



Soil and Materials Engineers, Inc.

IDENTIFYING PAVING PROBLEMS FROM PROFILE DATA

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Overview of Presentation

- Terminology.
- Examples of paving problems in Portland Cement Concrete (PCC) pavements.
- Examples of paving problems in Asphalt Concrete (AC) pavements.
- Conclusions.



TERMINOLOGY



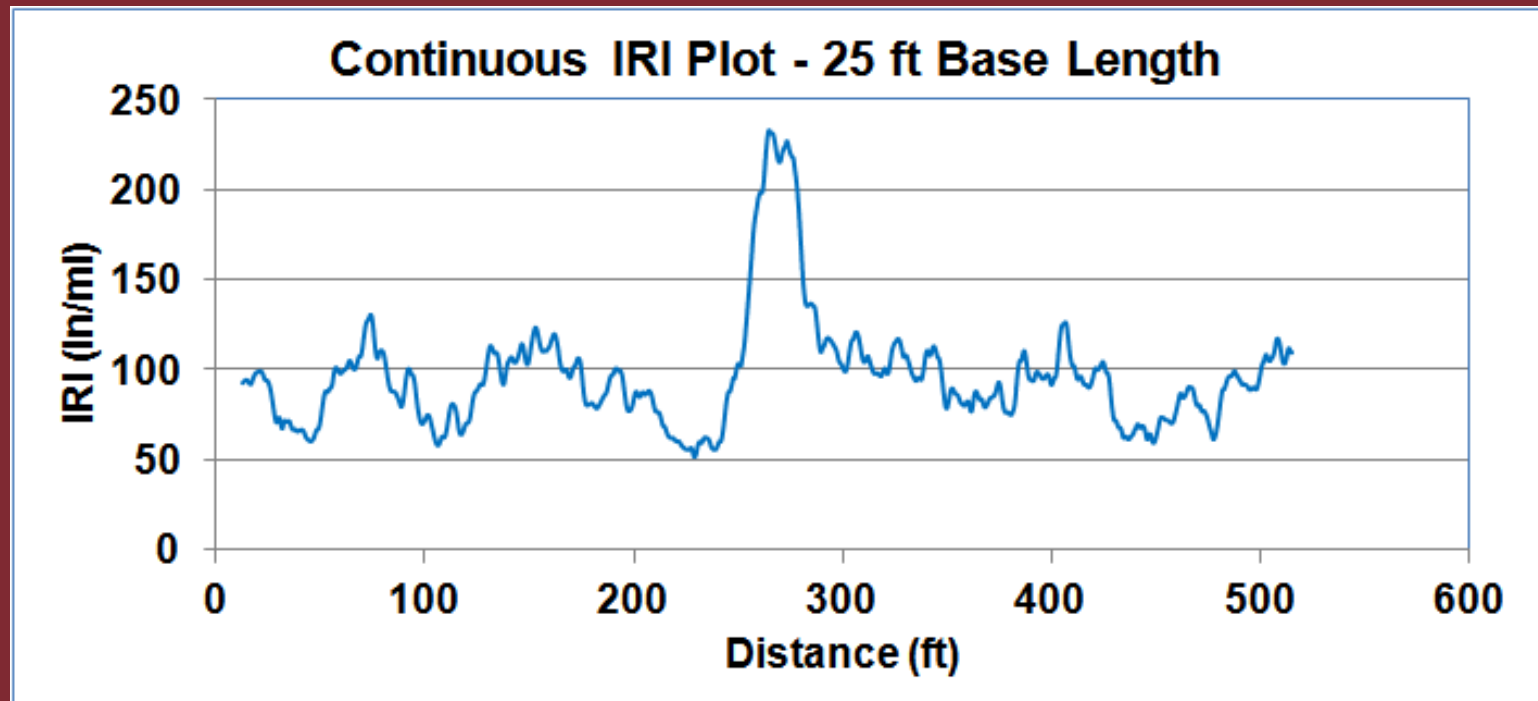
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Continuous IRI Plot

- Typically International Roughness Index (IRI) is computed for fixed intervals (e.g., 0.1 mile).
- A continuous IRI plot shows how IRI varies along the section.



