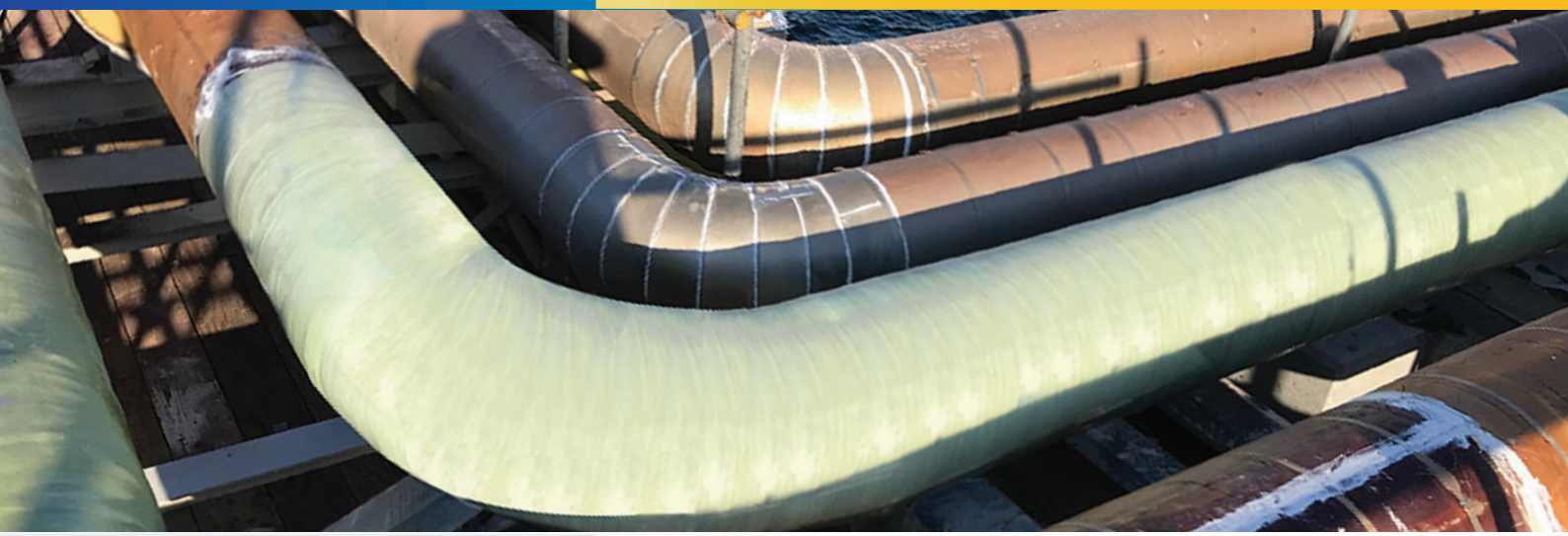
SKPS
Sap & Kaps Petroleum Services l.l.c

CLOCK SPRING

Product Data Sheet

Clock Spring® Contour



Benefits

- Installs without disrupting operations
- Minimal creep ensures a long service life
- NO VOCs
- No hot work
- No heavy lifting
- No heat affected zones
- No environmental hazards
- No chance of burn through

General Information

ClockSpring|NRI Contour is an engineered repair system that employs bi-axial or quad-axial stitched fiberglass cloth applied in a wet-lay system using two-part epoxy and a filler material. It is ideal for repairs involving complicated geometry, including tees, flanges, and varying diameter-pipe. Contour is used globally in plants, refineries, tank farms, terminals and on offshore assets as a pressure-containing repair to seal leaks and as a reinforcing repair to restore the strength of a pipe in the axial and circumferential directions.

This product is available in multiple kit sizes for any diameter pipe and can be installed with minimal disruption to operations. And because it is installed using only hand tools, only a cold work permit is required. Contour has been certified by DNV GL in accordance with the ASME PCC-2 and ISO 24817 standards.

Features

- ☑ Available in multiple kit sizes
- ☑ No hot work required
- ☑ Repairs conform to ISO 24817 and ASME PCC-2 guidelines
- ☑ DNV-GL certified

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Applications

Plants, refineries, tank farms, terminals and offshore assets

Structural reinforcement on straight pipes as well as elbows, tees, and flanges

Girth welds on vessels and pipe-lines

Damage prevention to coatings from potential impact and abrasion

Installation on top of stopgap measures (plugs, banded patches and clamps) to provide a long-lasting reliable repair

Splash zone and fully submerged applications

Clock Spring Contour ISO TS 24817 Qualification Data	For Quad Fabric	For Biax Fabric
Qualification Requirement	**Result**	**Result**
Ply or Layer Thickness	2.1mm (0.0827 inch)	2.1mm (0.0827 inch)
Tensile Modulus (Circumferential)	11.0 GPa (1.60x10^6 psi)	9.1 GPa (1.32 X 10^6 psi)
Tensile Modulus (Axial)	10.8 GPa (1.57 x 10^6 psi)	14.4 GPa (2.09 x 10^6 psi)
Tensile Strain to Failure (Circumferential)	1.8%	2.7%
Tensile Strain to Failure (Axial)	1.9%	1.8%
Tensile Strength (Circumferential)	147 MPa (21.3 ksi)	138 MPa (20.1 ksi)
Tensile Strength (Axial)	149 MPa (21.6 ksi)	153 MPa (22.3 ksi)
Thermal Expansion Coefficient (Circumferential)	15.7 x $10^{-6}C^{-1}$ (8.7 x $10^{-6}F^{-1}$)	25.6x$10^{-6}°C^{-1}$ (13.9 x $10^{-6}°F^{-1}$)
Thermal Expansion Coefficient (Axial)	15.7x $10^{-6}C^{-1}$ (8.7x$10^{-6}°F^{1}$)	20.0x$10^{-6}C^{-1}$ (11.0 X $10^{-6}°F^{-10.07}$)
Poisson's Ratio (Circumferential)	0.29	0.07
Poisson's Ratio (Axial)	0.30	0.11
Shear Modulus (Resin)	1.1 GPa (0.159 X 10^6 psi)	0.11 GPa (0.159X 10^6 psi)
Barcol/Shore Hardness	(82.5 Shore D)	(82.5 Shore D)
Upper Service Temperature Limits for Non-Leaking Defects	Standard Epoxy 118 °C (280°F)	HighT Epoxy 162°C (324°F)
Service Temperature Range Allowable temperatures are designed individually following ISO TS 24817/ASME PCC-2 guidance	-55°C (-67°F) to 162° C (324° F)	
Lap Shear Strength to Steel	10.0 MPa (1450 psi)	10.0 MPa (1450 psi)
Aged Lap Shear Strength (1000 hours in 93°C in water)	9.3 MPa (1349 psi)	9.3 MPa (1349 psi)
Fracture Toughness, LCL	149 Jm^{-2}(0.851 in lbf/in^2)	149 Jm^2 (0.851 in lbf/in^2)

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