

**Table 1: On-board compressed hydrogen storage system design assumptions**

Design Parameter	Base Case Value	Basis/Comment
Nominal Pressure	350 and 700 bar	Design assumptions based on DOE and industry input
Number of Tanks	Single and Dual	Design assumptions based on DOE and industry input
Tank Liner	Aluminum (Type III) HDPE (Type IV)	Design assumptions based on DOE and industry input
Maximum Filling Pressure	350-bar: 438 bar 700-bar: 875 bar	125% nominal pressure is assumed required for fast fills to prevent under-filling
“Empty” Pressure	20 bar	Discussions with Quantum, 2008
Usable H <sub>2</sub> Storage Capacity	5.6 kg	Design assumption based on drive-cycle modeling for 350 mile range assuming a mid-sized, hydrogen FCV [Ahluwalia 2004 and 2005]
Tank Size (water capacity)	350-bar: 258 L 700-bar: 149 L	Calculated based on Benedict-Webb-Rubin equation of state for 5.6 kg usable H <sub>2</sub> capacity and 20 bar “empty pressure” (6.0 and 5.8 kg total H <sub>2</sub> capacity for 350-bar and 700-bar tanks, respectively)
Safety Factor	2.25	Industry standard criteria (e.g., ISO/TS 15869) applied to nominal storage pressure (i.e., 350 bar and 700 bar)
Length/Diameter Ratio	3.0	Discussions with Quantum, 2008; based on the outside of the CF wrapped tank
Carbon Fiber (CF) Type	Toray T700S	Discussions with Quantum and other developers, 2008
CF Composite Tensile Strength	2,550 MPa	Toray material data sheet for 60% fiber by volume
Adjustment for CF Quality	10%	Reduction in average tensile strength to account for variance in CF quality, based on discussion with Quantum and other developers, 2010
CF Translation Efficiency	350-bar: 82.5% 700-bar: 80.0%	Assumption based on data and discussions with Quantum, 2004-09
Tank Liner Thickness	5 mm HDPE (Type IV) 7.4 mm Al (Type III, 350-bar) 12.1 mm Al (Type III, 700-bar)	Discussions with Quantum for Type IV tanks, 2008; ANL calculations for Type III tanks
Liner Cycle Life	5500 cycles	SAE J 2579
Overwrap	1 mm glass fiber	Discussions with Quantum, 2008; common but not functionally required
Protective End Caps	10 mm foam	Discussions with Quantum, 2008; for impact protection