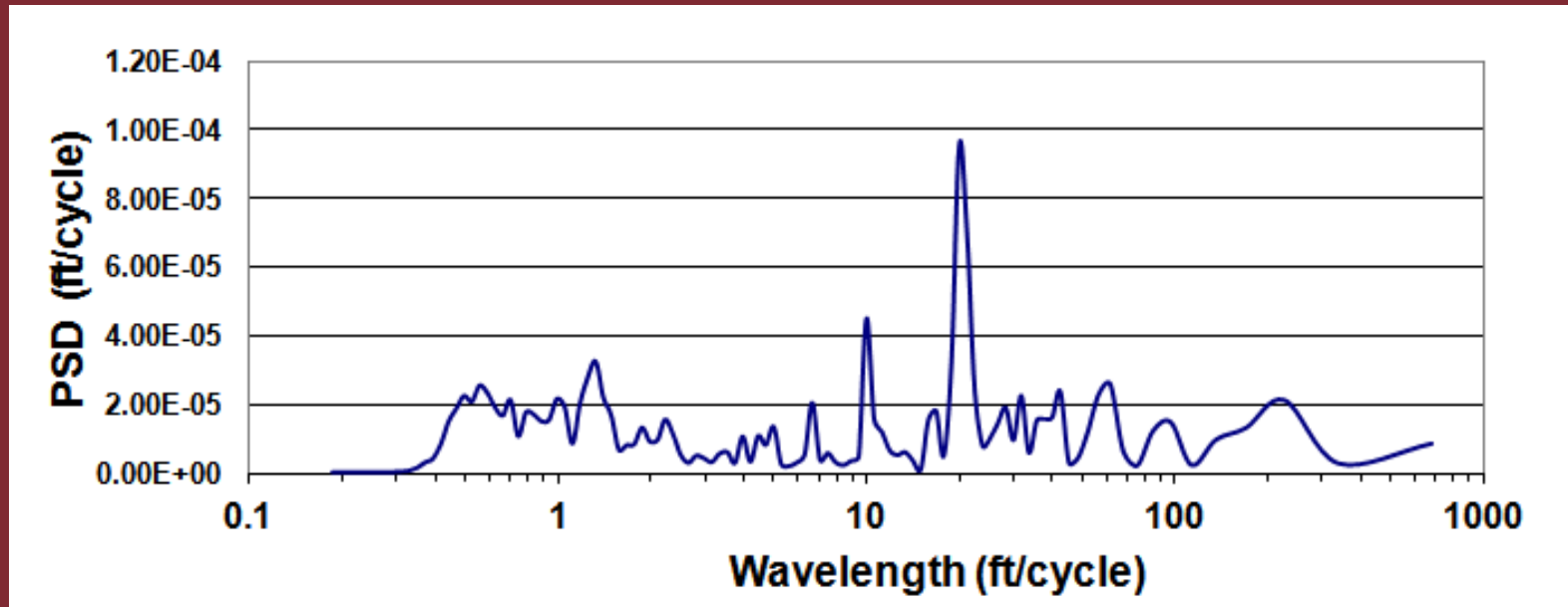
Continuous IRI Plot – 25 ft Base Length



- IRI at any point is average IRI for segment starting 12.5 ft before the point and ending 12.5 ft after the point
- IRI shown at 100 ft is average IRI from 87.5 to 112.5 ft.



Power Spectral Density (PSD) Plot



- Shows wavelength distribution of the profile data.
- Predominant wavelengths in profile can be detected.



STRINGLINE SAG – CONCRETE PAVEMENTS



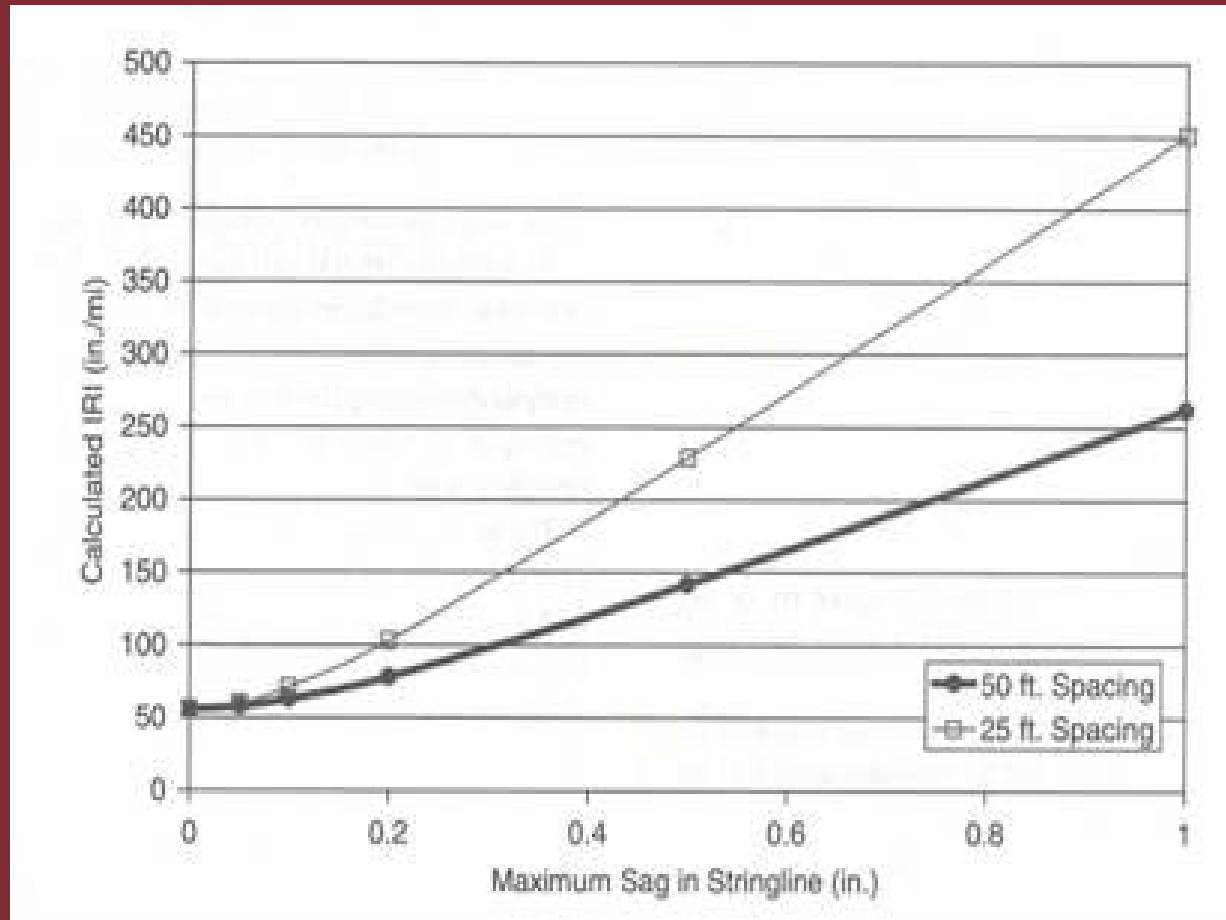
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Stringline

