.9	0.1985	0.2939	67.5	

E, 201051.12 MPa
[εa]=0.75(0.5t/D-0.0025+3000(PD/(2Et))²), 0.002939
[εa]%, 0.2939

Compression strain limit

$$0.75\left[0.50\left(\frac{t}{D'}\right)-0.0025+3000\left(\frac{pD}{2Et}\right)^2\right]$$

$$D'=\frac{D}{1-\frac{3}{D}(D-D_{min})}$$

Input | Stress

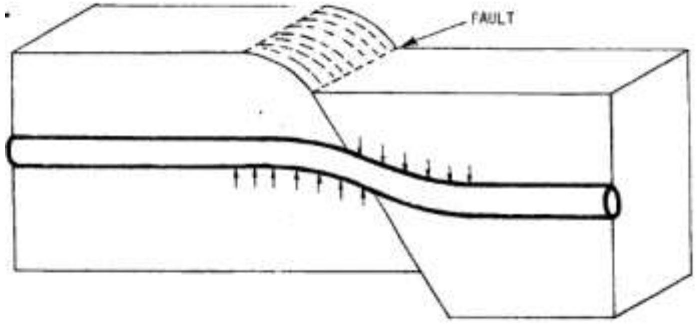
Operating Mode: Maximum

☑ Show Equations ☐ Stress Range from Operation to Cold ☐ Add Axial Force and Torsion Stress ?

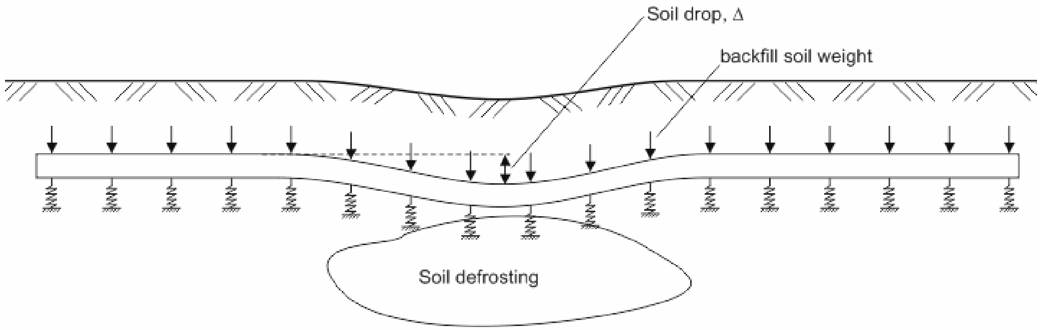
Object	Start End node	Hoop Stress, (MPa)			Primary Loads Stress in Hot State, (MPa)						Primary&Secondary Loads Stress in Hot State, (MPa)						Expansion Stress Range, (MPa)			Buried piping Seismic Check, (MPa)			Buried piping Seismic Check, (%)			Notes
		Sh	F*E*Sy	%	Seq	F*Sy	%	SI	F*Sy	%	Seq	F*Sy	%	SI	F*Sy	%	Se	Sa	%	SI	Allow	%	Σ	Allow	%	
Buried pipe	9	85	173.75	48.9				24.62	180.99	13.6	154	217.18	70.9	69	217.18	31.8	93.61	217.18	43.1	515.60	965.27	53.4	0.2009	0.2939	68.4	
	3	85	173.75	48.9				24.62	180.99	13.6	154	217.18	70.9	69	217.18	31.8	93.61	217.18	43.1	515.58	965.27	53.4	0.2009	0.2939	68.4	
Buried pipe	8	85	173.75	48.9				24.69	180.99	13.6	153.55	217.18	70.7	68.55	217.18	31.6	93.23	217.18	42.9	510.81	965.27	52.9	0.1985	0.2939	67.5	
	9	85	173.75	48.9				24.62	180.99	13.6	154	217.18	70.9	69	217.18	31.8	93.61	217.18	43.1	515.60	965.27	53.4	0.2009	0.2939	68.4	
Buried pipe	7	85	173.75	48.9				24.98	180.99	13.8	151.70	217.18	69.9	66.70	217.18	30.7	91.60	217.18	42.2	490.91	965.27	50.9	0.1884	0.2939	64.1	
	8	85	173.75	48.9				24.69	180.99	13.6	153.55	217.18	70.7	68.55	217.18	31.6	93.23	217.18	42.9	510.81	965.27	52.9	0.1985	0.2939	67.5	
Long Radius Pipe Bend	2	85	173.75	48.9				35.27	180.99	19.5	204.13	217.18	94.0	119.13	217.18	54.9	84.97	217.18	39.1	732.51	965.27	75.9	0.1589	0.2939	54.1	
Buried pipe	2	85	173.75	48.9				30.03	180.99	16.6	169.99	217.18	78.3	84.99	217.18	39.1	84.91	217.18	39.1	568.23	965.27	58.9	0.1588	0.2939	54.0	
	7	85	173.75	48.9				24.98	180.99	13.8	151.70	217.18	69.9	66.70	217.18	30.7	91.60	217.18	42.2	490.91	965.27	50.9	0.1884	0.2939	64.1	

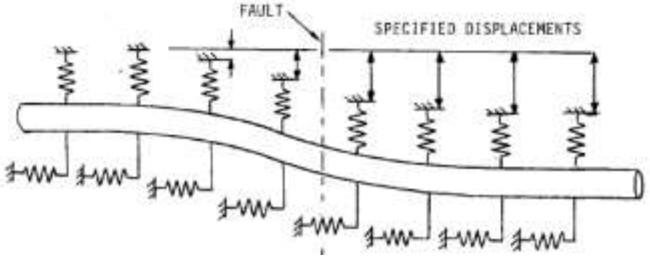
PASS/Start-Prof | Nuevas Funciones

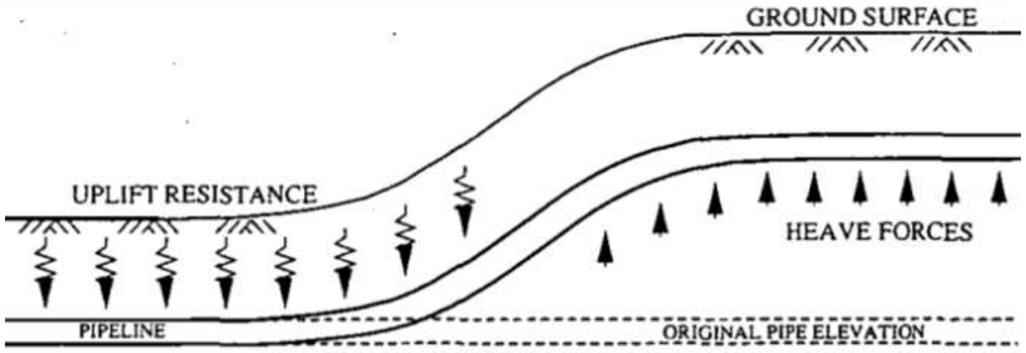
Deslizamiento de tierra, hundimiento de suelo, peso por congelamiento, deformación permanente del terreno (falla sísmica en el terreno) pueden ser también modelados. La verificación de tensión en la línea de tubería se hace de acuerdo con ASCE 2001 (ALA) y GB 50470

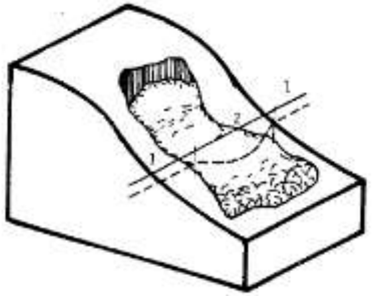


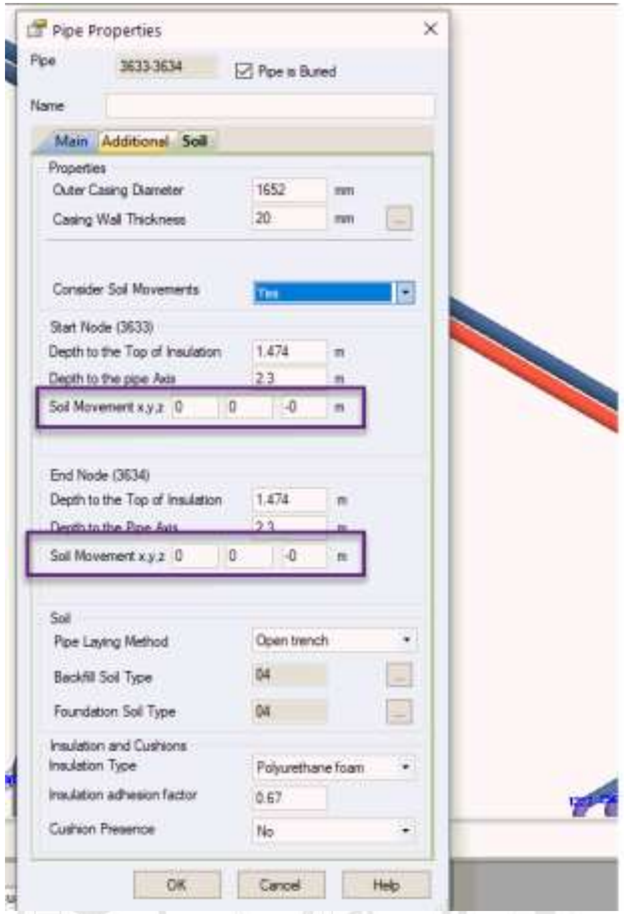
(A) ACTUAL GEOMETRY







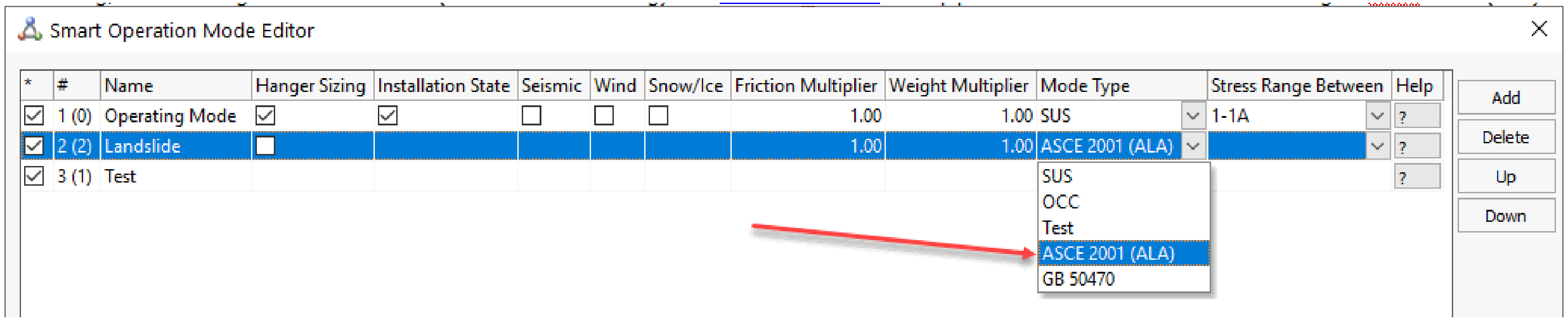


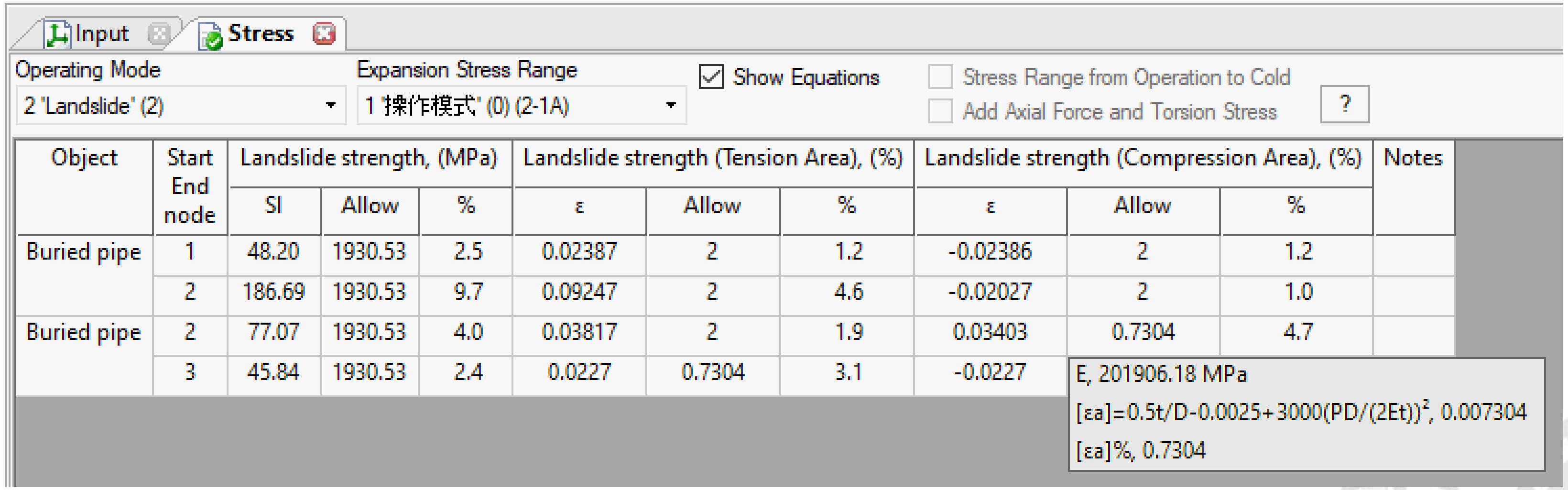


PASS
PIPING AND EQUIPMENT
ANALYSIS & SIZING SUITE

PASS/Start-Prof | Nuevas Funciones

La verificación de esfuerzos en la línea de tubería se hace de acuerdo con ASCE 2001 (ALA) y GB 50470

