


<b>PROJECT :</b>			<b>DATE :</b>	03/05/2013
<b>PROJ. NO. :</b>			<b>BY :</b>	S.R. M.
<b>CLIENT :</b>			<b>REV :</b>	
<b>UNIT :</b>			<b>DOC NO.:</b>	

### Flare Knock Out Drum Sizing (API-521 Method)

Input Data	Unit	Vapor	Liquid
Mass Flow Rate	kg/hr	757269	96301
Density	kg/m3	4.63	976.68
Viscosity	CP	0.0117	1.10
Volumetric Flow Rate	m3/hr	163557.0	98.60
Liquid Particle Diameter	micron	600	
No of Inlet Nozzel (Passage)	----	1	
Closed Drain Drain (Misc.) Volume	m3	5.00	
Hold up Time between LLL - LL	min	1	
Emergency Duration (for HL to HHL)	min	20	
Depressuring Liquid Volume	m3	3.00	
Min. LLL for Heater (if required)	mm	0	
Liquid Drainage Method	----	Pump	
Liquid Drainage Rate from KOD	m3/hr	25	

Vessel Diamter Trail		
Trial Diameter	mm	3300
Inlet Nozzle Size	mm	750
Gas Outlet Nozzle Size	mm	750
Inlet Device Type	----	None
Gas Outlet Device Type	----	None
Height of Inlet Device (if Req.)	mm	0
Minimum Hv/D Ratio	----	0.2

Light Droplet Separation		
Emergency Liquid Volume	m3	32.87
Total Liquid Volume	m3	37.87
BTM - EHHL	mm	1200
CRe <sup>2</sup>	----	92831
Drag Coefficient	----	0.61
Selected Drag Coefficient	----	0.61
Terminal Velocity	m/sec	1.65
Vapor Space	mm	2100
Liquid Droplet Drop out Time	sec	1.27
Vessel Cross Sectional Area	m2	8.55
Vapor Cross Sectional Area	m2	5.76
Vapor Velocity	m/sec	7.88
Lmin for Liq. Droplet Separation	mm	10047
<b>Vessel Calculated Length (min)</b>	<b>mm</b>	<b>11097</b>
Selected Length	mm	13500
<b>L/D</b>	<b>----</b>	<b>4.09</b>

Liquid Level Input			
BTM - LLL	mm	150	OK
LLL - LL	mm	100	OK
LL - HL	mm	300	OK
HL - HHL	mm	550	OK
HHL - EHHL	mm	100	---
BTM - EHHL	mm	1200	OK

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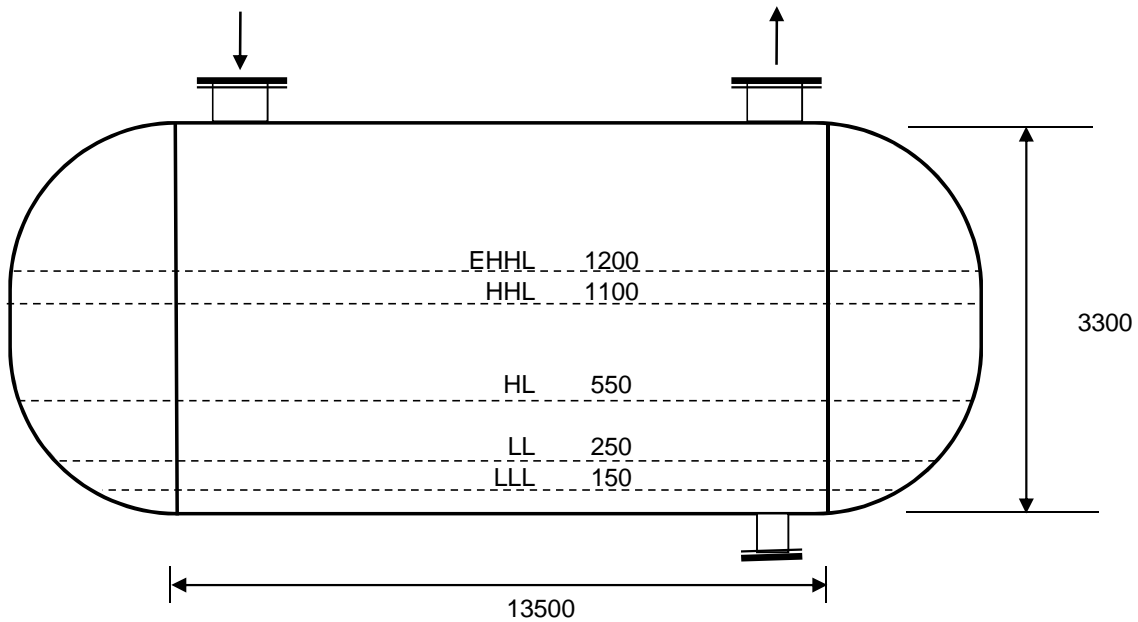
**Flare Knouck Out Drum Sizing (API-521 Method)**

**Liquid Hold up Time Calculation**


BTM - LLL Hold up Time	min	5.69	---
LLL - LL Hold up Time	min	4.93	OK
LL - HL hold up Time	min	5.23	---
HL - HHL hold up Time	min	12.77	---
HHL - EHHL hold up volume	m3	4.24	OK

**Other Level Settings**

Both KOD Pumps Trip	mm	150
Low Liquid Level Alarm Initiates	mm	250
Both KOD Pumps Stop - NLL	mm	350
1st KOD Pump Starts	mm	450
High Liquid Level Alarm Initiates	mm	550
2nd KOD Pump Starts	mm	650
High-High Liquid Level Alarm Initiates	mm	1100
ESD Trip Initiates	mm	1200