- Slipform paver uses stringline as guidance system.
- Typical stringline support spacing – 25 ft.



How Does Stringline Sag Affect IRI?

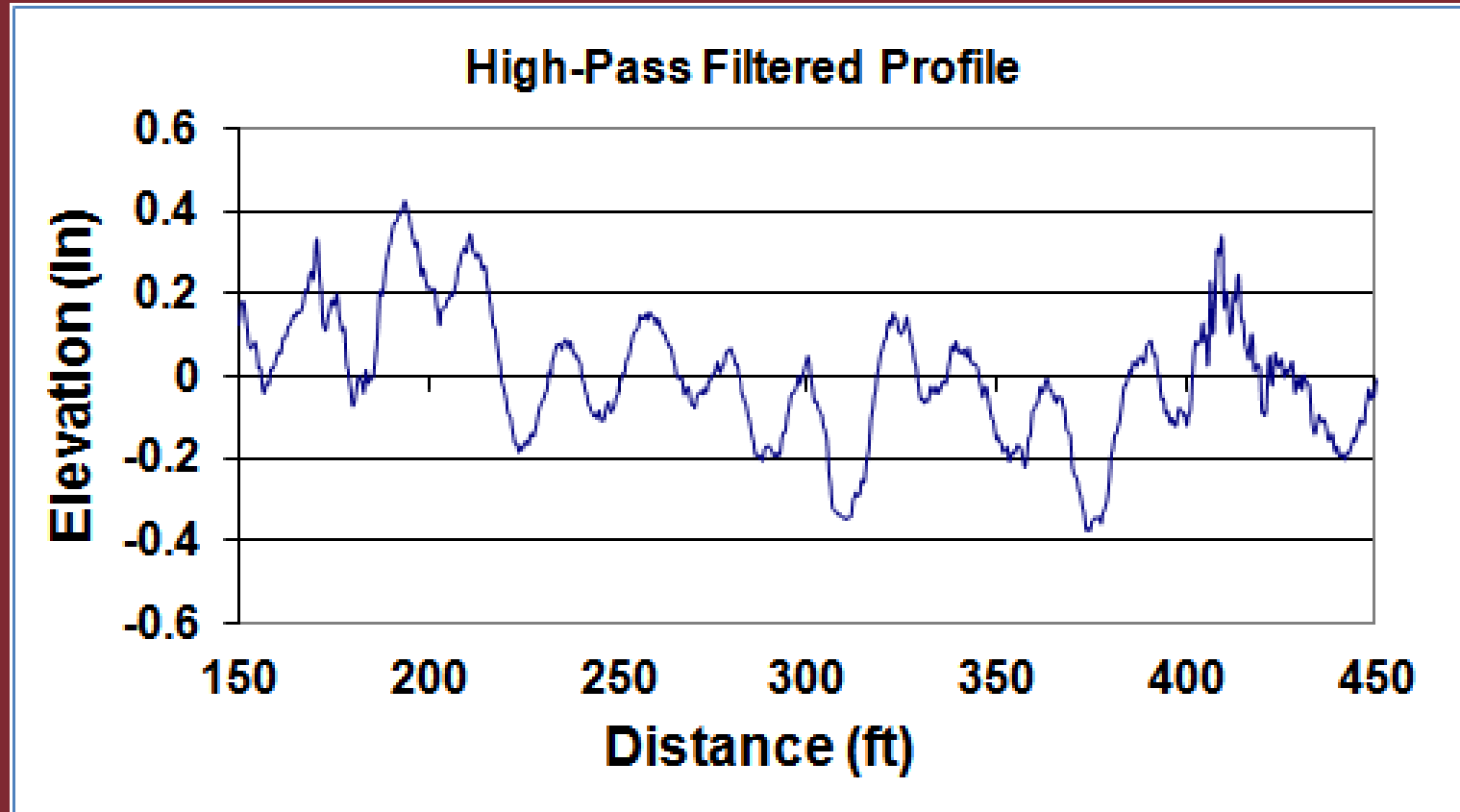


Rasmussen et al, TRR 1900

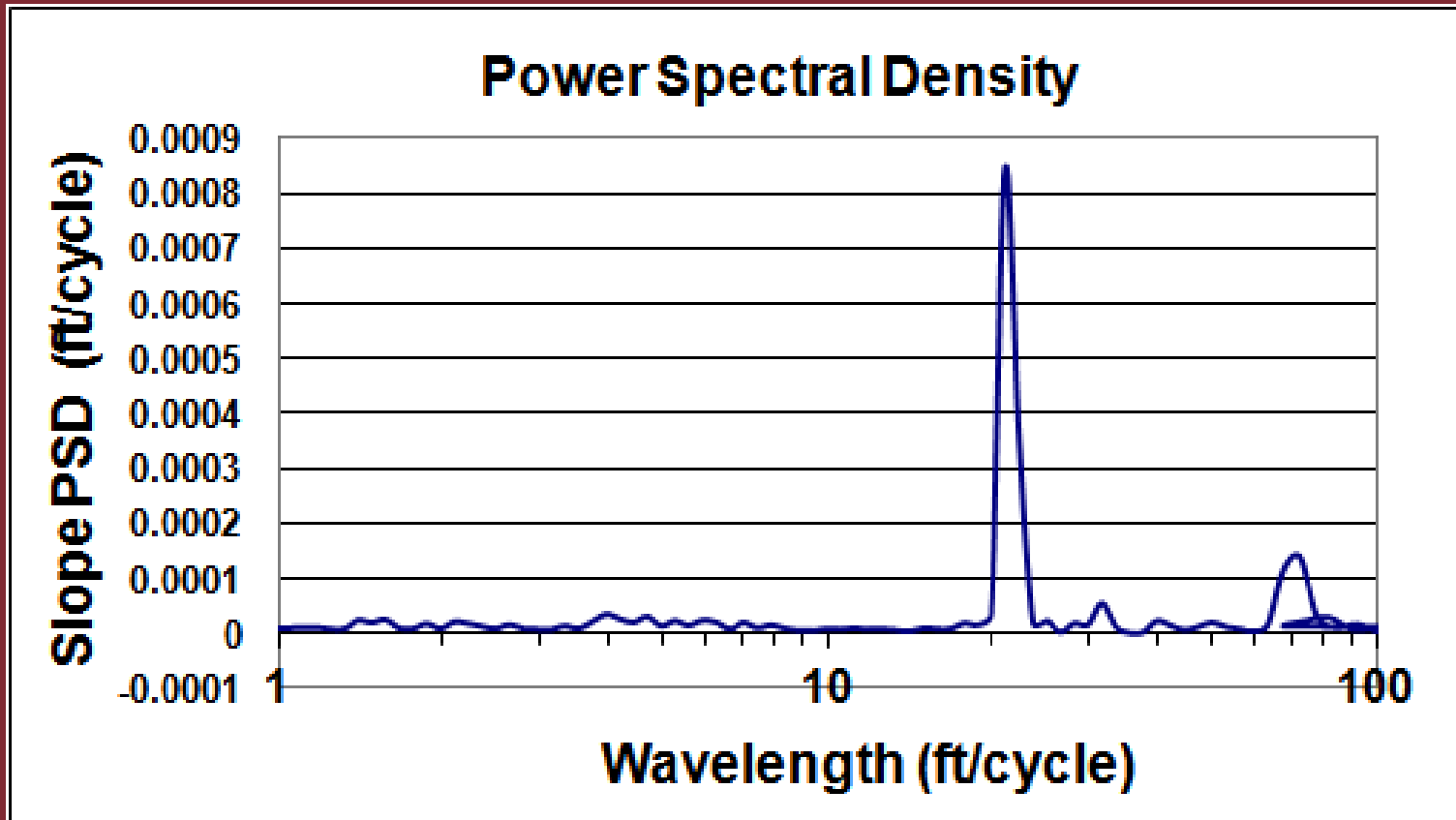