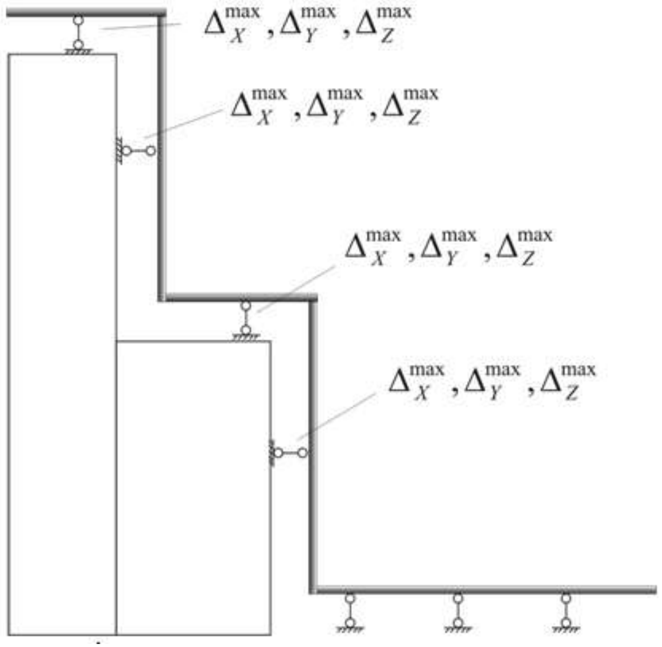


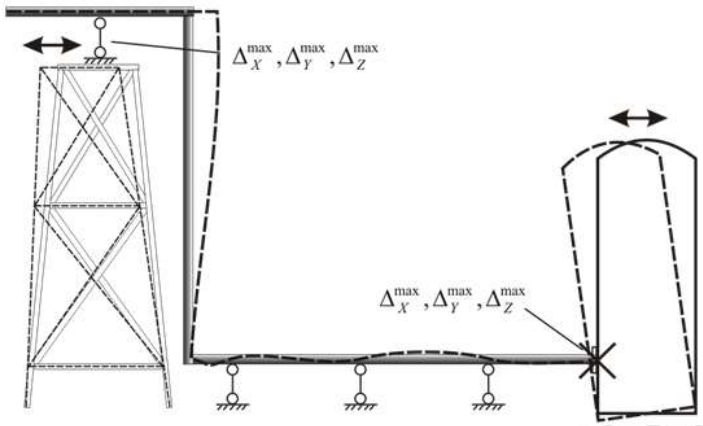


PASS
PIPING AND EQUIPMENT ANALYSIS & SIZING SUITE

PASS/Start-Prof | Nuevas Funciones

- Se agrega la habilidad de especificar diferentes valores de movimiento de ancla sísmica para el mismo grupo de fase. Es utilizado para definir varios movimientos de restricciones en varios pisos del mismo edificio.
- Se agregaron nuevas funciones para el Editor de Modo de Operación pudiendo ahora desactivar factores de sobrecarga, así mismo se agrega un factor a cargas por peso.

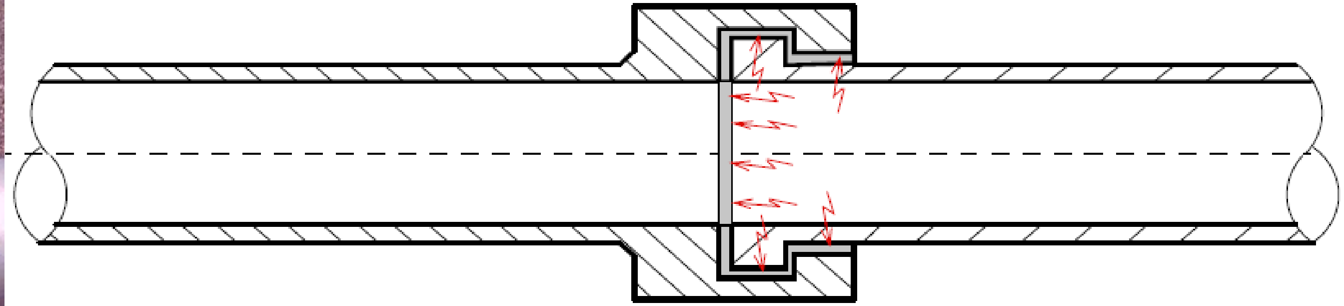


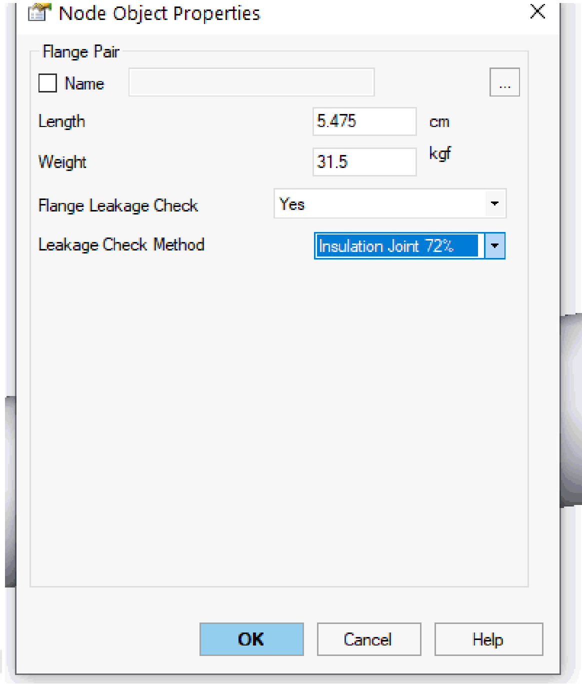


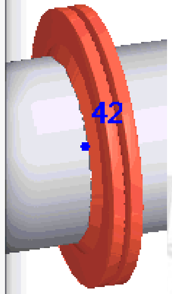
PASS
PIPING AND EQUIPMENT ANALYSIS & SIZING SUITE

PASS/Start-Prof | Nuevas Funciones

Se agregó el análisis de esfuerzos en la junta de aislamiento (kit de aislamiento). La tensión axial y la tensión del momento de torsión se verifican automáticamente.



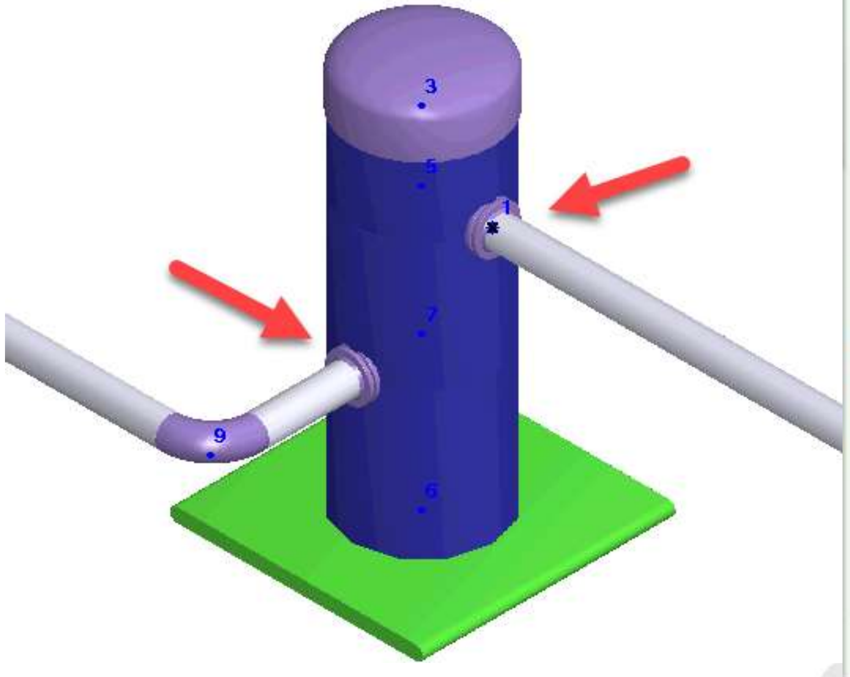


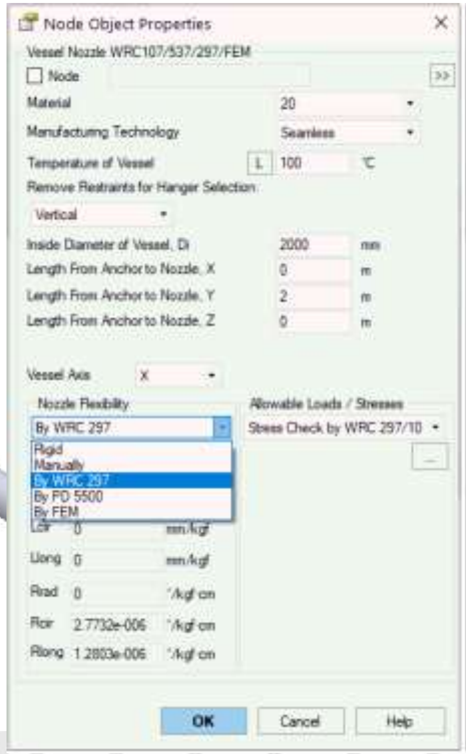


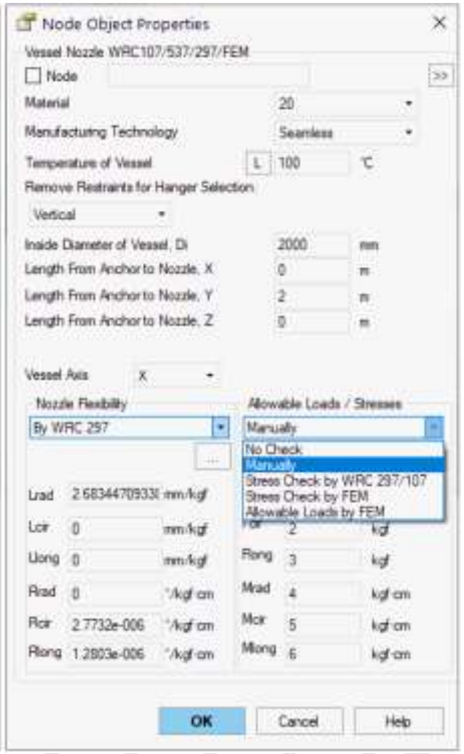
PIPING AND EQUIPMENT
ANALYSIS & SIZING SUITE

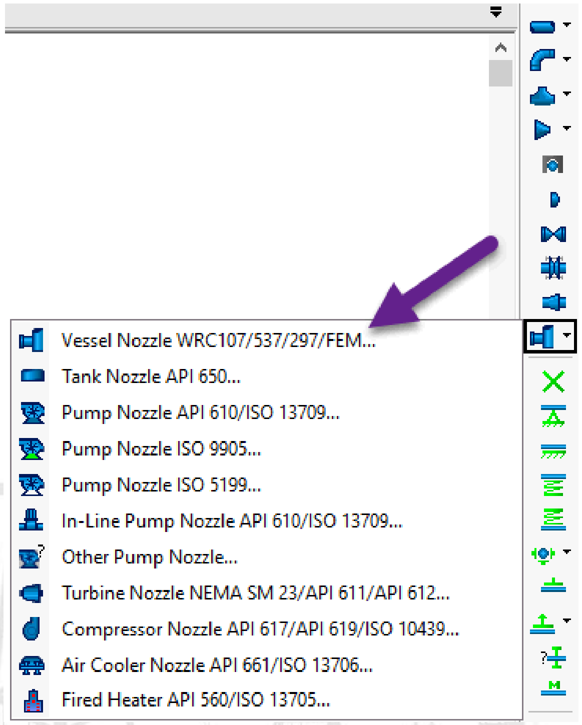
PASS/Start-Prof | Nuevas Funciones

- Se adicionó un nuevo objeto “Cylindrical Shell ", el cual puede ser usado para modelar calderas, recipientes a presión, columnas, recipientes horizontales
- Se agregó un nuevo objeto “Boquilla", para modelar automáticamente boquillas en calderas, recipientes a presión, y en columnas. Modela automáticamente las flexibilidades en la cubierta empleando WRC 297/PD 5500, valores personalizados o por método de elemento finito, FEM, movimientos debido a la expansión térmica del recipiente, verifica cargas permisibles, verifica automáticamente esfuerzos empleando WRC 107/537/297

