ZENTECH

Zenriser V6.3 Examples

Issue 1

Disclaimer

Zentech is continually improving the program and welcomes suggestions and comments. Any error encountered in the program or documentation should be reported as soon as possible.

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1. Introduction

This document describes the sample jobs, supplied with Zenriser, which demonstrate typical types of analysis that can be performed by the program.

The modelling for each job is described while the actual input data and output results can be seen from the job files.

2. HDPE outfall pipe installation

The purpose of this testcase is to introduce the user to performing analyses of installation of HDPE pipes by the controlled submergence installation method.

2.1 Installation method

The air-filled pipe is floated out, anchored at the shoreline and flooded by controlled pumping of water into the shore end of the pipe – evacuating air at the offshore end. The initial floating pipe is configured with two bends maintained by cables (see Figure 1).

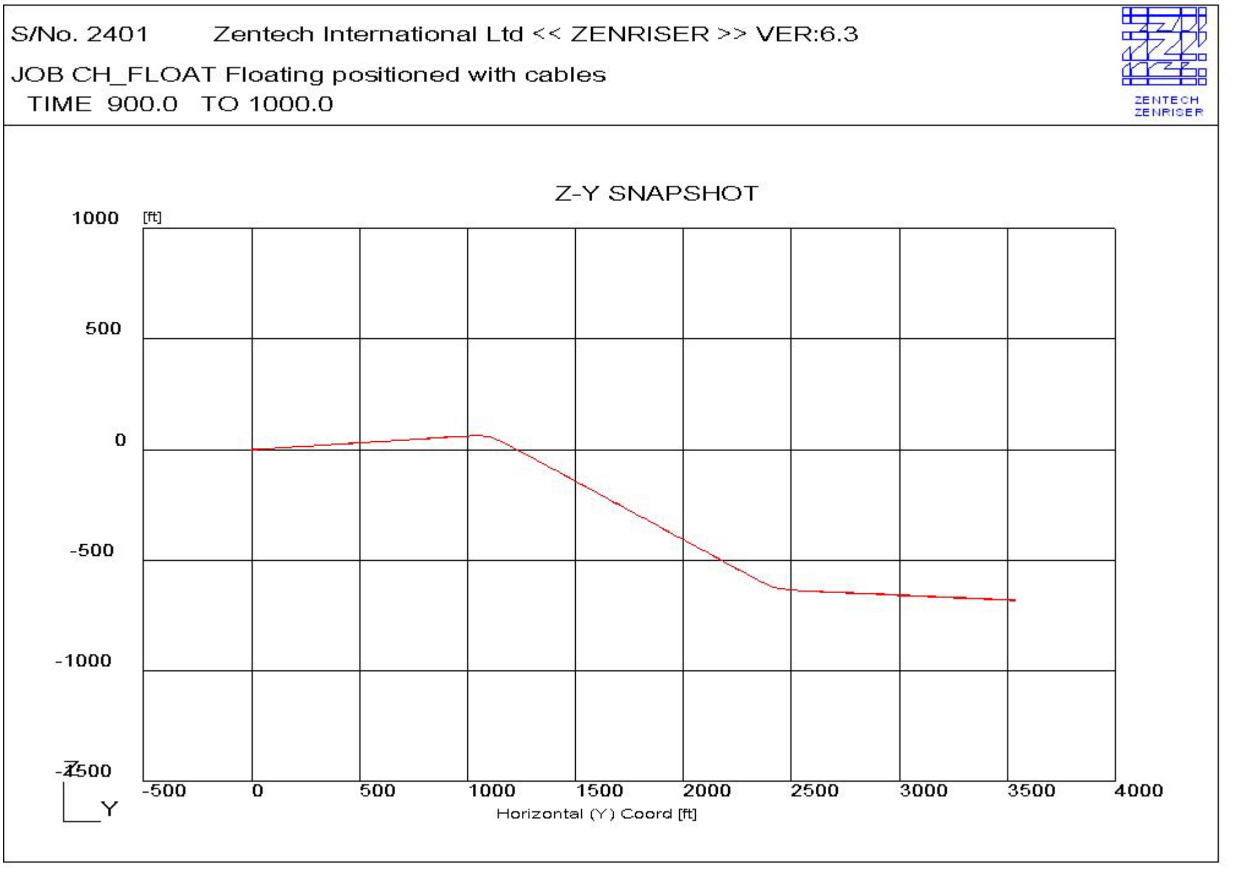

Figure 1 - Configuration plot – plan view

2.2 Pipe properties

The example pipe is 3700 ft in length, 28” HDPE SDR 26 with 900 lb anchor blocks at 12 ft spacing.

