API 620 Design Parameters and Example Engineering Notes

A concise English reference focused on public API 620 scope limits and reworked project-style example data derived from the user-provided engineering screenshots. The calculation examples are illustrative and have been normalized for readability rather than reproduced line-for-line.

Document use: This note is intended for website support, internal technical communication, and buyer-facing reference. It highlights the type of numeric content that matters in API 620 work: pressure boundary, temperature route, shell course progression, junction checks, and anchor/uplift logic.

1. API 620 Core Design Boundaries

API 620 is used for large, field-assembled, welded, low-pressure aboveground storage tanks. The numeric boundaries that readers usually need first are the pressure limit, temperature route, and tank form.

Item	API 620 public boundary / route	Why it matters in project work
Tank type	Large, field-assembled, welded, aboveground tank	Indicates a field-built tank route rather than a small shop-fabricated vessel.
Pressure basis	Gas or vapor space not more than 15 psig	Separates low-pressure storage from ordinary atmospheric service and changes the code route.
Tank form	Single vertical axis of revolution, including flat-bottom tanks	Important when checking whether a proposed concept is still within the main scope.
Metal temperature	Not greater than 250 F in the published scope description	Sets a base temperature ceiling before low-temperature annexes are considered.
Basic climate basis	Lowest recorded 1-day mean atmospheric temperature: -50 F	Defines the base environmental assumption for the main rules.
Low-temperature route A	Annex R: +40 F to -60 F	Used when the product is refrigerated but the project remains within the Annex R route.
Low-temperature route B	Annex Q: liquefied gases not lower than -325 F	Used when the project enters deeper low-temperature liquefied gas service.

Annex	Main topic	Typical reason to check it
Q	Liquefied gases at -325 F or warmer	Confirms the low-temperature design route for liquefied gas service.
R	Low-pressure storage tanks from +40 F to -60 F	Used for refrigerated products that do not fall into the deeper Annex Q route.
L	Seismic design of storage tanks	Relevant when site seismicity materially affects design loads.
M	Recommended scope of the manufacturer's report	Useful for handover documents and final project review.
N	Installation of pressure-relieving devices	Important when pressure relief arrangement is part of design review.
P	Summary of NDE and testing requirements	Helpful when inspection scope must be checked quickly.

2. Reworked Example Design Input for a 5,000 m3 Low-Pressure Dome-Roof Tank

The following table reworks the numerical design inputs visible in the provided screenshots into a cleaner English reference format. The values should be read as an illustrative example calculation case rather than as universal API 620 fixed values.

Parameter	Illustrative input
Stored medium	Light naphtha
Nominal volume	5,000 m3
Liquid density	630 kg/m3
Inside diameter	21,000 mm
Shell height	16,640 mm
Maximum operating pressure	60,000 Pa
Design pressure	Approx. +66,000 Pa (vacuum case also considered in the source notes)
Operating temperature	60 C
Design temperature	75 C
Material	Q345R
Roof form	Dome roof
Site category	Class II
Ground roughness	Category A
Seismic intensity / acceleration	7 / 0.10 g
Seismic group	Group 1
Basic wind pressure	650 Pa
Basic snow pressure	300 Pa

3. Example Shell Thickness, Junction, and Anchor Checks

Typical Shell Thickness Progression by Course

One of the most useful numeric takeaways from the screenshots is that shell thickness is not a fixed schedule item. It progresses by shell course according to the design case and nominal plate selection.

Shell course	Course height (mm)	Calculated thickness (mm)	Nominal thickness (mm)
1	1,980	21.3	24
2	1,980	19.7	22
3	1,980	18.1	20
4	1,980	16.5	19
5	1,980	14.8	17
6	1,980	12.6	15
7	1,980	11.1	13
8	1,980	9.5	12

In the source calculation notes, shell sizing is developed from the design pressure case together with hydrostatic pressure and an efficiency term. The engineering point to keep is the design logic: calculate by course, compare calculated thickness with the chosen nominal plate, and size the shell from the governing course upward rather than assuming one uniform shell thickness.

Shell-to-Roof Junction and Compression Ring

Check item	Illustrative value from the reworked source notes	Meaning
Shell effective width	404.10 mm	Effective shell width contributing to the compression ring area.
Roof effective width	515.86 mm	Effective roof width participating in the junction area.
Effective shell area	17,457.08 mm2	Shell contribution to the effective section area.
Effective roof area	47,234.29 mm2	Roof contribution to the effective section area.
Combined actual effective area	64,691.37 mm2	Available metal area at the shell-roof junction.
Required compression-ring metal area	62,833.02 mm2	Target area used for adequacy check in the example note.
Illustrative result	Actual area > required area	The example note indicates the junction arrangement is acceptable in that case.

Once internal pressure creates significant horizontal components at the roof-to-shell junction, compression-ring adequacy can become a real design item rather than a secondary detail.

4. Illustrative Uplift and Anchor Verification Notes

The third screenshot adds the kind of checks that are often missed in simplified summaries: uplift combinations and anchor stress. The values below are rewritten from the source note as a compact English reference.

Illustrative case	Source-note check result	Design implication
Design pressure + wind	Net uplift on the order of 29.2 MN; per-anchor stress around 119 MPa	Wind combination must be checked rather than relying on shell weight alone.
Design pressure + seismic	Net uplift on the order of 31.7 MN	Seismic uplift can become the governing anchor case depending on site input.
Design pressure only	Net uplift on the order of 36.0 MN; per-anchor stress around 142 MPa	Pressure-only uplift can still be a serious governing case.
Trial pressure case	Per-anchor stress around 113 MPa versus an allowable reference of 170 MPa	Hydrotest / trial pressure should be reviewed separately from operating combinations.

Key takeaway from the example screenshots
The most useful numeric content for an API 620 reference PDF is not OD / WT / tensile-property style product data. For low-pressure storage tanks, the more meaningful numbers are design pressure, temperature route, course-by-course shell thickness, junction area checks, uplift loads, anchor stress, and the associated inspection / documentation logic.

5. Practical Reading Notes

- Do not read the example shell thicknesses as fixed API 620 schedule values. They are project-derived outcomes tied to the selected design basis.
- Treat Annex Q and Annex R as temperature-route indicators, then connect them back to material, impact, inspection, and documentation decisions.
- Compression-ring and anchor checks become especially important when internal pressure, wind, seismic input, or test condition changes the uplift balance.
- For buyer-facing documents, reworked English tables are usually more useful than long copied formula pages.

End of reference note.