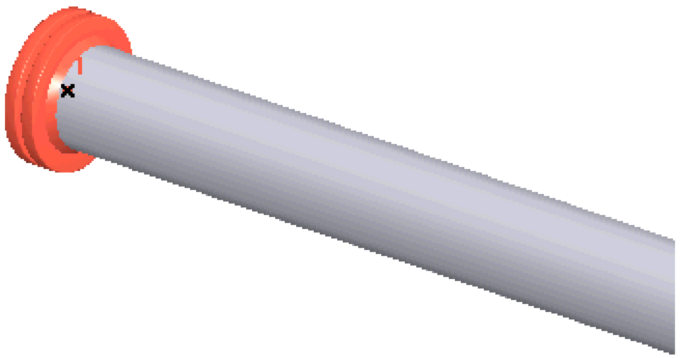


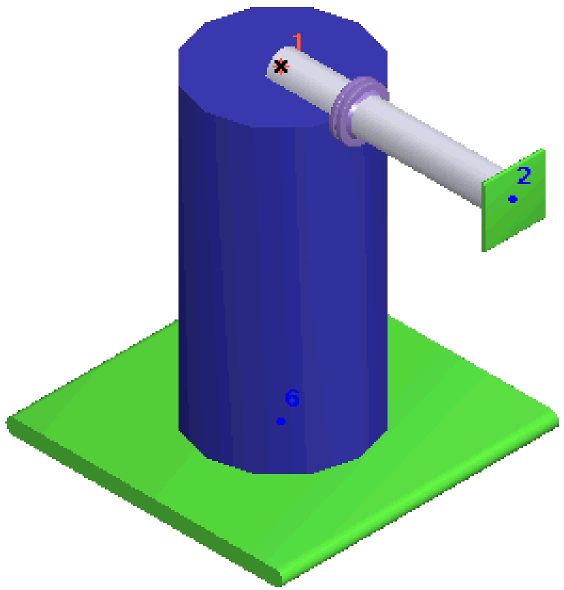


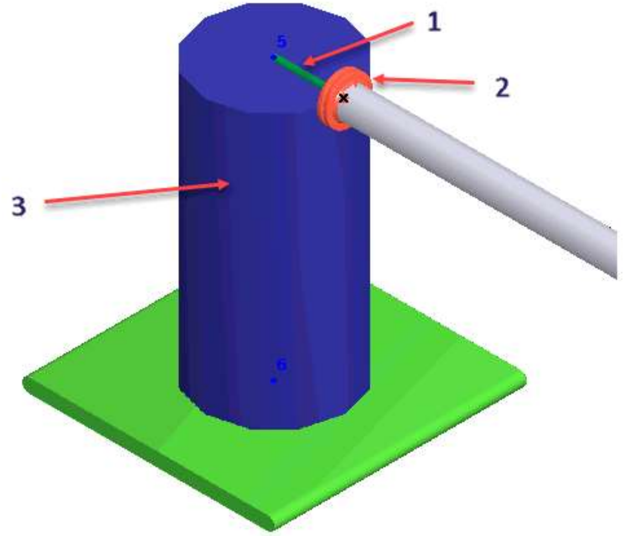


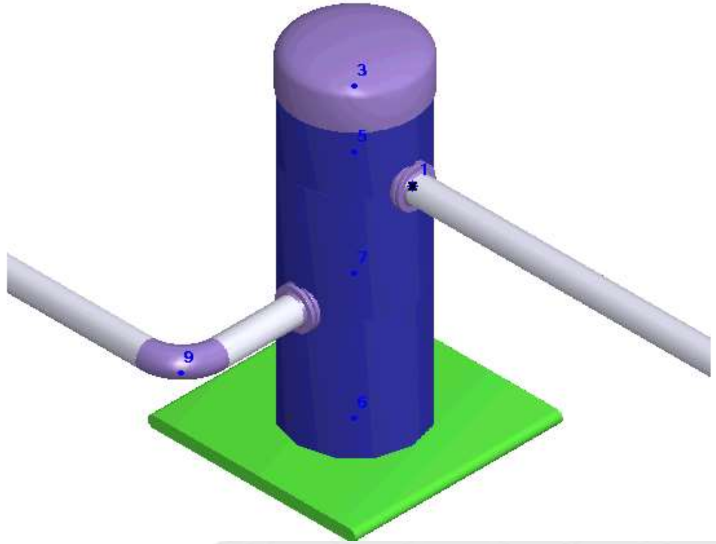


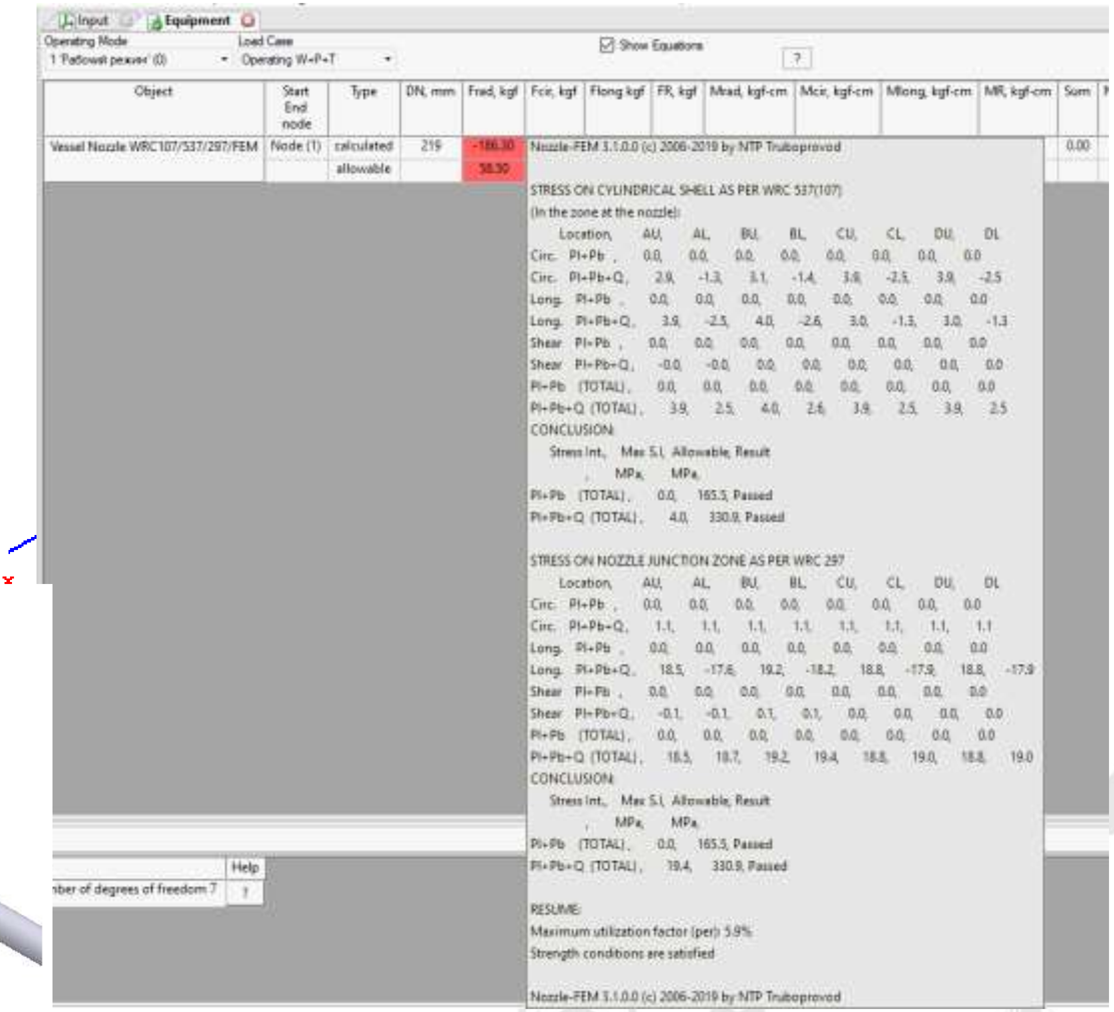
PASS/Start-Prof | Nuevas Funciones





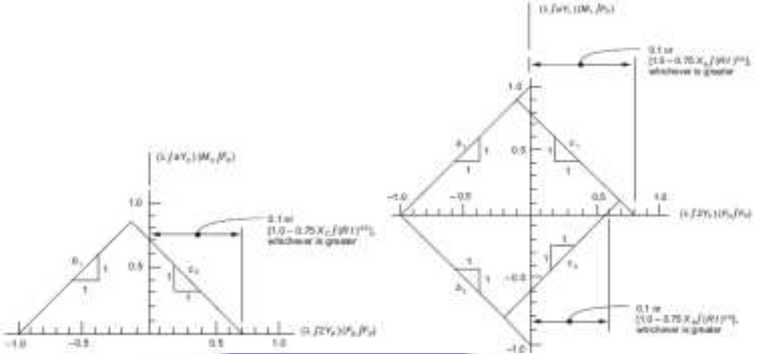


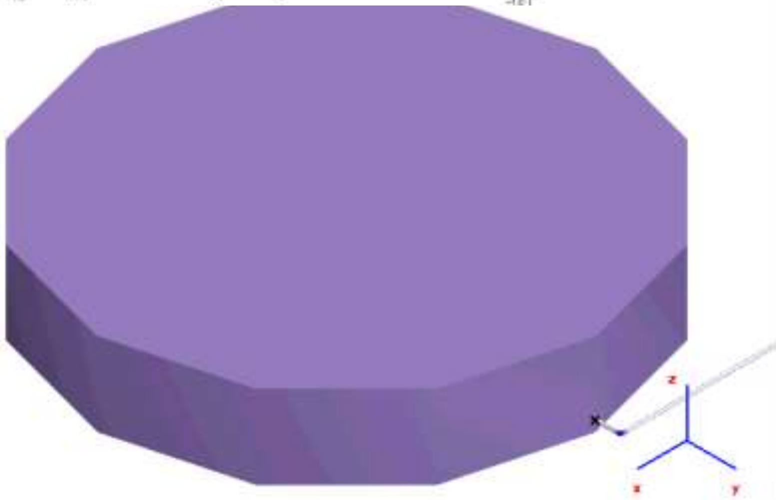


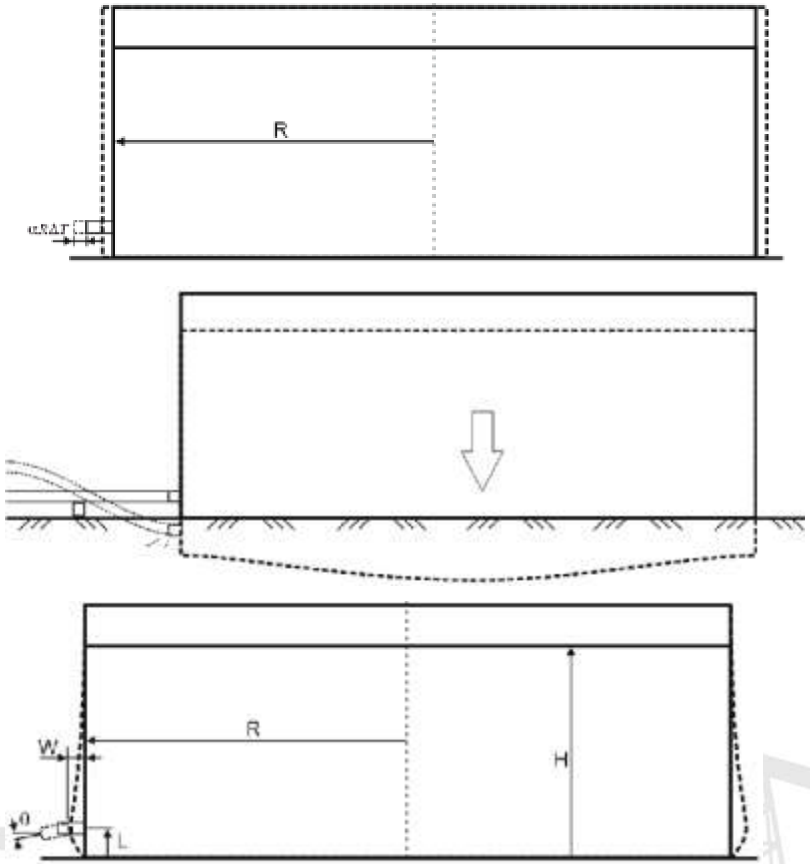


PASS/Start-Prof | Nuevas Funciones

Se adiciona un nuevo objeto “Tank Nozzle API 650", el cual permite modelar automáticamente boquillas en tanques de almacenamiento. Modela automáticamente flexibilidades empleando API 650, movimientos térmicos de la boquilla, movimientos y giros debido al efecto de abultamiento empleando API 650, es capaz de verificar los asentamientos y verificar automáticamente las cargas permisibles empleando API 650 y STO-SA 03-002-2009

