

<b>Title:</b>	<b>Sloshing Seismic Freeboard (620)</b>	<b>Agenda Item # 620-1030</b>
<b>Date:</b>	08/31/2023	
<b>Contact:</b>	Name:	<b>D J Berry</b>
	Company:	FHG, Inc.
	Phone:	918-697-1650
	E-mail:	DeeJayBerry@FHG-inc.com
	Name:	<b>Andy Wong (originator)</b>
	Company:	PEMY Consulting
	E-mail:	andywong@pemyconsulting.com
<b>Purpose:</b>	Correct and clarify seismic freeboard rules in API 620	
<b>Source:</b>	Email from Andy Wong 9/28/2022, Andrew Yearwood, PEMY Consulting, (918) 698-2110, andrew@pemyconsulting.com	
<b>Revision:</b>	1	
<b>Impact:</b>	Neutral	
<b>Rationale:</b>	<p>API 620 Annex L, as it is written, does not explicitly state that the freeboard required is equal to the sloshing wave height <math>\delta_s</math>. This is because it says to not use API 650's Table E.7, which is the one place where it states the minimum freeboard equals <math>\delta_s</math>. This agenda item defines freeboard and the height of the sloshing wave in API 620.</p> <p>Proposed changes in red font.</p>	
<b>Proposed verbiage:</b>	<p><b>API 620</b></p> <p><b>L.2 Notations</b></p> <p><math>h_s</math> is additional shell height required above the sloshing wave height, ft;</p> <p>...</p> <p><b>L.4.3 Operating Level Earthquake (OLE)</b></p> <p>...</p> <p><b>L.4.3.8 Seismic Freeboard</b></p> <p>Freeboard shall be provided in the primary liquid container for the OLE event in accordance with the following where the terms are as defined in API 650, Annex E, as modified below.</p> <p><del><math>\delta_s = 0.42DA_f + h_s</math></del></p> <p>Sloshing Wave Height, <math>\delta_s = 0.42DA_f</math></p> <p>Seismic Freeboard = <math>\delta_s + h_s</math></p> <p>The <math>A_f</math> formula for SUG III shall be applied for all tanks. Table E.7 shall not be applied. <math>SD1 = QFV</math>  <math>S1 = FVS1</math> shall be used in equations for <math>A_f</math>, and <math>Q</math> shall be set equal to 1.0.</p> <p><b>To determine seismic freeboard, an</b> additional shell height, <math>h_s</math>, shall be added to the calculated value above the sloshing height as required by the governing regulations. The minimum value of <math>h_s</math> for the OLE event shall be 1 ft.</p>	

If provided, the site-specific response spectrum shall be used to determine the effective spectral acceleration at the sloshing period in place of  $A_f$ .

Alternative sloshing height calculation methods may be used if approved by the regulatory body providing the calculated sloshing height is not less than 80 % of the value required by these provisions.

...

#### **L.4.4 Contingency Level Earthquake (CLE)**

##### **L.4.4.3 Inner Tank Freeboard**

Freeboard shall be provided in accordance with L.4.3.8 except the value of  $h_s$  shall be taken as zero unless required by the governing regulations.