The pipe properties input to the program are shown below, with the concrete weights modelled as a continuous ‘smeared’ coating along the pipe (increasing the effective outside diameter).

Property	**Value**	**Units**
PE density	59.62	lb/ft^3
Concrete density	149.83	lb/ft^3
Concrete weights per 12 ft **	900	lb
Inside diameter	2.1538	ft
Outside diameter	2.3333	ft
Effective outside diameter **	2.4662	ft
Mass air-filled	112.7	lb/ft
Mass water-filled	340.2	lb/ft
Axial stiffness	7927	kip
Bending stiffness	4993	kip ft^2

** Concrete weights are modelled as a continuous ‘smeared’ coating along the pipe

2.3 Environment

The shore end of the pipe is to connect to a flange fixed at a depth of 5 ½ ft. No wave or current effects are considered. The seabed profile is irregular, specified via eight points to a maximum depth of 65 ft.

2.4 Analyses

The analysis is performed in two separate jobs. In each, the shore end is connected to a 'vessel' allowing it to be moved in a prescribed way, the offshore end is connected to a 'buoy' with a horizontal force of 3 kip applied via a cable, allowing it to move shoreward as the pipe sinks.

i) CH_FLOAT – generates a suitable floating configuration using cables to establish the bends in the pipe.

ii) CH_SINK – starting from the CH_FLOAT configuration, sinks the shore end to a depth of 5 ½ ft and floods the pipe at the rate of 10 ft/s from the shore end.

2.5 Results

The selected output for the 2nd job, presented below, shows configuration at 10 sec intervals during the analysis (distorted to emphasise the depth), and the envelope of curvature (with different sign for the over bend and sag bend).

Further output can be extracted from the demo examples, as required.