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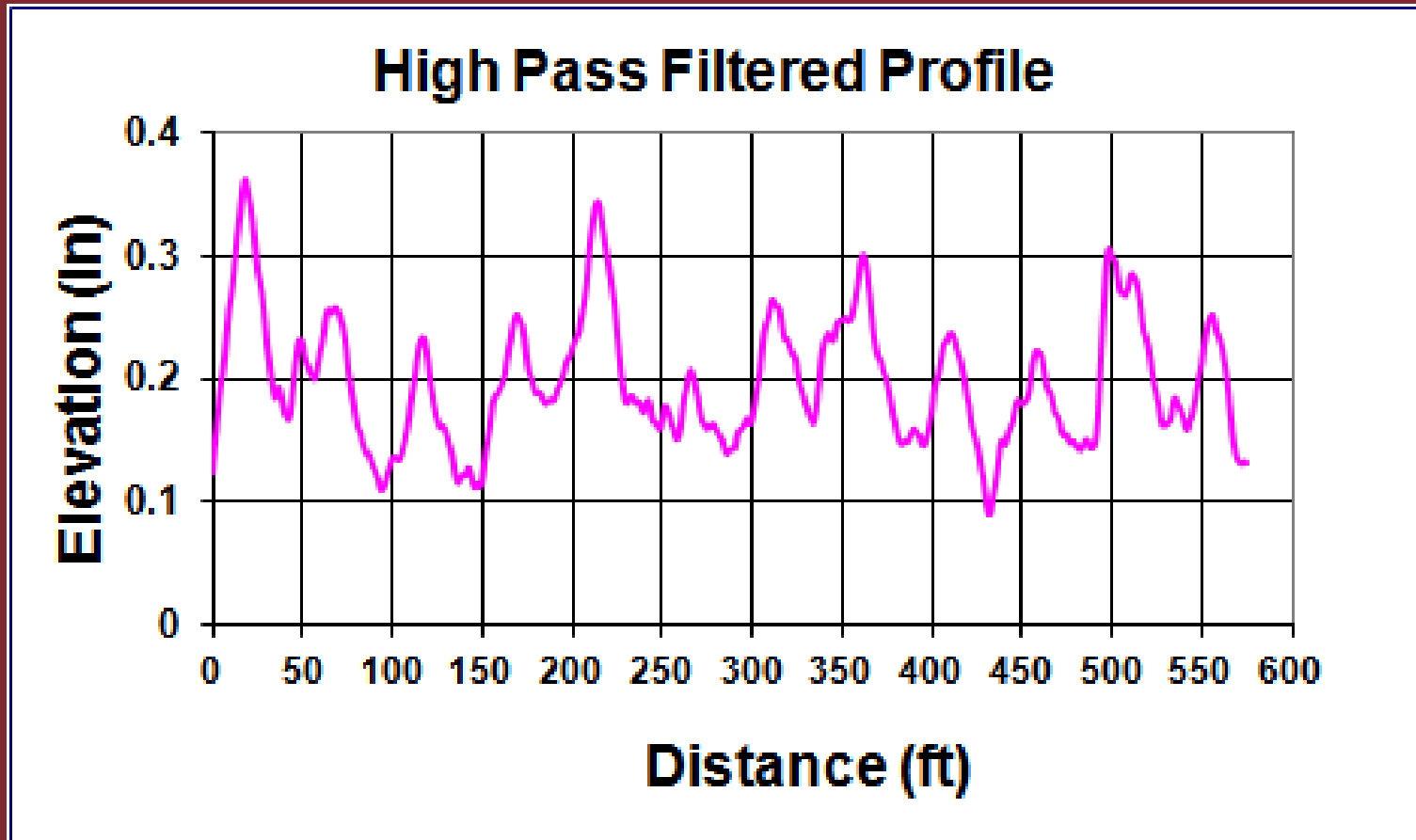
Stringline Sag



Stringline Sag



Stringline Sag, Stake Spacing = 50 ft



How Do You Correct Stringline Sag?

- Cannot usually do spot grinding.
- Entire project will need grinding.