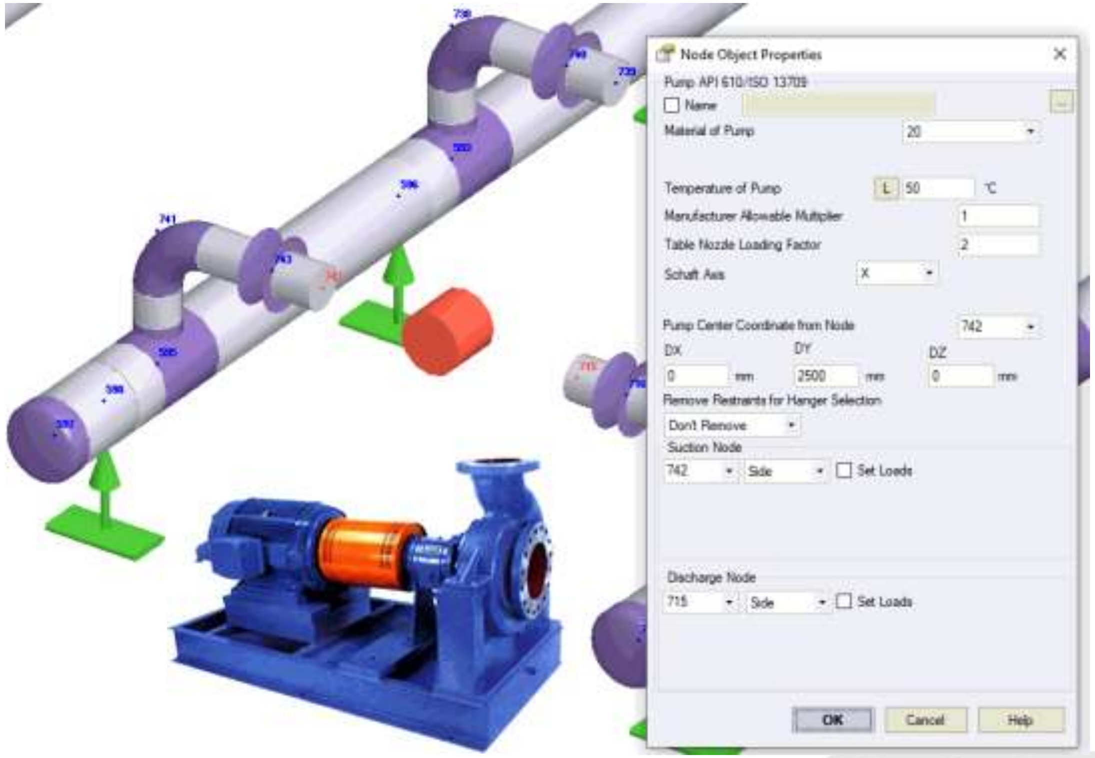






PASS/Start-Prof | Nuevas Funciones

- Se agregó el nuevo objeto "Pump API 610 / ISO 13709", permite modelar automáticamente las bombas, considerar los movimientos térmicos de las boquillas, verificar las cargas permitidas utilizando API 610 e ISO 13709
- Se agregó el nuevo objeto "Pump ISO 9905"
- Se agregó el nuevo objeto "Pump ISO 5199"



a) The individual component forces and moments acting on each pump nozzle flange shall not exceed the range specified in Table 5 (T4) by a factor of more than 2.

b) The resultant applied force (F_{RSA}, F_{RDA}) and the resultant applied moment (M_{RSA}, M_{RDA}) acting on each pump-nozzle flange shall satisfy the appropriate interaction equations as given in Equations (F.1) and (F.2):

$$[F_{RSA}/(1.5 \times F_{RST4})] + [M_{RSA}/(1.5 \times M_{RST4})] < 2 \quad (F.1)$$

$$[F_{RDA}/(1.5 \times F_{RDT4})] + [M_{RDA}/(1.5 \times M_{RDT4})] < 2 \quad (F.2)$$

c) The applied component forces and moments acting on each pump nozzle flange shall be translated to the centre of the pump. The magnitude of the resultant applied force, F_{RCA}, the resultant applied moment, M_{RCA}, and the applied moment shall be limited by Equations (F.3) to (F.5). (The sign convention shown in Figures 21 through 25 and the right-hand rule should be used in evaluating these equations.)

$$F_{RCA} < 1.5(F_{RST4} + F_{RDT4}) \quad (F.3)$$

$$|M_{YCA}| < 2.0(M_{YST4} + M_{YDT4}) \quad (F.4)$$

$$M_{RCA} < 1.5(M_{RST4} + M_{RDT4}) \quad (F.5)$$

where

$$F_{RCA} = [(F_{XCA})^2 + (F_{YCA})^2 + (F_{ZCA})^2]^{0.5}$$

where

$$F_{XCA} = F_{XSA} + F_{XDA}$$

$$F_{YCA} = F_{YSA} + F_{YDA}$$

$$F_{ZCA} = F_{ZSA} + F_{ZDA}$$

$$M_{RCA} = [(M_{XCA})^2 + (M_{YCA})^2 + (M_{ZCA})^2]^{0.5}$$

where

$$M_{XCA} = M_{XSA} + M_{XDA} - [(F_{YSA})(zS) + (F_{YDA})(zD) - (F_{ZSA})(yS) - (F_{ZDA})(yD)]/1\,000$$

$$M_{YCA} = M_{YSA} + M_{YDA} + [(F_{XSA})(zS) + (F_{XDA})(zD) - (F_{ZSA})(xS) - (F_{ZDA})(xD)]/1\,000$$

$$M_{ZCA} = M_{ZSA} + M_{ZDA} - [(F_{XSA})(yS) + (F_{XDA})(yD) - (F_{YSA})(xS) - (F_{YDA})(xD)]/1\,000$$

Input | Equipment

Operating Mode: 1 'main mode' (0) | Load Case: Operating W+P+T | Show Equations | ?

Object	Start End node	Type	DN, mm	Frad, N	Fcir, N	Flong N	FR, N	Mrad, N-m	Mcir, N-m	Mlong, N-m	MR, N-m	Sum	Notes
Pump API 610/ISO 13709	Node (1)	Suction, Side	200	-7333	5887	-29592	31050	-2626.53	18306.88	4598.20	19057.39	2.84	!
				9780	6220	7560	6920	3520	5160	7060	4710		
	Node (3)	Discharge, Side	200	1440505	-173	0	1440505	0		28.89	28.89	69.39	!
				9780	6220	7560	6920	3520	5160	7060	4710		
		Summary Loads		1433173	5714	-29592	1433490	-2626.53	33102.90	7657.21	34078.35		!
							20760	[My_sum]=2([MradT1] + [MradT2])=2*(1760+1760)=7040 N-m					

PASS/Start-Prof | Nuevas Funciones

Se agregó el nuevo objeto "In-line Pump", permite modelar automáticamente bombas verticales en línea, considera movimientos térmicos de las boquillas, verifica cargas permisibles de acuerdo con API 610 e ISO 13709

For SI units, Equations (F.6) to (F.8) apply:

$$\sigma_p = (\sigma/2) + (\sigma^2/4 + \tau^2)^{0,5} < 41 \quad (F.6)$$

$$\sigma_l = [1{,}27 F_Y/(D_o^2 - D_i^2)] + [10\,200 D_o (M_X^2 + M_Z^2)^{0,5}]/(D_o^4 - D_i^4) \quad (F.7)$$

$$\tau = [1{,}27 (F_X^2 + F_Z^2)^{0,5}]/(D_o^2 - D_i^2) + [5\,100 D_o (|M_Y|)]/(D_o^4 - D_i^4) \quad (F.8)$$

For USC units, Equations (F.9) to (F.11) apply:

$$\sigma_p = (\sigma/2) + (\sigma^2/4 + \tau^2)^{0,5} < 5\,950 \quad (F.9)$$

$$\sigma_l = [1{,}27 F_Y/(D_o^2 - D_i^2)] + [122 D_o (M_X^2 + M_Z^2)^{0,5}]/(D_o^4 - D_i^4) \quad (F.10)$$

$$\tau = [1{,}27 (F_X^2 + F_Z^2)^{0,5}]/(D_o^2 - D_i^2) + [61 D_o (|M_Y|)]/(D_o^4 - D_i^4) \quad (F.11)$$

where

σ_p is the principal stress, expressed in megapascals (pounds-force per square inch);

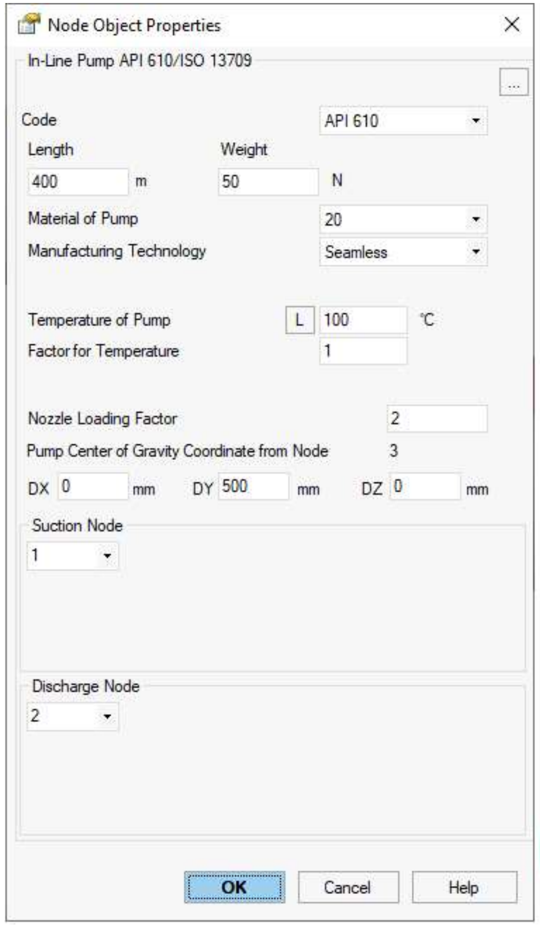
σ_l is the longitudinal stress, expressed in megapascals (pounds-force per square inch);

τ is the shear stress, expressed in megapascals (pounds-force per square inch);

F_X is the applied force on the X axis;

F_Y is the applied force on the Y axis;

F_Z is the applied force on the Z axis;



Input | Equipment

Operating Mode: 1 'main mode' (0)

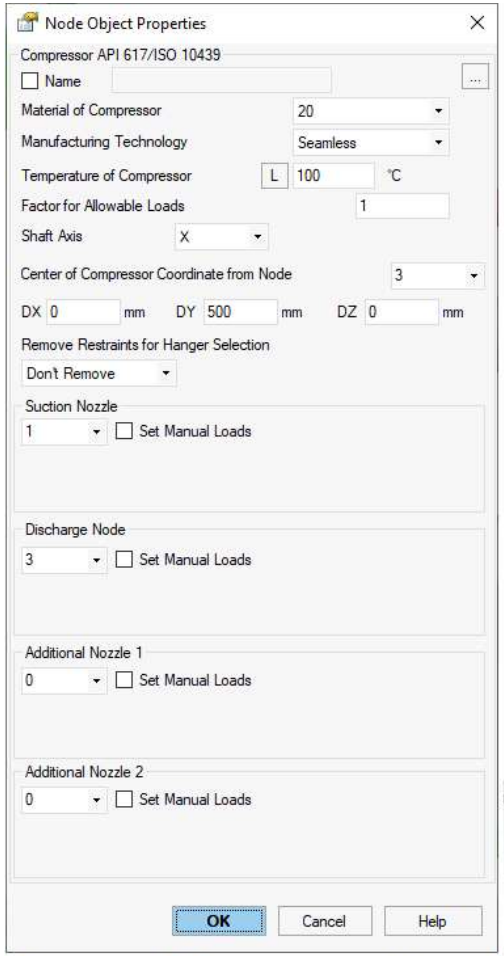
Load Case: Operating W+P+T

Show Equations ?

