

FRP Industry Group	FRP Handrails for Offshore - Proposed Fire Integrity Requirements and Test Protocol Matrix to Facilitate Use Offshore		Rev 4.1 (21-April-2021)
			ABS Certificate Number 21-2129121-PDA Date of Issue: 28 May 2021 Date of Expiry: 27 May 2026
Increasing fire integrity requirement	FRP Handrail - Proposed Fire Integrity Requirements (subject to Risk Assessment)		
	Handrail Level Notation	Proposed FRP Handrail Fire Integrity Requirements	Proposed FRP Handrail Test Plan and Pass/Fail Criteria
	R1	R1 Integrity requirement TBA and will be included in this matrix at a later date pending further review and discussion	TBA
	R2	HSE Document Table 14 - "Thermal Radiation exposure Effects", thermal radiation of 12.5kW/m2; advises the likely effect as being "significant chance of fatality for medium duration exposure" and "thin steel with insulation on the side away from the fire may reach thermal stress level high enough to cause structural failure" Note - steel handrails could be considered as thin steel construction. R2 fire integrity requirement for FRP Handrails: FRP Handrails shall be subjected to a heat flux of 12.5kW/m2 for 15 mins (no flame impingement) and shall be subjected to a horizontal load before, during and after the application of the heat flux. (Note - 15 mins taken from industry norm for "blow down" duration per API 521). Handrail deflection during and after the fire test shall be measured and shall not exceed 60mm. Base Line Post Fire Integrity Test as set out for R3 is also required for R2	Handrail panel to be tested shall be to full scale dimensions as per normal service use, minimum 1100mm effective height with 2 posts at 1500mm centres, top rail, mid rail(s) and kickflat. Handrail shall be secured to a steel base frame using manufacturers recommended connection detail, this connection being below the 1100mm effective post height. For 12.5 kW/m2 Test: New FRP Handrail sample shall have a point load applied to the centre of the top rail during and after the fire test. Point Load shall be 200 lbs (0.89Kn) applied in the horizontal direction only, with safety factor of 1.0. The Handrail shall be initially loaded with 200lb point load for 1 minute, then the load removed, at which point the handrail position shall be recorded as the zero deflection position. The point load shall then be reapplied before commencement of the fire test, and deflection shall be measured and recorded at minimum 1 min intervals throughout the test. The handrail shall be subjected to 12.5 kW/m2 heat flux in a calibrated furnace for a period of 15 mins (time measured from the point when the furnace has achieved target heat flux), with no flame impingement. Handrail shall be considered to pass if it continues to support the point load both during, and for 5 mins after, the applied fire test regime with measured deflection being no greater than 60mm.
	R3	Ref HSE Document Table 14 & Table 21 - "Recommended Thermal Radiation Flux Criteria", Maximum Radiation Level Impairment of Escape Routes = 6kW/m2. R3 fire integrity requirement for FRP Handrails: FRP Handrails shall be subjected to a heat flux of 6.0 kW/m2 for 15 mins (no flame impingement) and shall be subjected to a horizontal load before, during and after the application of the heat flux. (Note - 15 mins taken from industry norm for "blow down" duration per API 521). Handrail deflection during and after the fire test shall be measured and shall not exceed 60mm.	Handrail panels to be tested shall be to full scale dimensions as per normal service use, minimum 1100mm effective height with 2 posts at 1500mm centres, top rail, mid rail(s) and kickflat. Handrail shall be secured to a steel base frame using manufacturers recommended connection detail, this connection being below the 1100mm effective post height. For 6.0 kW/m2 Test: New FRP Handrail sample shall have a point load applied to the centre of the top rail during and after the fire test. Point Load shall be 200 lbs (0.89Kn) applied in the horizontal direction only, with safety factor of 1.0. The Handrail shall be initially loaded with 200lb point load for 1 minute, then the load removed, at which point the handrail position shall be recorded as the zero deflection position. The point load shall then be reapplied before commencement of the fire test, and deflection shall be measured and recorded at minimum 1 min intervals throughout the test. The handrail shall be subjected to 6.0 kW/m2 heat flux in a calibrated furnace for a period of 15 mins (time measured from the point when the furnace has achieved target heat flux), with no flame impingement. Handrail shall be considered to pass if it continues to support the point load both during, and for 5 mins after, the applied fire test regime with measured deflection being no greater than 60mm.
		R3 to include "Base Line Post Fire Integrity Test" as follows: In the event of a higher heat flux fire event, establish duration of such fire event after which FRP Handrail will be able to provide service for post fire rescue or emergency operations. Higher heat flux is defined as 36.5kW/m2. Service load applied during the test shall be as defined as "minimum service load" Fmin=300N/M in BS EN ISO 14122-3 (deflection and permanent deformation requirements in this standard shall not apply in this instance)	For Base Line Post Fire Integrity Test: Part 1: New FRP Handrail sample shall have a point load applied to the centre of the top rail before and during the fire test. Point Load shall be 100 lbs (0.45Kn) applied in the horizontal direction only. The Handrail shall be initially loaded with 100lb point load for 1 minute, then the load removed, at which point the handrail position shall be recorded as the zero deflection position. The point load shall then be reapplied before the fire test commences and deflection shall be measured and recorded at minimum 1 min intervals throughout the test. The handrail shall be subjected to 36.5 kW/m2 heat flux in a calibrated furnace, with no flame impingement. Once the furnace has reached the required 36.5kW/m2 heat flux, handrail deflection and time period shall be measured until handrail failure. Results shall be recorded and reported. Part 2: New FRP Handrail sample shall be positioned in the furnace. No loading is applied to the handrail. The fire test of 36.5kW/m2 is then completed for an agreed shorter period from that recorded in Part 1 (to be determined once the results of Part 1 are known). The FRP Handrail sample is then allowed to cool to ambient temperature, and is then post-loaded with a horizontal point load applied to the centre of the top rail. The load shall be applied from 0 lbs in 20 lb increments, until handrail structural failure occurs. For each load increment, deflection shall be measured and recorded. Handrail should sustain 100lb post fire test load (as per Part 1) as a minimum (deflection limit n/a).
R0	No structural fire integrity requirements.	N/A	