DOWEL BASKET SPRING BACK – CONCRETE PAVEMENTS



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Dowel Baskets



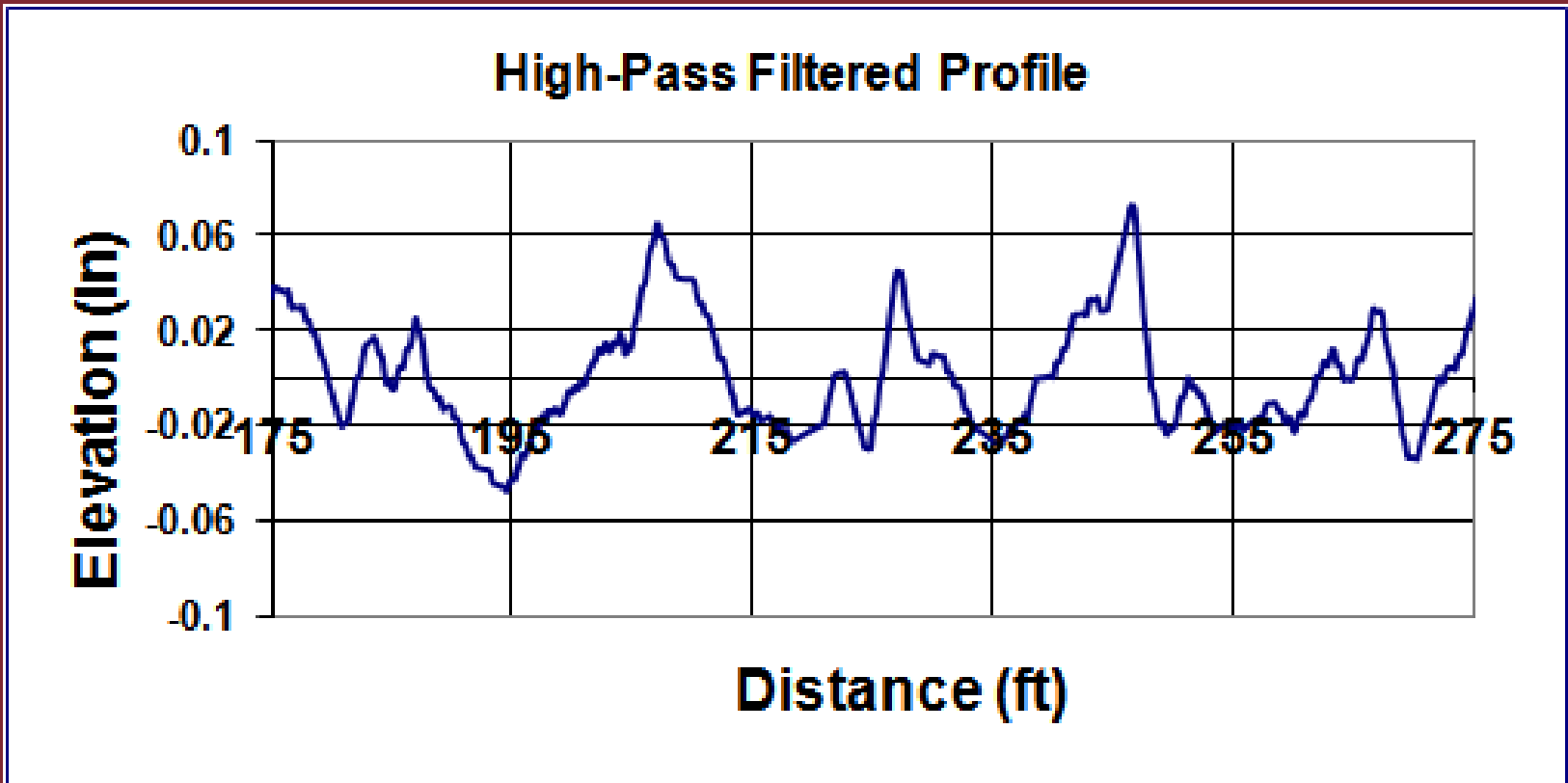
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Dowel Basket Spring-Back