Object	Start End node	Type	DN, mm	Frad, N	Fcir, N	Flong N	FR, N	Mrad, N·m	Mcir, N·m	Mlong, N·m	MR, N·m	Sum	Notes
In-Line Pump API 610/ISO 13709	Node (1)	Suction, Side	219	-1200421		-28			47.98			0.00	1
				7560	9780	6220		7060	3520	5160			
	Node (2)	Discharge, Side	219	-1200421		-27			47.98			0.00	1
				7560	9780	6220		7060	3520	5160			

PASS/Start-Prof | Nuevas Funciones

Se agregó el nuevo objeto "Compressor API 617/API 619/ISO 10439", permite modelar automáticamente compresores, considera los movimientos térmicos de la boquillas, verifica cargas permisibles empleando API 617 e ISO 10439



In SI units:

$$F_r + 1.09\,M_r \le 54.1\,D_e \quad \text{(F.1a)}$$

In U.S. customary (USC) units:

$$3\,F_r + M_r \le 927\,D_e \quad \text{(F.1b)}$$

F_r is the resultant force, Newtons (lb) (see Figure F.1);

$$F_r = \sqrt{F_x^2 + F_y^2 + F_z^2} \quad \text{(F.2)}$$

M_r resultant moment, in Newton-meters (ft-lb) from Figure F.1;

$$M_r = \sqrt{M_x^2 + M_y^2 + M_z^2} \quad \text{(F.3)}$$

For sizes greater than 200 mm (8 in.), use the following values.

In SI units:

$$D_e = \frac{(400 + D_{nom})}{3}\ \text{(mm)} \quad \text{(F.4a)}$$

In USC units:

$$D_e = \frac{(16 + D_{nom})}{3}\ \text{(in.)} \quad \text{(F.4b)}$$

In SI units:

$$F_c + 1.64\,M_c \le 40.4\,D_c \quad \text{(F.5a)}$$

In USC units:

$$2F_c + M_c \le 462\,D_c \quad \text{(F.5b)}$$

In SI units:

$$F_c + 1.64\,M_c \le 40.4\,D_c \quad \text{(F.5a)}$$

In USC units:

$$2F_c + M_c \le 462\,D_c \quad \text{(F.5b)}$$

where

F_c is the combined resultant of inlet, sidestream, and discharge forces, Newtons (lb);

M_c is the combined resultant of inlet, sidestream, and discharge moments, and moments resulting from forces, Newton-meters (ft-lb);

D_c is the diameter [mm (in.)] of one circular opening equal to the total areas of the inlet, sidestream, and discharge openings. If the equivalent nozzle diameter is greater than 230 mm (9 in.), use a value of D_c equal to the following.

In SI units:

$$D_c = \frac{(460 + \text{Equivalent Diameter})}{3}\ \text{(mm)} \quad \text{(F.6a)}$$

In USC units:

$$D_c = \frac{(18 + \text{Equivalent Diameter})}{3}\ \text{(in.)} \quad \text{(F.6b)}$$

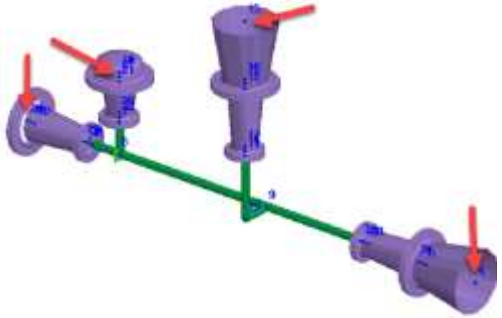
The absolute value of the individual components (Figure F.1) of these resultants should not exceed the following.

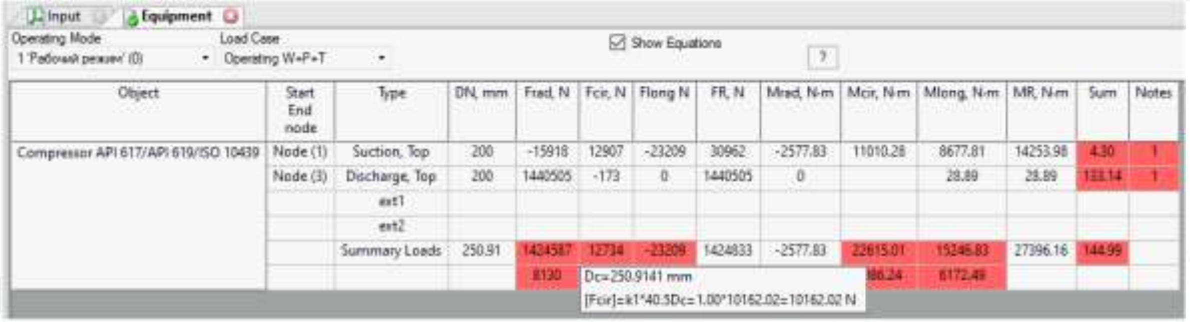
In SI units:

$$F_x = 16.1\,D_c \qquad M_x = 24.6\,D_c$$

$$F_y = 40.5\,D_c \qquad M_y = 12.3\,D_c$$

$$F_z = 32.4\,D_c \qquad M_z = 12.3\,D_c$$





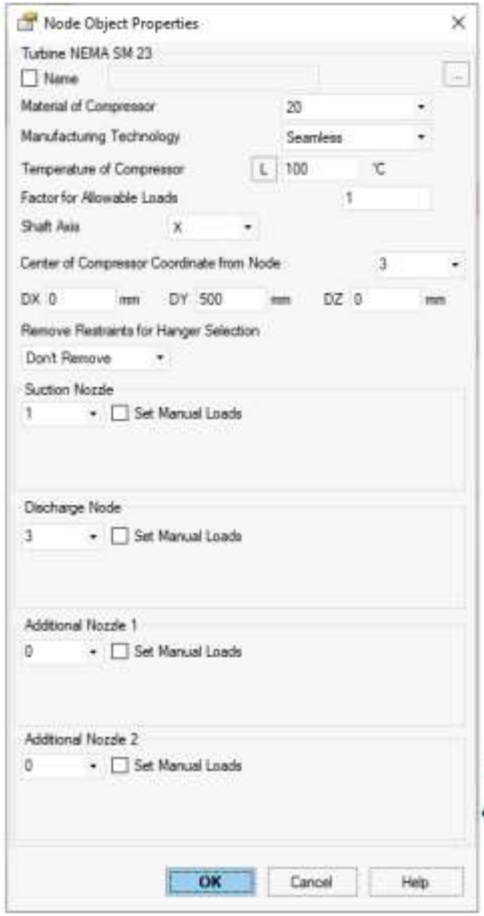
Input | Equipment

Operating Mode: 1 'Рабочий режим' (0) — Load Case: Operating W+P+T — Show Equations

Object	Start End node	Type	DN, mm	Frad, N	Fcir, N	Flong N	FR, N	Mrad, N-m	Mcir, N-m	Mlong, N-m	MR, N-m	Sum	Notes
Compressor API 617/API 619/ISO 10439	Node (1)	Suction, Top	200	-15918	12907	-23209	30962	-2577.83	11010.28	8677.81	14253.98	4.30	1
	Node (3)	Discharge, Top	200	1440505	-173	0	1440505	0		28.89	28.89	133.14	1
		ext1											
		ext2											
		Summary Loads	250.91	1424587	12734	-23209	1424833	-2577.83	22615.01	15246.83	27396.16	144.99	
				8130	Dc=250.9141 mm [Fcir]=k1*40.5Dc=1.00*10162.02=10162.02 N				86.24	6172.49			

PASS/Start-Prof | Nuevas Funciones

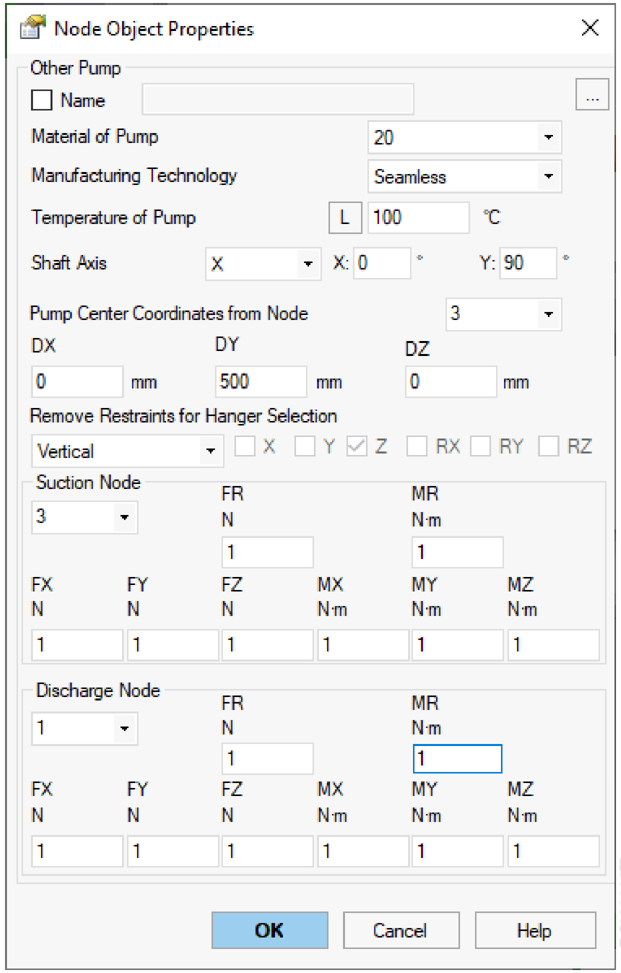
Se agregó el nuevo objeto "Turbine NEMA SM23/API 611/API 612", permite modelar automáticamente turbinas de vapor, considera movimientos térmicos de las boquillas, verifica cargas permisibles empleando NEMA SM23, API 611, API 612, ISO 10437



PASS PIPING AND EQUIPMENT ANALYSIS & SIZING SUITE

PASS/Start-Prof | Nuevas Funciones

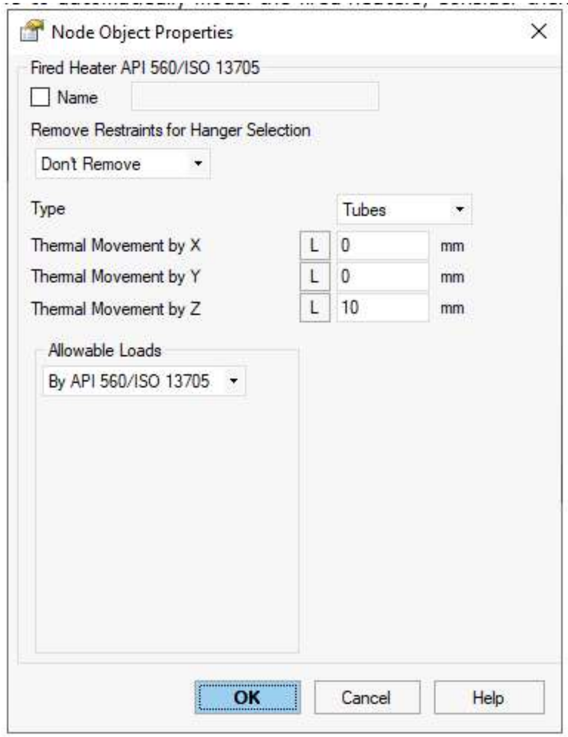
Se agregó el nuevo objeto "Other Pump", permite modelar automáticamente bombas, considera movimientos térmicos de las boquillas, verifica cargas permisibles

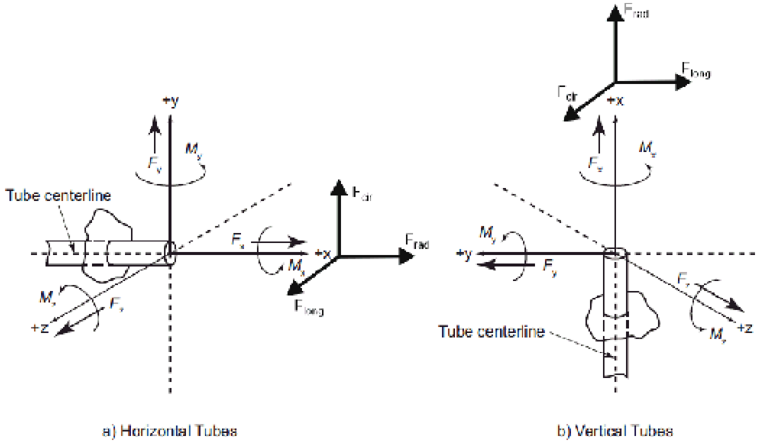


PASS PIPING AND EQUIPMENT ANALYSIS & SIZING SUITE

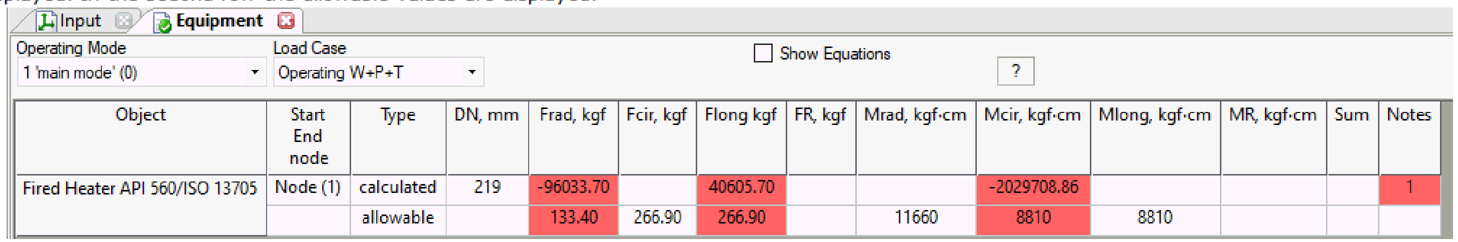
PASS/Start-Prof | Nuevas Funciones

Se agregó el nuevo objeto "Fired Heater API 560/ISO 13705", permite modelar automáticamente calentadores a fuego directo, considera movimientos en las boquillas, verifica cargas permisibles empleando API 560 e ISO 13705





splayed. In the second row the allowable values are displayed.

