

Spectral Analysis of Surface Waves-S » ACI 228.2R

Spectral Analysis of Surface Waves (SASW) investigations are typically applied to assess material stiffness and condition, and layer thickness.



The Spectral Analysis of Surface Waves (SASW-S) system is designed for the following applications:

1. Condition assessment of concrete, including liners in tunnels, slabs, and other structural concrete members.
2. Evaluation of alkali-silica, fire, freeze-thaw and other cracking damage.
3. Surface-opening crack depth measurement.
4. Determination of abutment depths of bridges.
5. Determination of pavement system profiles including the surface layer, base and subgrade materials with optional WINSASW software.

The SASW method uses the dispersive characteristics of surface (Rayleigh) waves to determine the variation of the shear wave velocity (stiffness) of layered systems with depth. The SASW testing is applied from the surface making it both nondestructive and non-intrusive. Once the dispersion waves are determined, Young's moduli of the materials can be calculated through the use of elastic wave theory equations.

If optional WINSASW software is purchased, shear wave velocity profiles can be determined from experimental dispersion curves (surface wave velocity versus wavelength) and compared to actual SASW measurements through a process called forward modeling or through an inversion process. This allows the user to find the best thickness and stiffness model for the layered system of interest. The SASW method can be performed on any material provided there is an accessible surface for receiver attachments.

Features:

- Receivers mounted on the SASW-S bar allow for fast and accurate field measurements
- Real-time waveform display while testing
- System is compact, durable, and easily transported allowing for multiple tests per day
- Measurements accurate to within 5% for the determination of the thickness and stiffness of the top layer in a pavement system or of the concrete liner of a tunnel
- Acquisition and analysis software are compatible and easy to use, yielding fast and accurate results

> Applicable On:	
Asphalt	
Concrete	
Masonry	
Stone	
Wood	
> Test For:	
Surface Crack Depth	
Layer Thickness	
Material Moduli	
Shear Wave Velocity Profiles	



Model	Advantages
SASW-S Model	Rapidly performs SASW tests with receiver spacings between 2.4" and 31.5" (6 and 80 cm). Includes SASW Bar.
SASW-A Model	Performs testing with accelerometer receiver spacings up to 12 ft (3.6 m). <i>Does not include SASW Bar.</i>
SASW-SA Model	Most complete SASW system. Includes SASW Bar and two accelerometers for testing with receiver spacings up to 12 ft (3.6 m).
Option	Advantages
WINSASW Software	Allows determination of pavement system profiles



Freedom Data PC or NDE 360 Required, Sold Separately



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Method

The SASW method requires an accessible surface for receiver placement. The extent of the accessible surface limits the investigation depth. As a rule of thumb, in order to investigate material properties to a depth D , the line of receivers on the surface must extend to at least a distance equal to $1.5D$, preferably $2D$. Once the receivers are mounted to the surface, acoustic energy is generated by an impactor and measured on the receivers.

Data Collection

The user-friendly WinSW software is written and tested at Olson Instruments' corporate office in Colorado. We do not outsource any tech support questions and, should you require software support, we welcome your questions and comments. It should be noted the SASW-S data is usually displayed and analyzed with our WinSW software. Additionally, more detailed analysis and modeling is possible with a program called WINSASW, available from the University of Austin Texas.

Available Models

The Spectral Analysis of Surface Waves system is available in three different models which can be run from Olson's Freedom Data PC or NDE 360 Platforms:

1. Spectral Analysis of Surface Waves - S (SASW-S)
2. Spectral Analysis of Surface Waves - A (SASW-A)
3. Spectral Analysis of Surface Waves - SA (SASW-SA)

The **SASW-S Model** is the base model and includes the SASW receivers mounted to the SASW bar, the SASW cable, and ball-peen hammers for impacting the surface. This system is used for testing with receiver spacings between 2.4" and 31.5" (61 mm and .8 m). These spacings are appropriate for depth investigations down to approximately 5 ft (1.5 m) and multi-layered analysis to 2.6 ft (.8 m).

The **SASW-A Model** is comprised of two accelerometers. This system is appropriate for testing with receiver spacings up to 12 ft (3.6 m).

The **SASW-SA Model** is the most complete SASW system as it includes both the SASW bar and a two accelerometers, which will allow for investigations with receiver spacings up to approximately 12 ft (3.6 m).