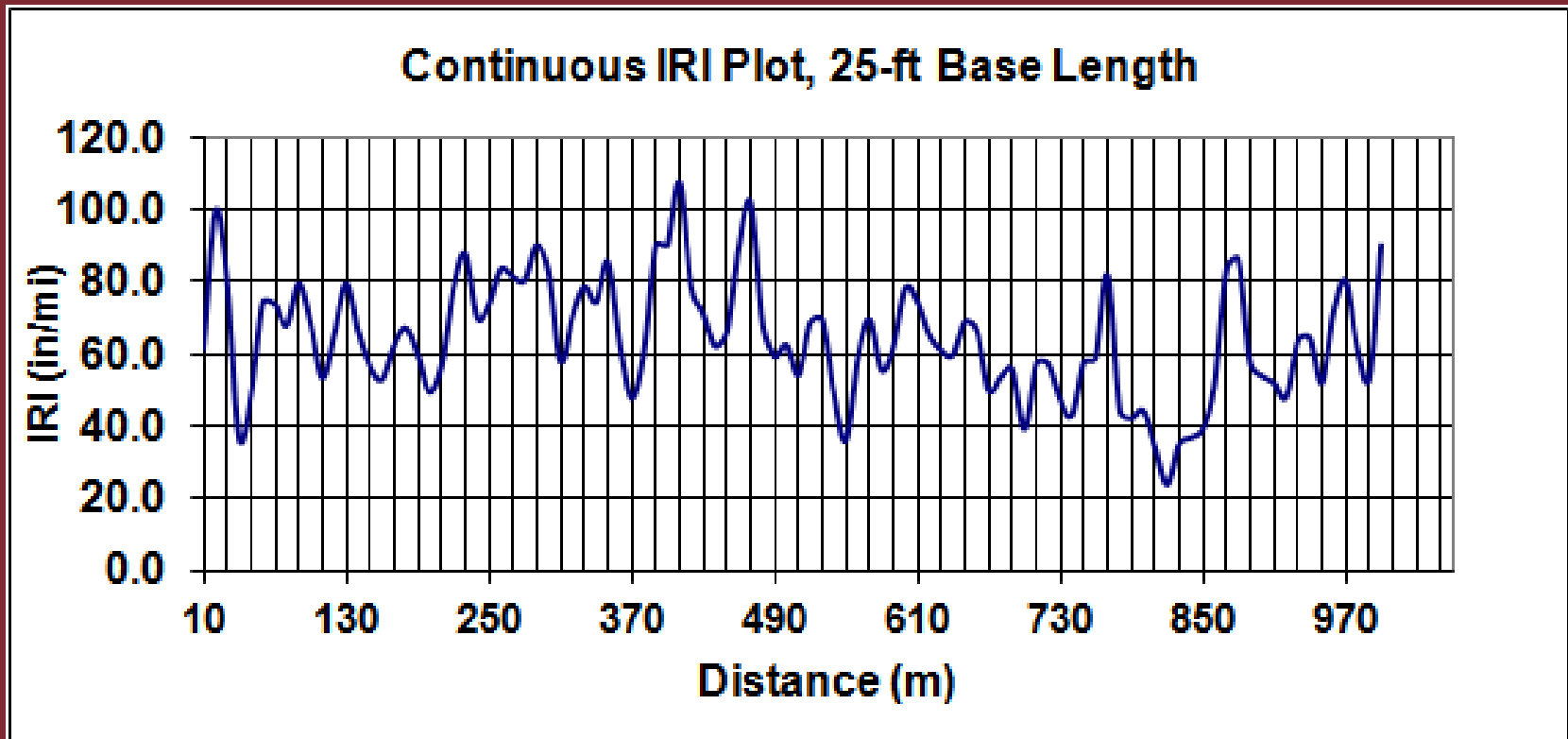
- Dowel assembly can deflect when profile pan of slip-form paver passes over basket.
- Then springs back after pan passes and extrusion pressure is releases.
- Creates an disturbance on pavement surface.