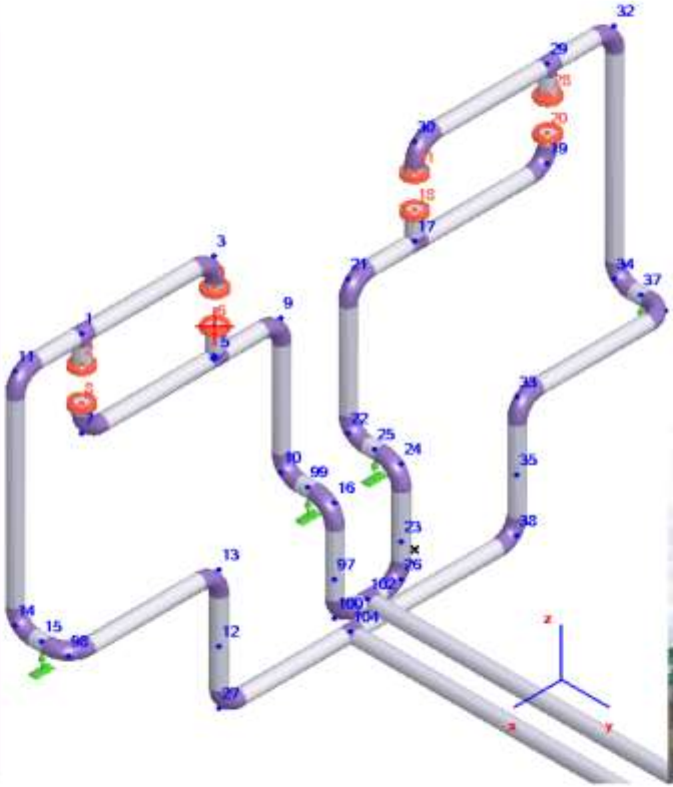


Object	Start End node	Type	DN, mm	Frad, kgf	Fcir, kgf	Flong kgf	FR, kgf	Mrad, kgf·cm	Mcir, kgf·cm	Mlong, kgf·cm	MR, kgf·cm	Sum	Notes
Fired Heater API 560/ISO 13705	Node (1)	calculated	219	-96033.70		40605.70			-2029708.86				1
		allowable		133.40	266.90	266.90		11660	8810	8810			

PASS PIPING AND EQUIPMENT ANALYSIS & SIZING SUITE

PASS/Start-Prof | Nuevas Funciones

Se agregó el nuevo objeto "Air cooled Heat Exchanger API 661/ISO 13706", permite modelar automáticamente aero enfriadores, considera movimientos térmicos de la boquillas, verifica cargas permisibles empleando API 661 e ISO 13706



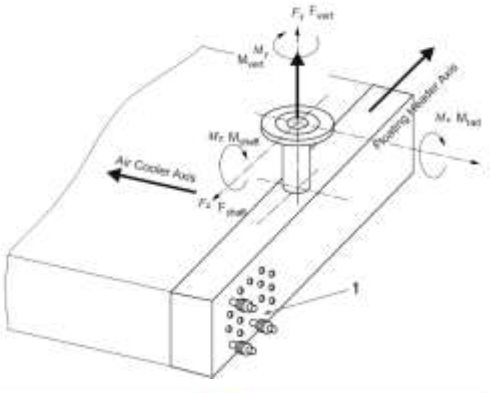


Table 4 — Maximum Allowable Nozzle Loads

Nozzle Size DN (NPS)	Moments N·m (ft·lbf) M_x	M_y	M_z	Forces N (lbf) F_x	F_y	F_z
40 (1½)	110 (80)	150 (110)	110 (80)	670 (150)	1020 (230)	670 (150)
50 (2)	150 (110)	240 (180)	150 (110)	1020 (230)	1330 (300)	1020 (230)
80 (3)	410 (300)	610 (450)	410 (300)	2000 (450)	1690 (380)	2000 (450)
100 (4)	810 (600)	1220 (900)	810 (600)	3340 (750)	2670 (600)	3340 (750)
150 (6)	2140 (1580)	3050 (2250)	1630 (1200)	4000 (900)	5030 (1130)	5030 (1130)
200 (8)	3050 (2250)	6100 (4500)	2240 (1650)	5690 (1280)	13,340 (3000)	8010 (1800)
250 (10)	4070 (3000)	6100 (4500)	2550 (1880)	6670 (1500)	13,340 (3000)	10,010 (2250)
300 (12)	5080 (3750)	6100 (4500)	3050 (2250)	8360 (1880)	13,340 (3000)	13,340 (3000)
350 (14)	6100 (4500)	7120 (5250)	3570 (2630)	10,010 (2250)	16,680 (3750)	16,680 (3750)

lues from 7.1.10.2

7.1.10.2 The design of each fixed or floating header, the design of the connections of fixed headers to side frames, and the design of other support members shall ensure that the simultaneous application (sum) of all nozzle loadings on a single header does not cause any damage. The components of the nozzle loadings on a single header shall not exceed the following values:

M_x 6100 N·m (4500 ft·lbf)
M_y 8130 N·m (6000 ft·lbf)
M_z 4070 N·m (3000 ft·lbf)
F_x 10,010 N (2250 lbf)
F_y 20,020 (4500 lbf)
F_z 16,680 (3750 lbf)

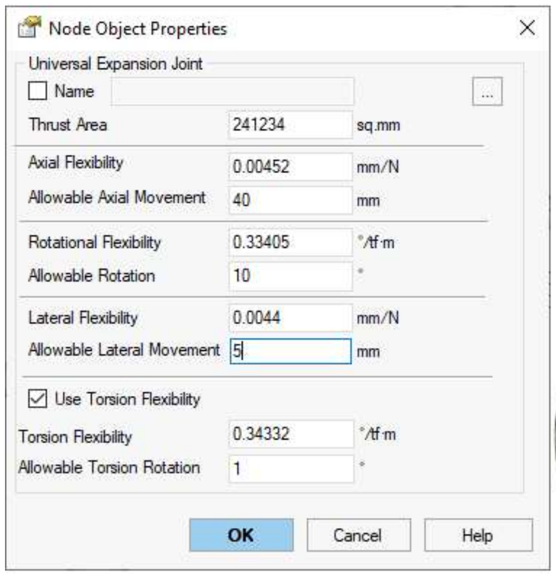
om 7.1.10.2 multiplied by 3

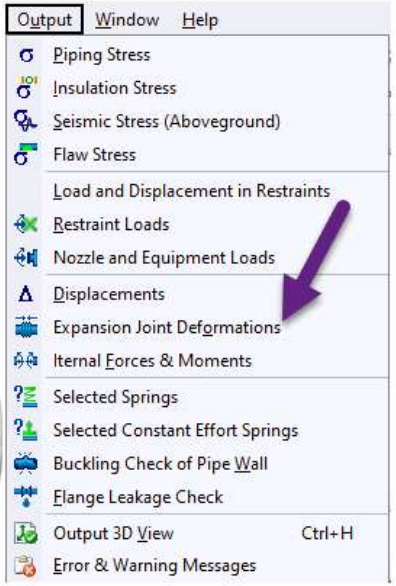
7.1.10.3 The total of all nozzle loads on one multi-bundle bay shall not exceed three times that allowed for a single header.

PASS PIPING AND EQUIPMENT ANALYSIS & SIZING SUITE

PASS/Start-Prof | Nuevas Funciones

Se agregó el nuevo objeto "Untied Expansion Joint" y base de datos de Juntas de Expansion sin tirantes, lo que permite especificar flexibilidad axial, rotacional, cortante y torsión también verifica automáticamente las deformaciones tanto individuales como combinadas. No necesita más modelar manualmente empleando junta de expansión no-estándar.





$$\frac{|\lambda_p|}{[\lambda_p]} + \frac{|\lambda_\theta|}{[\lambda_\theta]} + \frac{|\lambda_\Delta|}{[\lambda_\Delta]} \le 1.$$

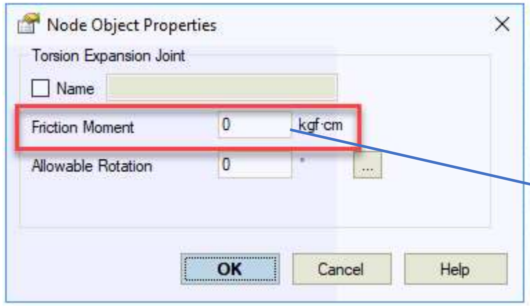
Axis: Local axis (Design/Allowable) ?

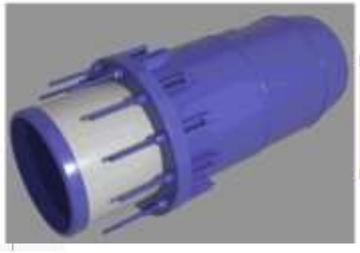
Node Number	Type	Local axis	Axial, (mm)	Allowable, (mm)	Shear, (mm)	Allowable, (mm)	Angular, (°)	Allowable, (°)	Torsion, (°)	Allowable, (°)	Summary	Notes
12	Untied Expansion Joint	Pipe 3 - 12	2.41	50	1.22	15	9.59131	10	-2.05119	No	1.09	1
13	Torsion Expansion Joint	Pipe 5 - 13	0	No	0	No	0	No	13.9229	51.5662	0.27	
15	Torsion Expansion Joint	Pipe 7 - 15	0	No	0	No	0	No	10.1299	51.5662	0.20	
21	Torsion Expansion Joint	Pipe 19 - 21	0	No	0	No	0	No	-4.36021	51.5662	0.08	

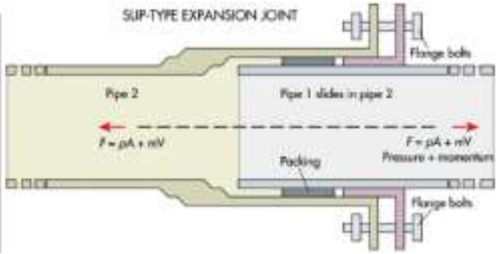
PIPING AND EQUIPMENT
ANALYSIS & SIZING SUITE

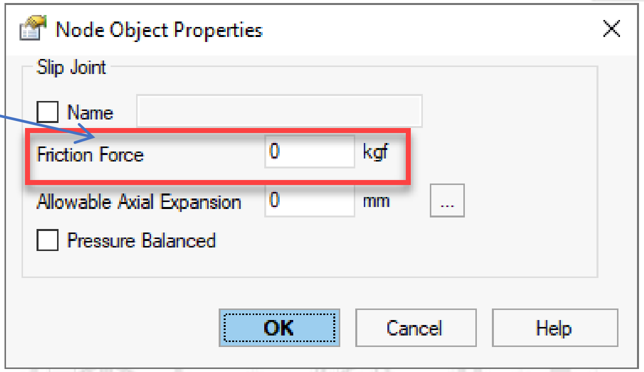
PASS/Start-Prof | Nuevas Funciones

Se agregó el nuevo objeto "Torsion Expansion Joint" y base de datos de juntas de expansión y torsión, modela automáticamente fricción por torsión (momento de torsión) y verifica el ángulo permisible de rotación.