**Notes**

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### Flare Knock Out Drum Sizing (GPSA Method)

Input Data	Unit	Vapor	Liquid
Mass Flow Rate	kg/hr	757269	96301
Density	kg/m <sup>3</sup>	4.63	976.68
Viscosity	CP	0.0117	1.10
Volumetric Flow Rate	m <sup>3</sup> /hr	163557.0	98.60
Liquid Particle Diameter	micron	600	
No of Inlet Nozzel (Passage)	----	1	
Hold up Time between LLL - LL	min	1	
Emergency Duration	min	20	
Depressuring Liquid Vol.	m <sup>3</sup>	3.00	
Min. LLL for Heater (if required)	mm	0	
Liquid Drainage Method	----	Pump	
Liquid Drainage Rate from KOD	m <sup>3</sup> /hr	25	

Vessel Diamter Trail		
Trial Diameter	mm	3300
Inlet Nozzle Size	mm	750
Gas Outlet Nozzle Size	mm	750
Inlet Device Type	----	None
Gas Outlet Device Type	----	None
Height of Inlet Device (if Req.)	mm	0
Minimum Hv/D Ratio	----	0.2

Liquid Level Input			
BTM - LLL	mm	150	OK
LLL - LL	mm	100	OK
LL - NL	mm	100	OK
NL - HL	mm	200	OK
HL - HHL	mm	850	OK
HHL - EHHL	mm	100	----
BTM - EHHL	mm	1500	----

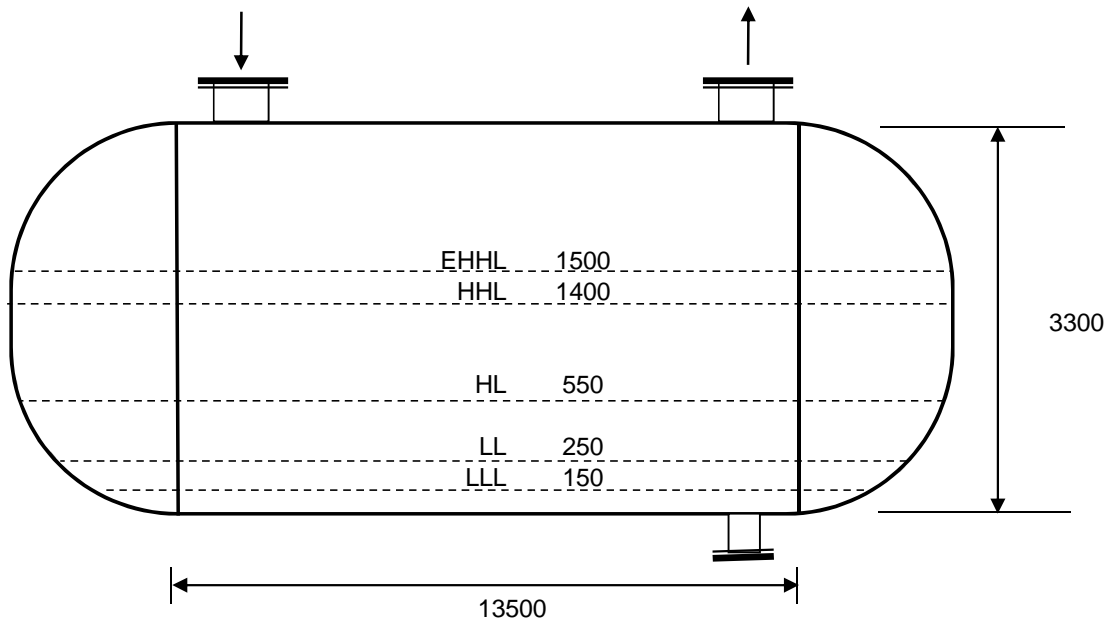
Light Droplet Separation		
CRe <sup>2</sup>	----	92831
Drag Coefficient	----	0.61
Selected Drag Coefficient	----	0.61
Terminal Velocity	m/sec	1.65
Vapor Space	mm	1800
Liquid Droplet Drop out Time	sec	1.09
Vessel Cross Sectional Area	m <sup>2</sup>	8.55
Vapor Cross Sectional Area	m <sup>2</sup>	4.79
Vapor Velocity	m/sec	9.48
Lmin for Liq. Droplet Separation	mm	10360
<b>Vessel Calculated Length (min)</b>	<b>mm</b>	<b>11410</b>
Selected Length	mm	13500
<b>L/D</b>	<b>----</b>	<b>4.09</b>

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**Flare Knock Out Drum Sizing (GPSA Method)**

<b>Liquid Time/Vol Calculation</b>	<b>m3</b>	<b>min</b>	
BTM to LLL	2.37	5.69	---
LLL to LL	2.05	<b>4.93</b>	OK
LL to NL	2.52	1.53	---
NL to (HL-100 mm)	3.18	1.94	---
NL to HL	6.07	3.69	---
HL to (HL+100 mm)	3.43	2.08	----
HL to HHL	33.91	<b>20.64</b>	OK
HHL to EHHL	<b>4.42</b>	2.69	OK

<b>Other Level Settings</b>		
Both KOD Pumps Trip	mm	150
Low Liquid Level Alarm Initiates	mm	250
Both KOD Pumps Stop - NLL	mm	350
1st KOD Pump Starts	mm	450
High Liquid Level Alarm Initiates	mm	550
2nd KOD Pump Starts	mm	650
High-High Liquid Level Alarm Initiates	mm	1400
ESD Trip Initiates	mm	1500



**Notes**