API 510 formula sheet

Built from our API 510 formula guide, which follows the API 510 Body of Knowledge for September 2026 to May 2027. www.api.org

Our own one-page summary of the API 510 formula guide. Work each check by hand, then use the calculator beside it.
- Corroded dimensions in pressure formulas: add twice the corrosion allowance to the inside diameter (once to R), subtract the allowance from the measured thickness before MAWP. Confirm constants in your own code copy.
- One unit system per problem, converted once: 1 in. is 25.4 mm.

Wall loss and inspection interval

Corrosion rate

long term = (first reading - current reading) / years between them

short term = (previous reading - current reading) / years between them

Check: 0.750 (2010), 0.705 (2018), 0.681 in. (2026): 0.00431 in./yr long term, 0.00300 short term

Open in calculator: longseam.com/tools/corrosion-rate-calculator

Remaining life

remaining corrosion allowance = actual thickness - required thickness

remaining life = remaining corrosion allowance / corrosion rate

Check: required 0.612 in.: allowance 0.069 in.; 16.0 years at the long-term rate, 23.0 at the short-term

Open in calculator: longseam.com/tools/remaining-life-calculator

Internal or on-stream interval

the smaller of half the remaining life and the 10-year maximum for a pressure vessel

Check: 16.0-year life: half is 8.0 years, so 8.0 years governs

Open in calculator: longseam.com/tools/inspection-interval-calculator

Pressure, thickness and test

Required thickness and MAWP (P, S, E, R inside radius, D inside diameter)

shell: $t = P R / (S E - 0.6 P)$; $P = S E t / (R + 0.6 t)$

sphere or hemi head: $t = P R / (2 S E - 0.2 P)$; 2:1 head: $t = P D / (2 S E - 0.2 P)$

Check: 200 psi, 72.000 in. ID, 0.125 in. allowance, S 17,500, E 0.85: R 36.125 in., t 0.490 in.; MAWP 202 psi at 0.620 in.

Open in calculator: longseam.com/tools/mawp-thickness-calculator

Static head

head (psi) = 0.433 x specific gravity x liquid height (ft)

allowed pressure at the top = part MAWP - head at the part's lowest point

Check: MAWP 220 psi, 26 ft down: head 11.26 psi, allowed at top 208.74 psi

Open in calculator: longseam.com/tools/static-head-calculator

Hydrostatic test pressure

stress ratio = allowable stress at test / at design temperature (lowest ratio)

top = 1.3 x MAWP x ratio (pneumatic: 1.1); bottom = top + head of the test water

Check: MAWP 250, 20,000 / 18,000 psi, 40 ft: ratio 1.111, top 361.1, bottom 378.4 psi

Open in calculator: longseam.com/tools/hydrotest-pressure-calculator

Sources

API 510 Body of Knowledge and Effectivity Sheet, Sept 2026 to May 2027, API. Thin-wall background: Roylance, MIT.

Read next

API 510 calculations guide: longseam.com/guides/api-510-calculations

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