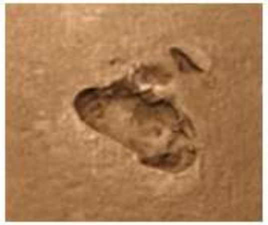


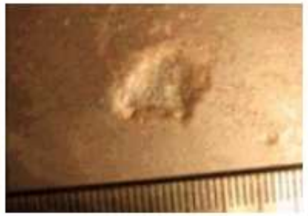


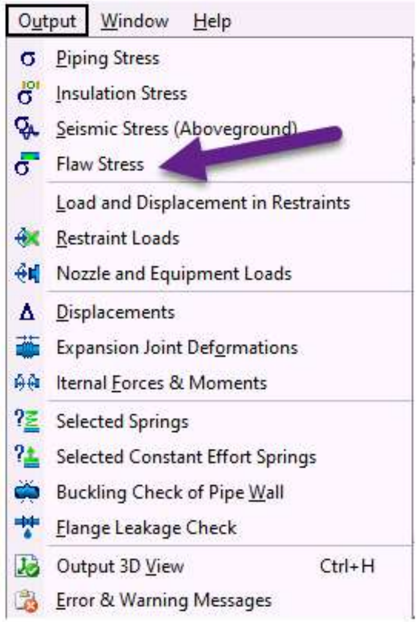
PIPING AND EQUIPMENT ANALYSIS & SIZING SUITE

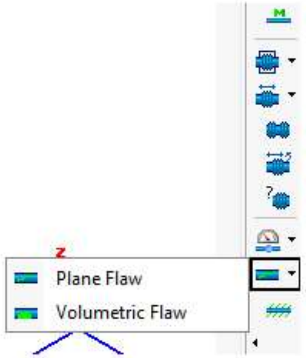
PASS/Start-Prof | Nueva Funciones

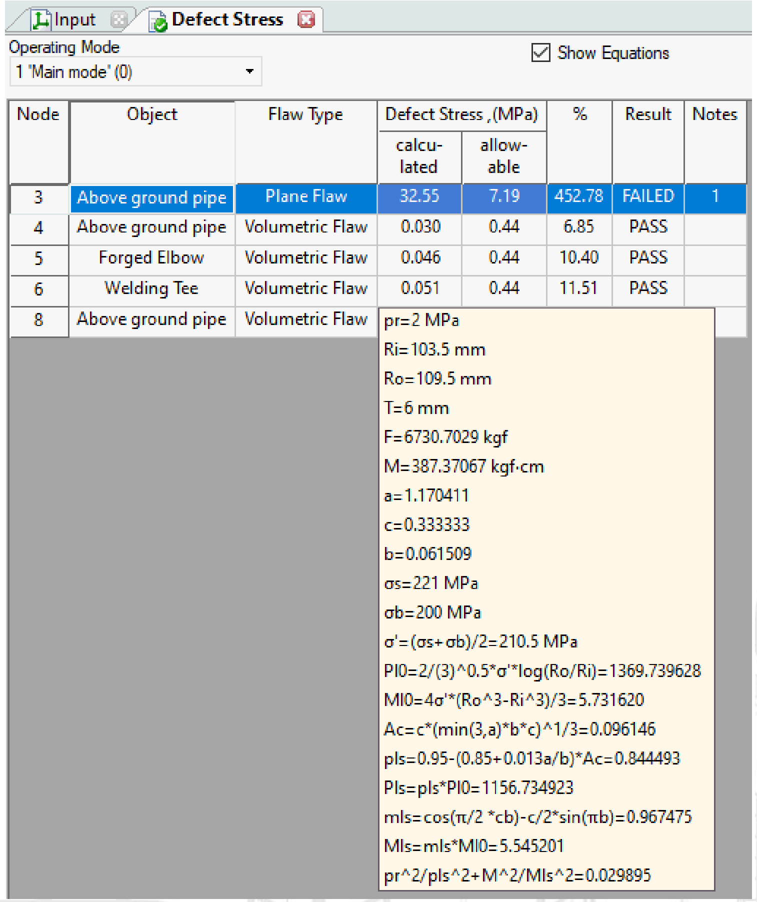
Se agregaron nuevas habilidades para-servicio: "Plane Flaw" y objeto "Volumetric flaw", permiten modelar falla en un tubo, doblez o tee y verifica el esfuerzo que se presenta en las fallas











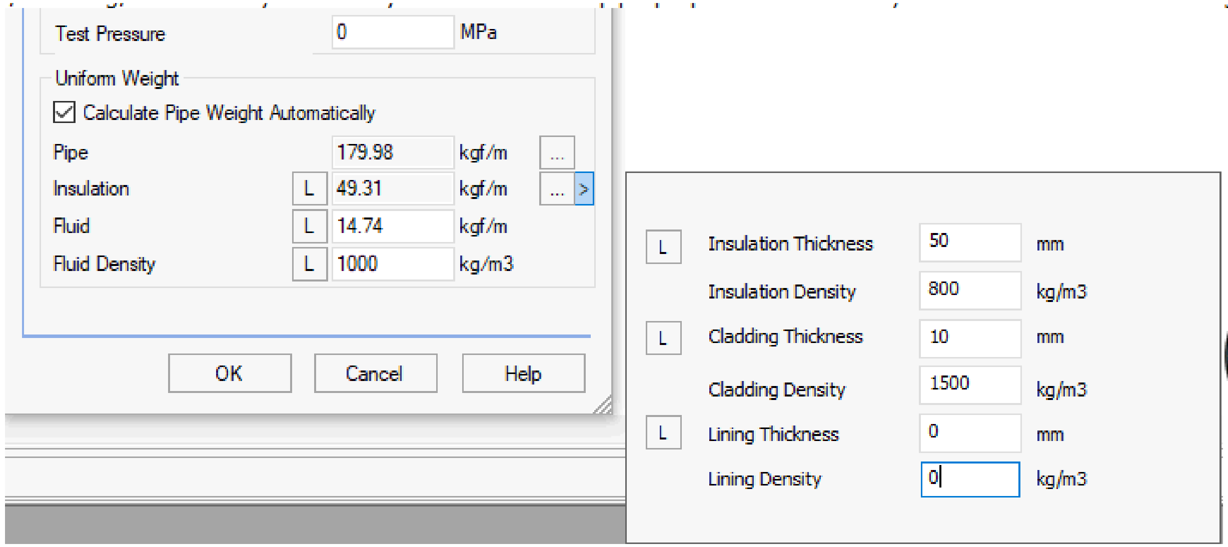
Node	Object	Flaw Type	Defect Stress ,(MPa)		%	Result	Notes
			calcu-lated	allow-able			
3	Above ground pipe	Plane Flaw	32.55	7.19	452.78	FAILED	1
4	Above ground pipe	Volumetric Flaw	0.030	0.44	6.85	PASS	
5	Forged Elbow	Volumetric Flaw	0.046	0.44	10.40	PASS	
6	Welding Tee	Volumetric Flaw	0.051	0.44	11.51	PASS	
8	Above ground pipe	Volumetric Flaw					

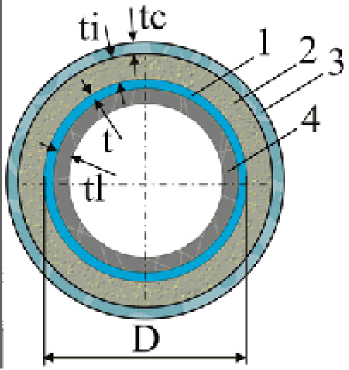
pr=2 MPa
Ri=103.5 mm
Ro=109.5 mm
T=6 mm
F=6730.7029 kgf
M=387.37067 kgf·cm
a=1.170411
c=0.333333
b=0.061509
σs=221 MPa
σb=200 MPa
σ'=(σs+σb)/2=210.5 MPa
Pl0=2/(3)^0.5*σ'*log(Ro/Ri)=1369.739628
Ml0=4σ'*(Ro^3-Ri^3)/3=5.731620
Ac=c*(min(3,a)*b*c)^1/3=0.096146
pls=0.95-(0.85+0.013a/b)*Ac=0.844493
Pls=pls*Pl0=1156.734923
mls=cos(π/2 *cb)-c/2*sin(πb)=0.967475
Mls=mls*Ml0=5.545201
pr^2/pls^2+M^2/Mls^2=0.029895

PIPING AND EQUIPMENT
ANALYSIS & SIZING SUITE

PASS/Start-Prof | Nuevas Funciones

Se agrego la habilidad de especificar aislamiento, recubrimiento, y densidad lineal de las capas y espesor en las propiedades del tubo. La habilidad de escoger el peso del aislamiento desde la base de datos continua existiendo.





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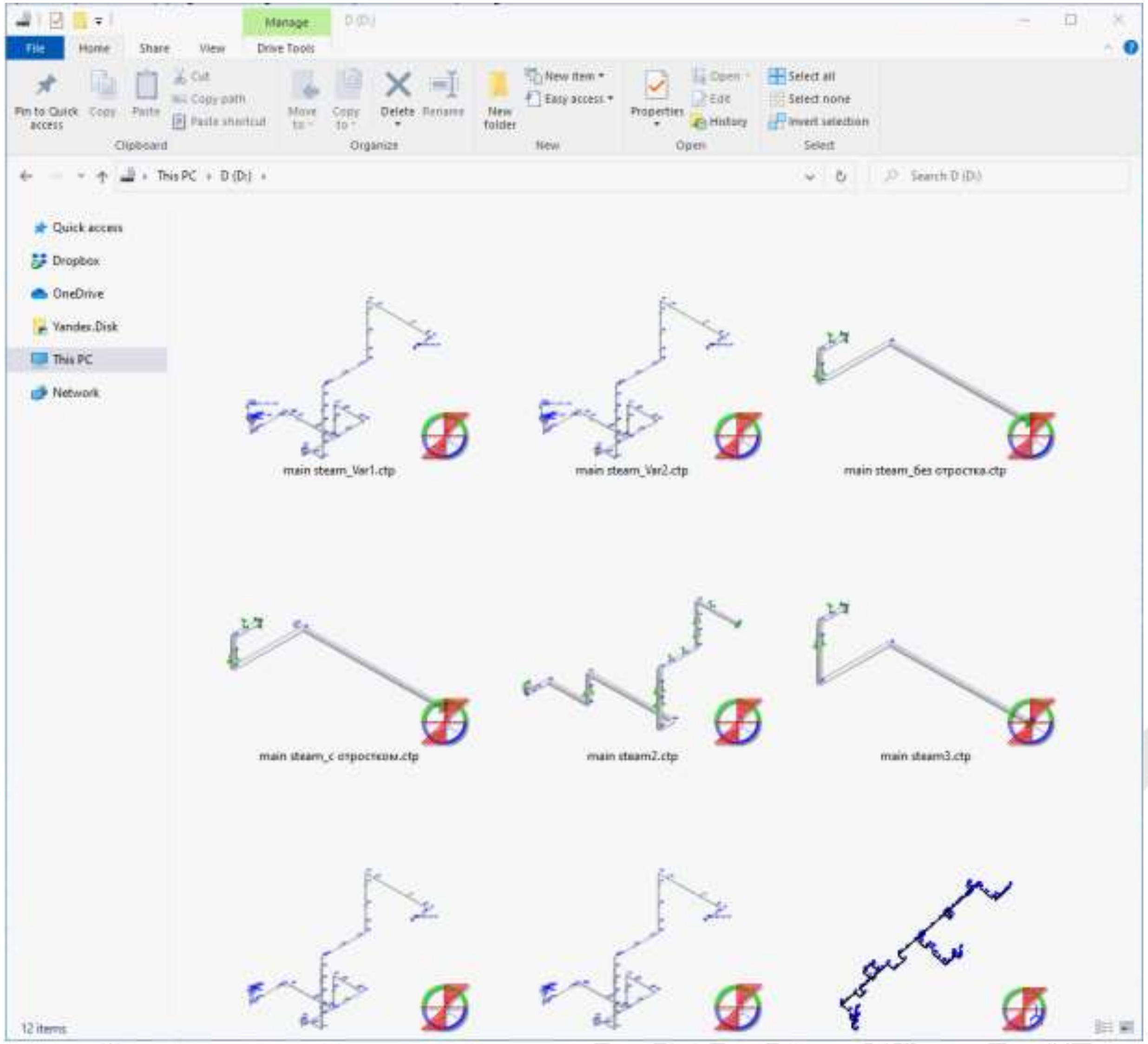
Se agregó la capacidad de ver en miniaturas el modelo dentro del Explorador de Windows. Ahora se pueden ver todos los modelos antes de abrir el archivo.



