



'As Built' Dynamic Performance Assessment

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STRAAM Group, Inc.

Using advanced technology to measure and quantify a structure's performance



Condominiums, government buildings and schools are required to be designed and maintained to a special high standard for public safety which is dictated in building design codes. Advancements in technology now allow for the rapid and objective measure of a structure's 'as built' performance through an advanced engineering analysis to quantify its structural risk, code compliance and for future safety assessments.

Challenges for municipalities and facility managers.

- ❖ Buildings may look alike but some are inherently stronger and some weaker. Construction quality can be poor and age and shock events can cause damage leaving hidden risks.
- ❖ Visual inspections cannot find covered-up damage or structural weaknesses.
- Quantifying each structure's risk profile is achievable for a complete profile for each building. Upgrades can be planned for buildings with the highest risk profile.
- Damage from events, or aging, can be quantified to **assure safety** for residents and workers.

A simple one-day measurement will memorialize a structure's performance, quantify its structural risk profile, and can be used to identify weaknesses or problems, help prioritize budgets, validate construction work and assess damage after a wind or seismic event. A STRAAM **Baseline Dynamic Signature (BDS)** of a building provides an objective measurement of the 'as built' performance compared to code required criteria.

The techniques used for a BDS analysis are based on structural dynamics and engineering. Recent advancements in electronics, sensors and cloud computing have converged to allow us to provide this advanced service in a rapid and cost effective manner. We use this advanced technology to help assess and protect important structures for government and private industry.

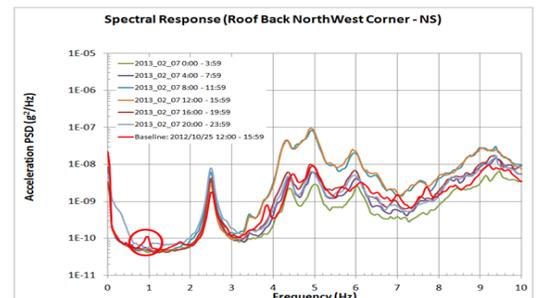


Figure 9: Spectral Response recorded from Roof Back sensor in the N/S direction Comparison between January 6th and February 7th

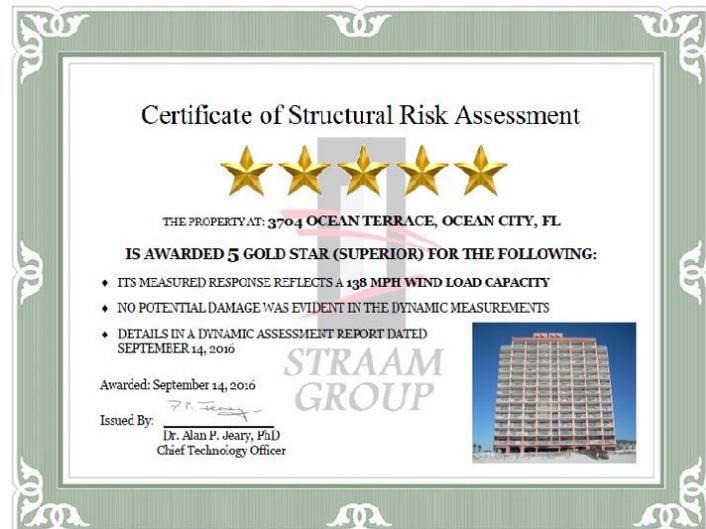
What is a Baseline Dynamic Signature (BDS)?

- ❖ It's an OBJECTIVE method of quickly measuring a structures dynamic response.
- ❖ It memorializes a structure's performance including; frequencies of resonance, displacements, mode shapes and non-linear damping. These parameters define the structural response.
- ❖ The analysis of the response is used to compare with the wind code requirements.
- ❖ This is invaluable for assessing a structure's condition compared to code minimums. Also for quantifying future damage due to aging, earthquakes or wind events. This is an invaluable decision making tool!

- ❖ It's like an 'EKG' for a structure. As with an EKG, a BDS is used to memorialize and assess the dynamic function and behavior of a structure to identify problems and risks. It also is used for future comparison to determine a loss of capacity or damage. We also refer to a BDS as a 'Structuro-cardiogram'™.

What is the value to the owner?

- Owners receive a **Certificate of Risk Assessment**.
- Helps assure that the building is safe and built as designed. Compares response to design codes.
- Identifies potential structural problems so they can be quantified and repaired correctly.
- Clearly proves if damage has occurred from construction work, excavation, aging, or natural events. Integral to the decision-making process.



What does an analysis of the BDS yield?

- Compare the building with the 'bell curve' of structures from our data-base of 700 structures.
- Identifies specific areas of weakness, stiffness anomalies, 'damaged state' and significant risk factors.

How does a BDS help owners and managers of buildings?

- ✓ A BDS provides an objective benchmark of a structure's dynamic performance and risk profile.
- ✓ A BDS will identify major flaws which may have been missed through inspections.
- ✓ Real-time measurements used to avoid damage during construction and for re-occupancy.

How does this Baseline Dynamic Signature help after an event or terrorist attack?

- ✓ A follow up Dynamic Signature after an event will help identify and quantify the level of damage.
- ✓ A BDS is used to help expedite re-occupancy of damaged properties.
- ✓ After repairs are made, a BDS will validate that the structure is back to its original condition.

How does the process of taking a BDS work?

1. Measurements are taken on buildings in hours with an advanced system of sensors and computer hardware. Access is needed to the roof and stairwells. The process is quick and non-invasive.
2. Wireless communication and cloud computing, along with advanced algorithms help allow for expedited data processing analysis.
3. QA/ QC processes assure data is correct and the report reflects accurate results.
4. Final Reports are provided in a few days in the form Certificate of Risk and a supporting detailed report.

STRAAM Group provides a complete and cost effective service by providing equipment, expertise and professional staff to perform these studies at a competitive price. We are offering licenses of our technology for qualified partners around the globe.

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