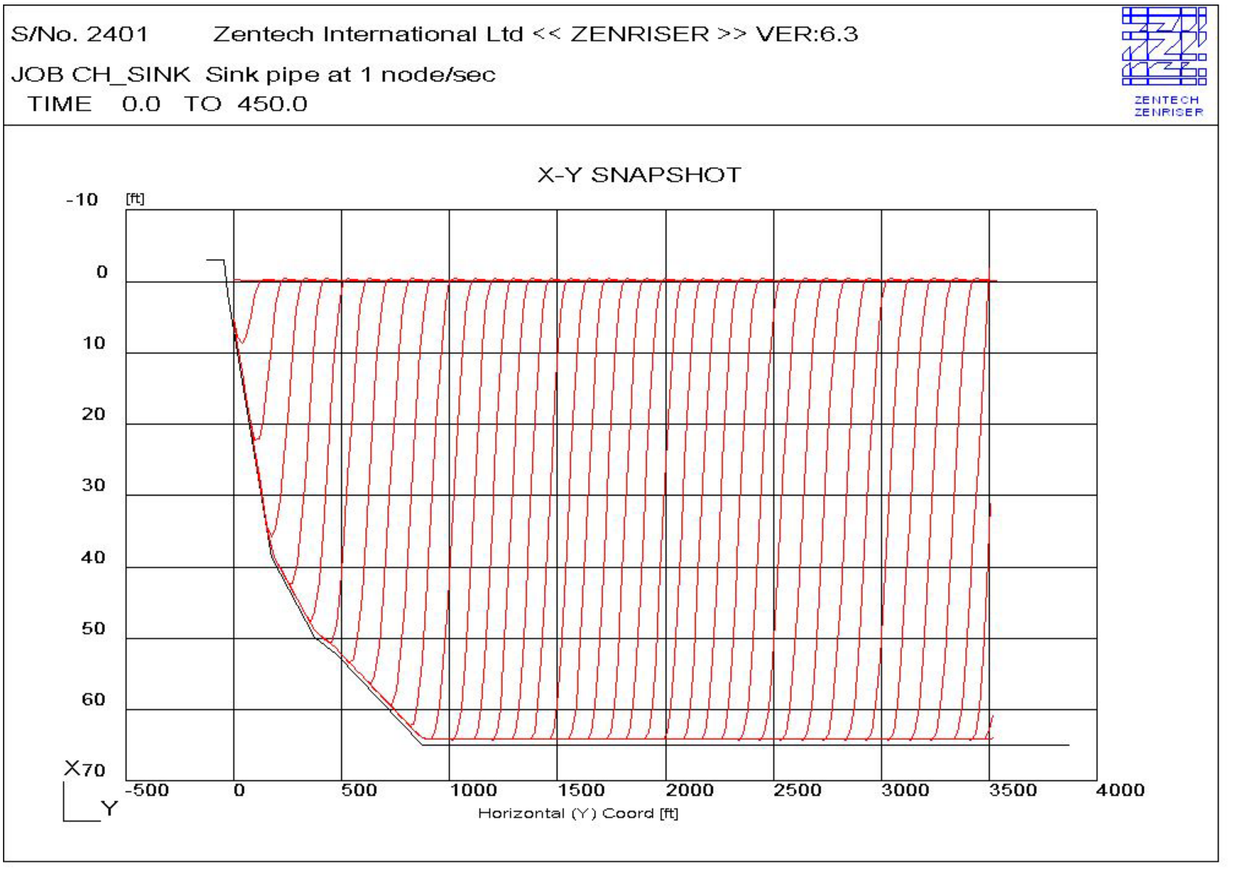

Figure 2 – 'Distorted' Sinking Configuration

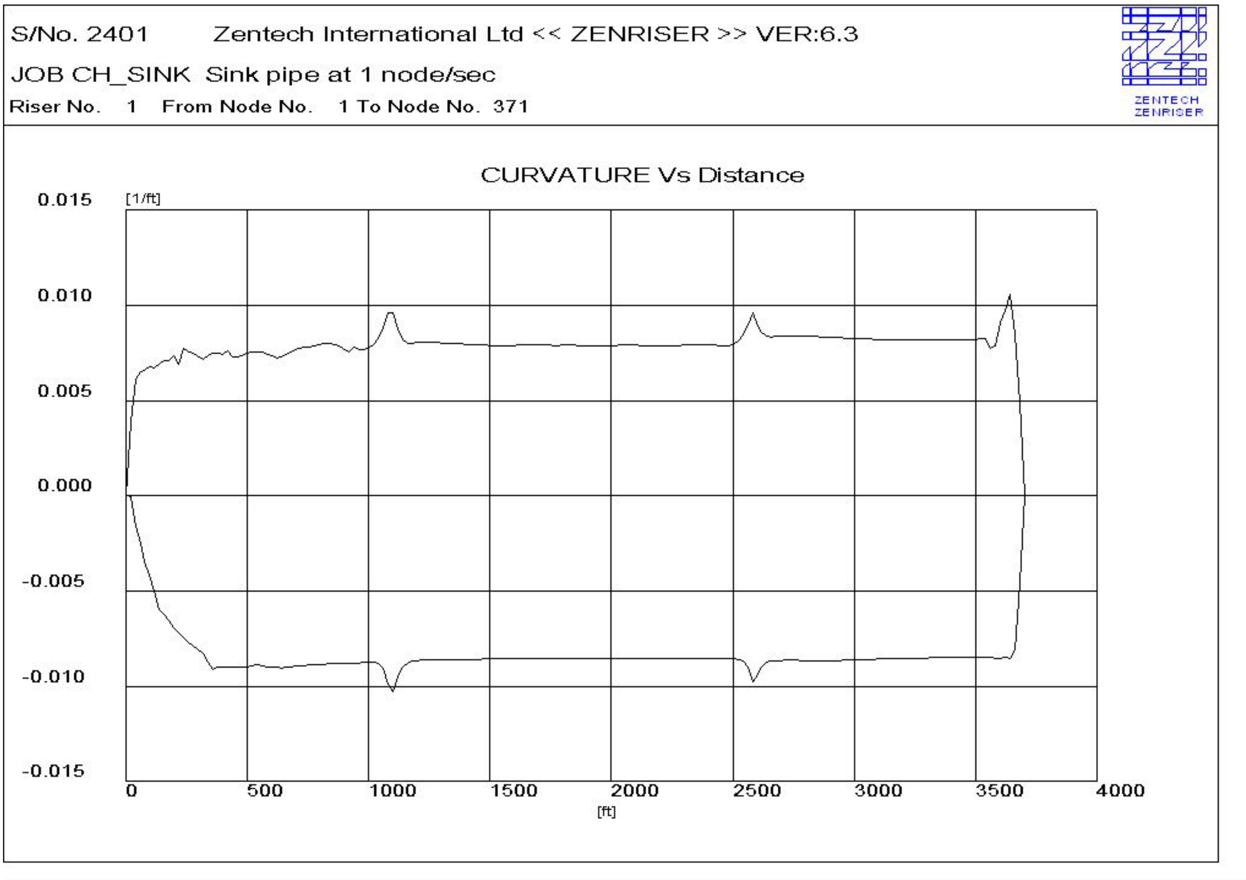

Figure 3 – Curvature envelope

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