Dowel Spring-Back, Joint Spacing 20 ft



Dowel Spring-Back, Joint Spacing 20 ft



Vertical gridlines correspond to joints.



FINISHING BEHIND PAVER



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Automated Float

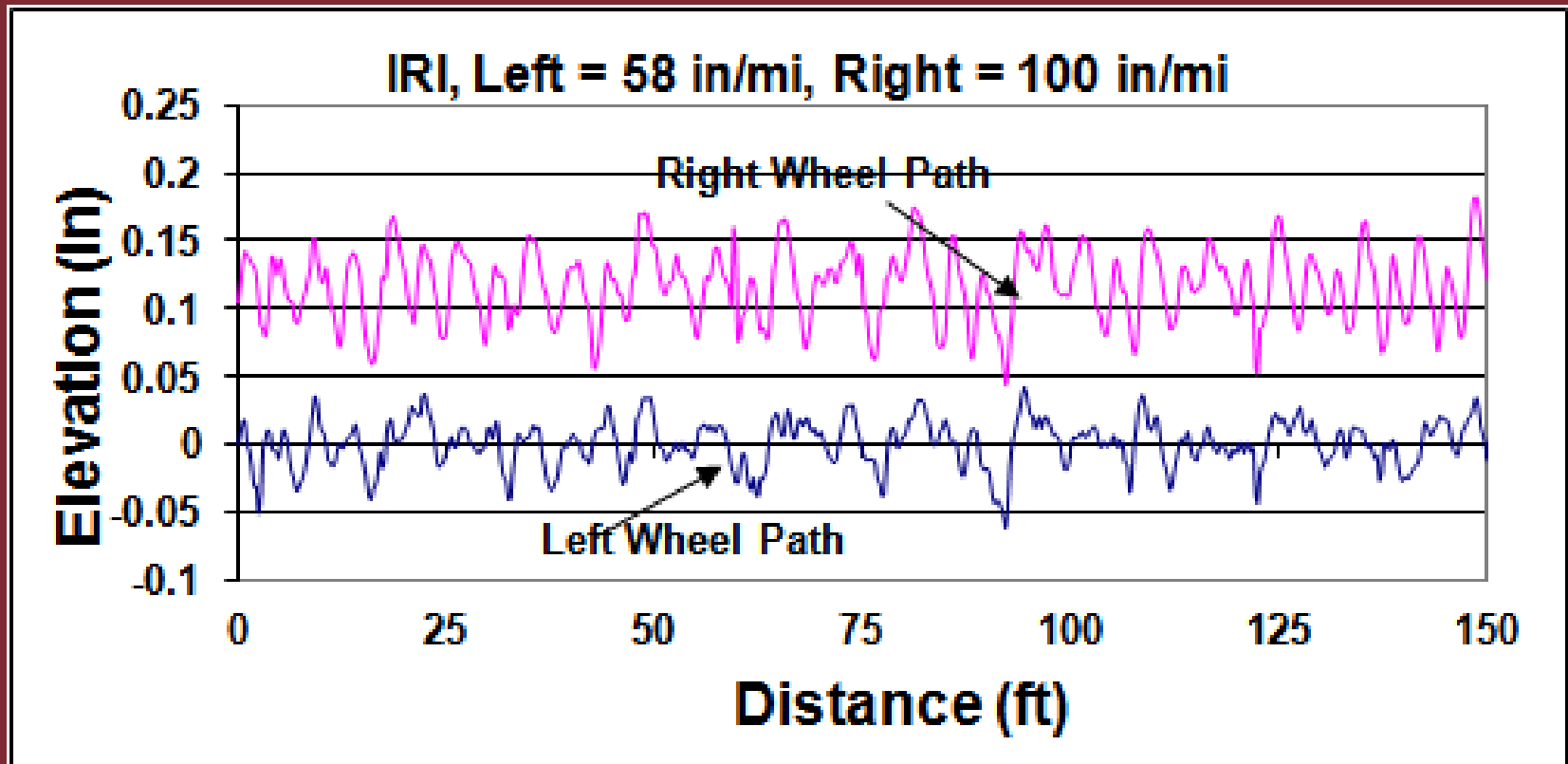


