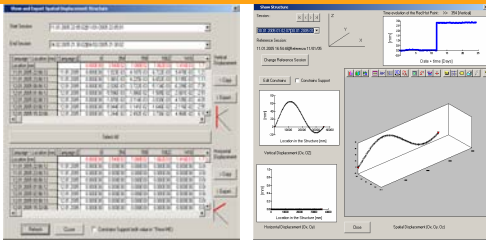


# 20.1040 SDB SPADS SPATIAL DISPLACEMENT SOFTWARE

Plug-in for SDB software



## GENERAL DESCRIPTION

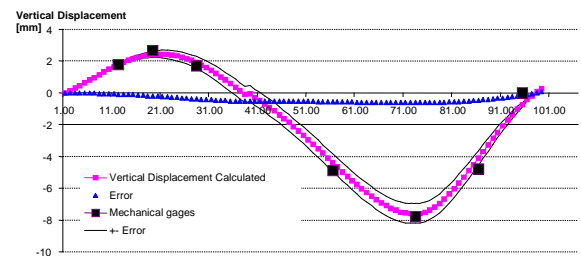
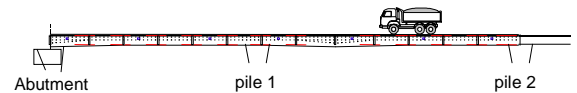
The SDB Spads (SPAtial DiSplacement) software is part of the SDB suite. This tool retrieves the spatial deformed shape and spatial displacements of a structure composed of linear elements (beam, girder, bridge, pile, etc.) from the internal SOFO deformation measurements. SDB Spads software is currently limited to the straight beams but can be used with curved beams (arches, tunnel...) with a reduced accuracy.

## TECHNICAL DESCRIPTION

SPADS calculates deformed shape of the beam using the following assumptions:

- The structure can be divided in short beams called macroelements, and each macroelement is divided in cells;
- The moment of inertia and Young modulus can be considered as constant along each macro-element;
- The Bernoulli hypothesis is generally valid (initially plane cross-section remains plane after the deformation);
- The load is composed of forces that are concentrated and/or distributed along the macroelements;
- The distributed load can be approximated by a polynomial function of degree  $n$ ,  $n=0, 1, \dots$ ;
- The minimal number of cells per macroelement is 3 or  $n+1$ , where  $n$  is degree of polynomial load approximation;
- A minimum of two parallel sensors are installed in each cell in case of plane deformations;
- A minimum of three parallel non-coplanar sensors are installed in each cell in case of spatial deformations;
- Sensors in the border cells are to be fitted with macroelement extremities in order to avoid extrapolation issues; sessions and measurements are properly managed in the SDB database (see SPADS manual);
- The coordinates of the sensors with respect to the structure are known (position of sensors in the structure is known). A user-friendly interface allows the definition of these parameters.

SPADS calculates displacement distribution perpendicular to the axis of the beam if a minimum of 2 limit conditions are monitored or known (limit conditions are absolute displacements or rotations in some points of structure).



## FEATURES

- Bridge, beams and column data analysis
- Compatible with SDB Database
- Curvature calculation
- Determination of spatial deformed shape
- Can incorporate measurement of absolute rotations and displacements (e.g using GPS system, inclinometers etc.)
- Result visualization and export

## SDB SPADS PERFORMANCES

<b>Input files</b>	SDB file containing result of monitoring (measurements) SITU file containing coordinates (position) of sensors with respect to structure and their organization in cells and macro elements
<b>Output file</b>	RESU file containing the following results of calculus: - Sensor measurement history (graph and history table) - Curvature for each cell (graph and history table) - Deformed shape of each macro-element (graph and history table) - Deformed shape of the whole structure (graph and history table) - Displacement distribution (if limit conditions are available, graph and history table)
<b>Further export of data</b>	Cell curvature history table Deformed shape history table Displacement distribution history table

## SDB SPADS SOFTWARE SCREEN SHOT

The screenshot displays the 'Show Structure' window of the SDB SPADS software. The interface includes several key components:

- Session Management:** A dropdown menu for the 'Active Session' (showing '30.01.2005 01:02:07|30.01.2005 01') and a 'Change Reference Session' button with a 'Reference Session' field (showing '11.01.2005 16:54:46|Referenza 11/01/05').
- Time Evolution Graph:** A line graph titled 'Time evolution of the Red Hot Point : X= 354 (Vertical)' showing displacement in [mm] over 'Date + time [Days]'. The displacement is near zero until day 10, then jumps to approximately 2.5 mm.
- Vertical Displacement Graph:** A line graph titled 'Vertical Displacement (Dx, Dz)' showing displacement in [mm] versus 'Location in the Structure [mm]'. It shows a sinusoidal wave with a peak of about 60 mm.
- Spatial Displacement Graph:** A line graph titled 'Spatial Displacement (Dx, Oy, Oz)' showing displacement in [mm] versus 'Location in the Structure [mm]'. It shows a curve with a peak of about 0.8 mm.
- 3D Model:** A 3D perspective view of a structure with a red dot indicating the 'Red Hot Point' location.
- Navigation and Tools:** A toolbar with various icons for navigation and analysis, and a 'Close' button at the bottom.

Red arrows on the left side of the image point to the 'Active Session' dropdown, the 'Change Reference Session' button, the 'Vertical Displacement' graph, and the 'Spatial Displacement' graph.

## HARDWARE AND SOFTWARE REQUIREMENTS

SDB SPADS requires SDB software and hardware license key.