PIPING AND EQUIPMENT
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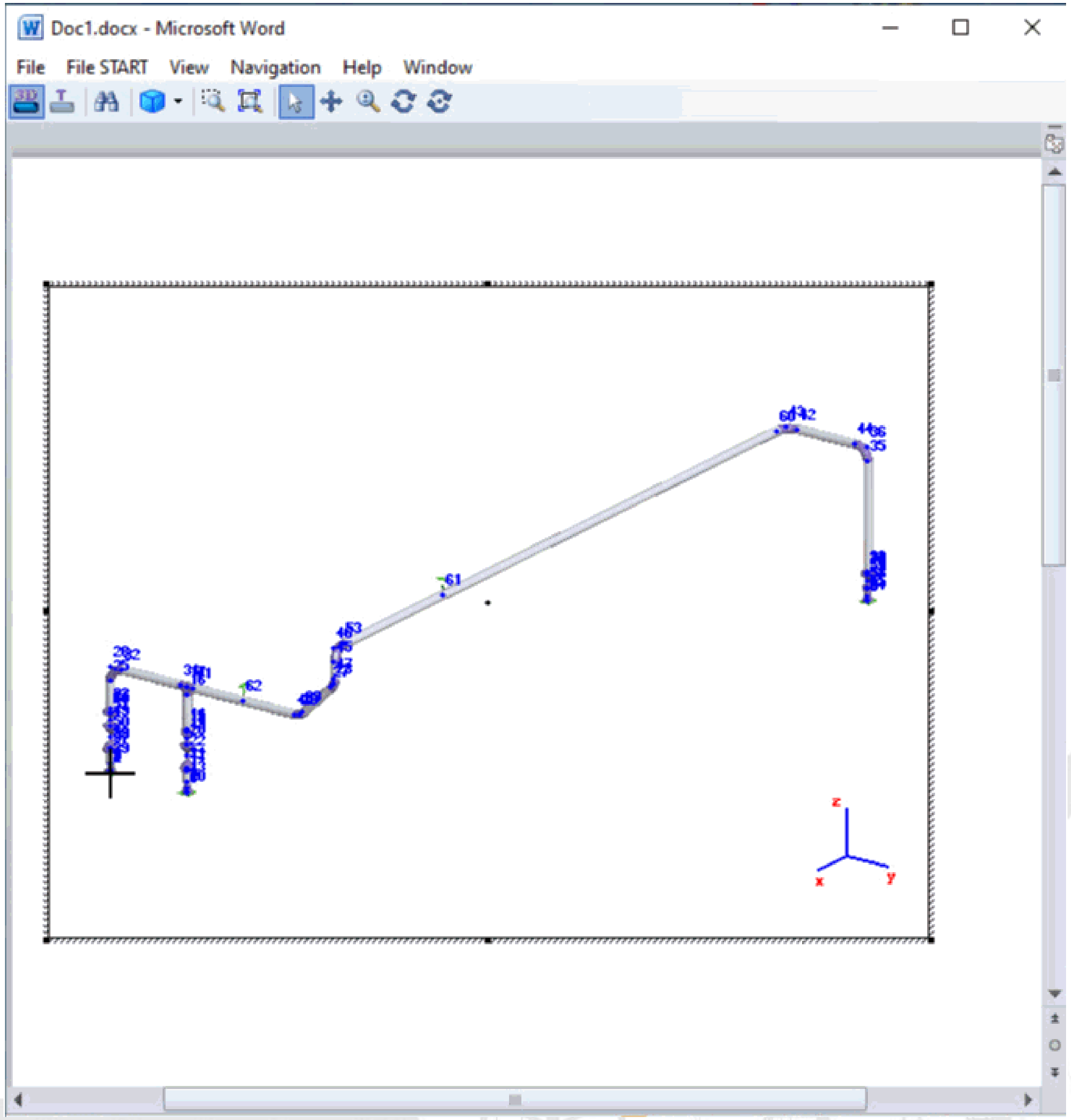
Agregada función "Copy Whole Model". Permite copiar todo el modelo de tubería como un objeto al portapapeles. Después puede insertar este modelo interactivo en otro software como MS WORD, EXCEL etc. Usted puede girar, desplazar, acercar el modelo dentro de MS Word.
Usted puede agregar interacción al reporte en MS Word y enviar a su cliente para revisión.



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- Se agregó la capacidad de exportar al software EHS para el dimensionamiento de soporte. START-PROF puede crear el archivo cad8.dat
- Se agregó la función para respaldar copia del archivo antes de cada corrida con fecha y hora estampadas. Disponible en los ajustes generales.
- Se agregó la compactación automática de los archivos del modelo de tubería START-PROF (.ctp). Los archivos ahora son 10 veces más pequeños.
- Se mejoró significativamente la velocidad al abrir y/o guardar modelos grandes.
- Se agregaron nuevos tópicos en la Guía de Aplicación.

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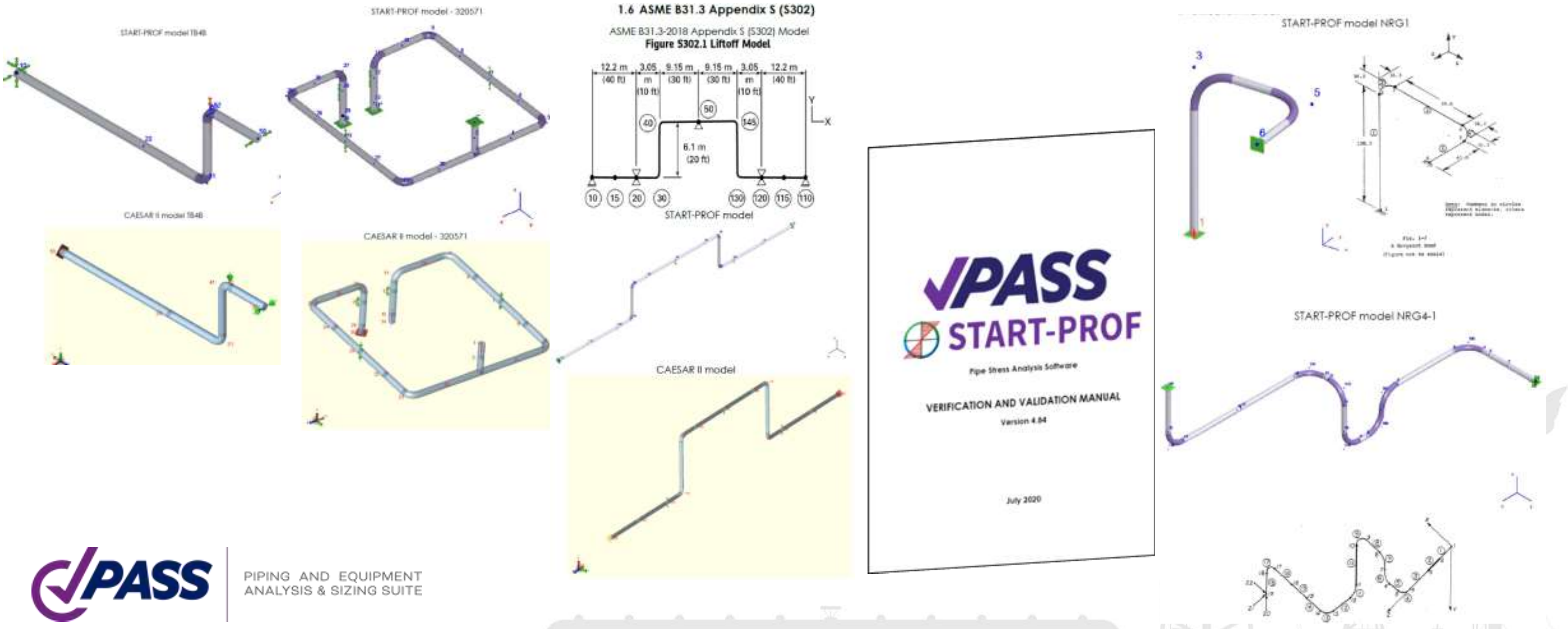
Manual completo de verificación y validación. Se agregaron muchos ejemplos de verificación, y se compararon con cálculos manuales así como con otro software



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Cada nueva versión de PASS/START-PROF es

- Verificada automáticamente en más de 300 ejemplos con versiones previas (Sistema de aseguramiento de Calidad)
- Verificada manualmente por un grupo de expertos en análisis de esfuerzos en la tubería (testers)
- Cada versión pasa por 1 a 3 entrenamientos de análisis de esfuerzos en la tubería con 10 a 20 estudiantes antes de su liberación oficial.
- Tras la liberación, todos los errores reportados por nuestros usuarios activos en 2000 empresas se reparan rápidamente y se provee una nueva liberación.

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- Twitter twitter.com/passuitecom
- Más de 50 artículos acerca de análisis de esfuerzos en la tubería y funciones en PASS/START-PROF https://whatispiping.com/category/start-prof

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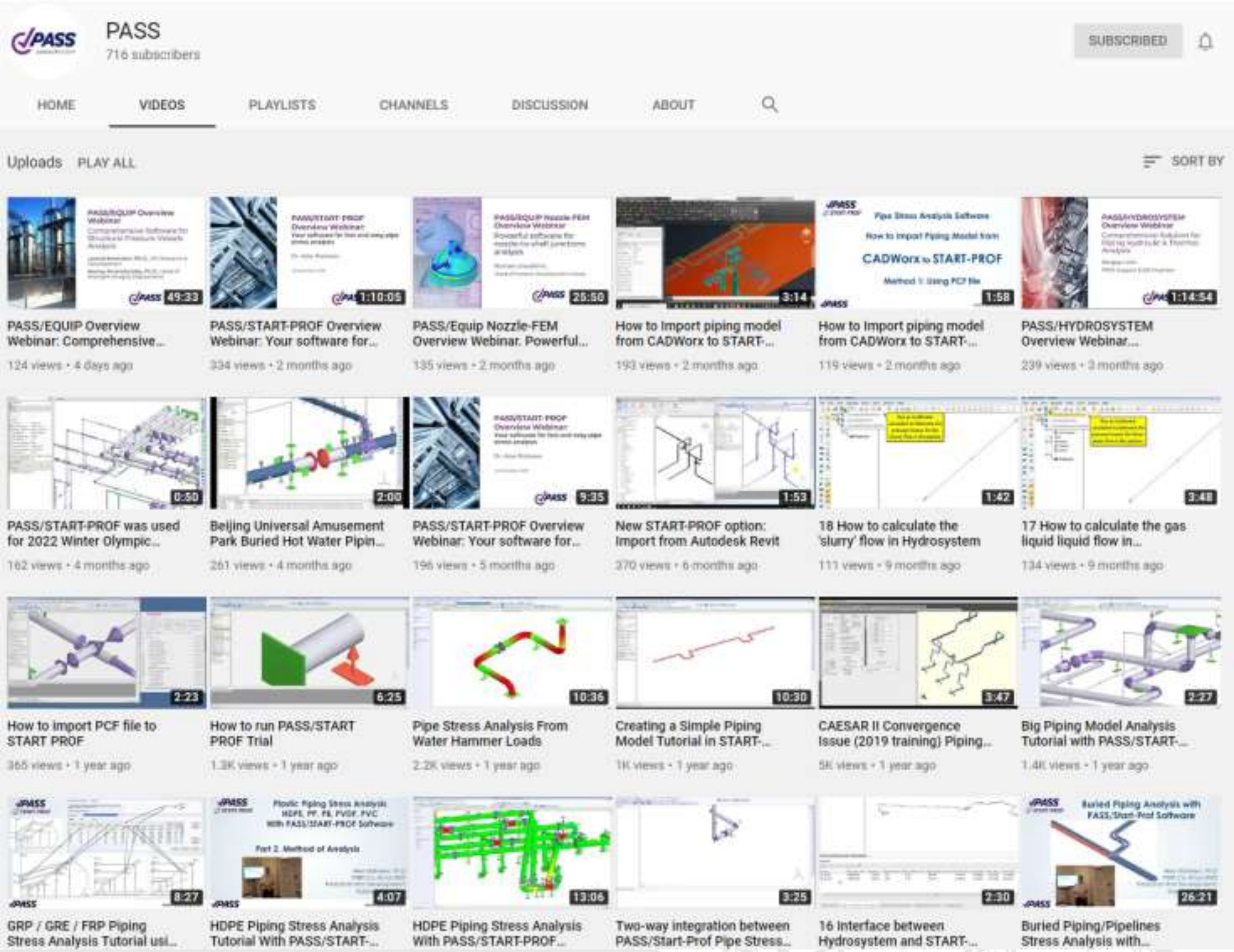
Suscríbase al canal de YouTube, encontrará muchos vídeos de entrenamiento en PASS/START-PROF

www.youtube.com/passuite



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ISO 14692	✓	✓	✓				✓
HDPE Piping	✓	✓	✓				✓
ASME B31.1	✓		✓	✓		✓	
ASME B31.3	✓	✓		✓	✓		
ASME B31.4	✓	✓		✓	✓		
ASME B31.5	✓	✓	✓	✓	✓	✓	
ASME B31.8	✓	✓		✓	✓		
ASME B31.9	✓	✓	✓	✓	✓	✓	
EN 13480	✓	✓	✓	✓	✓	✓	
GB 50316	✓	✓	✓	✓	✓		
GB/T 20801	✓	✓		✓	✓		
GB 50251	✓	✓		✓	✓		
GB 50253	✓	✓		✓	✓		
DL/T 5366	✓		✓	✓		✓	
CJJ/T 81	✓		✓				
RD 10-249-98	✓		✓				
GOST R 55596	✓		✓				
GOST 32388	✓	✓					
SNiP 2.05.06-85	✓	✓					
SP 36.13330	✓	✓					

PASS | PIPING AND EQUIPMENT ANALYSIS & SIZING SUITE