Float

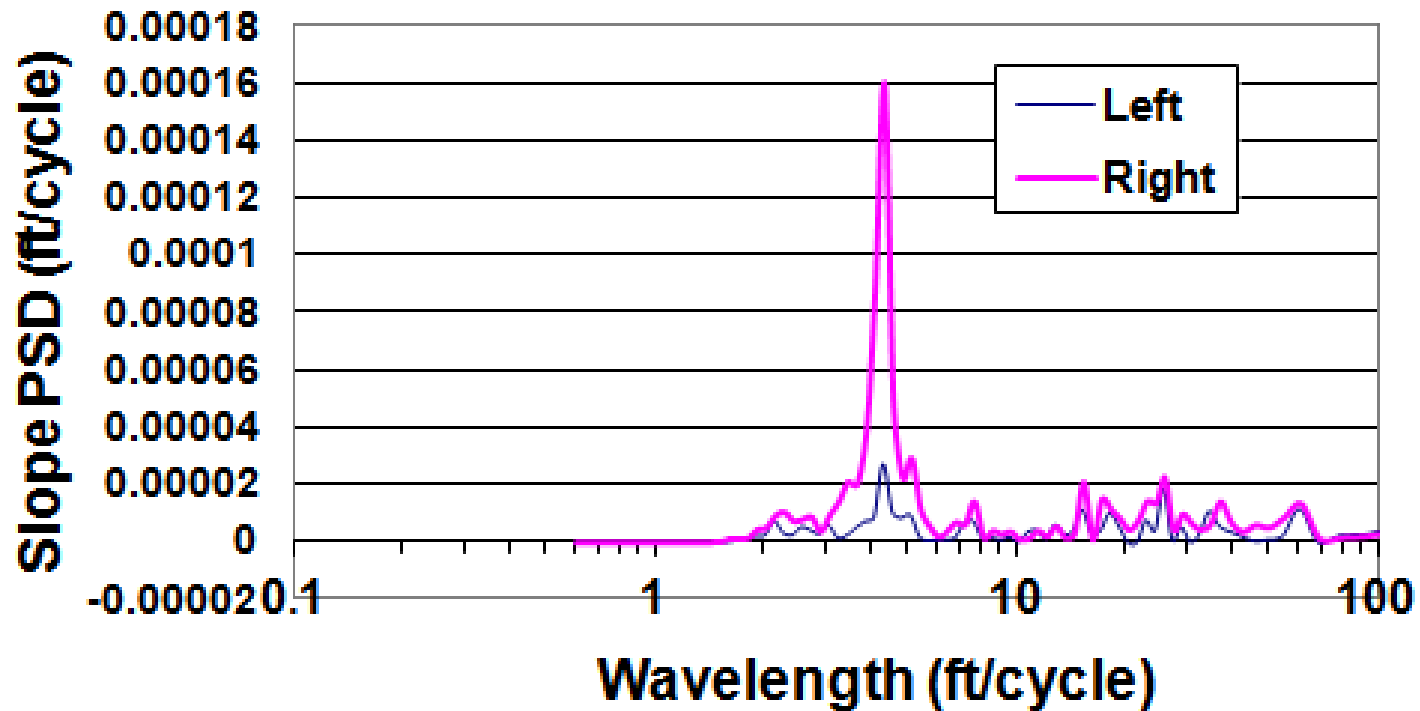


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High-Pass Filtered Profiles



PSD Plot

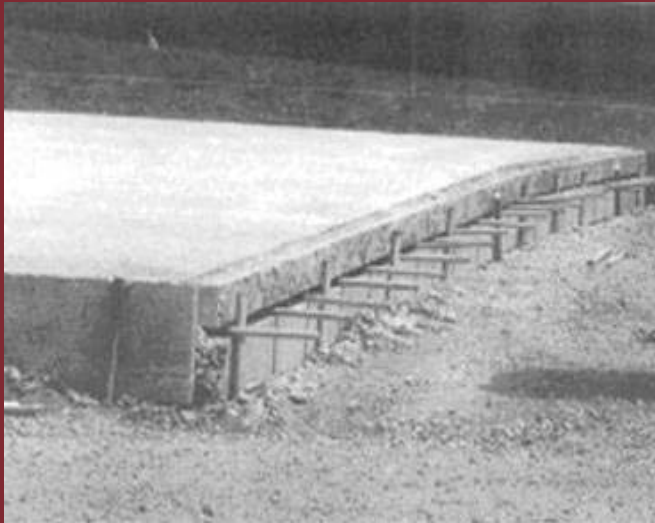


HEADERS



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Headers



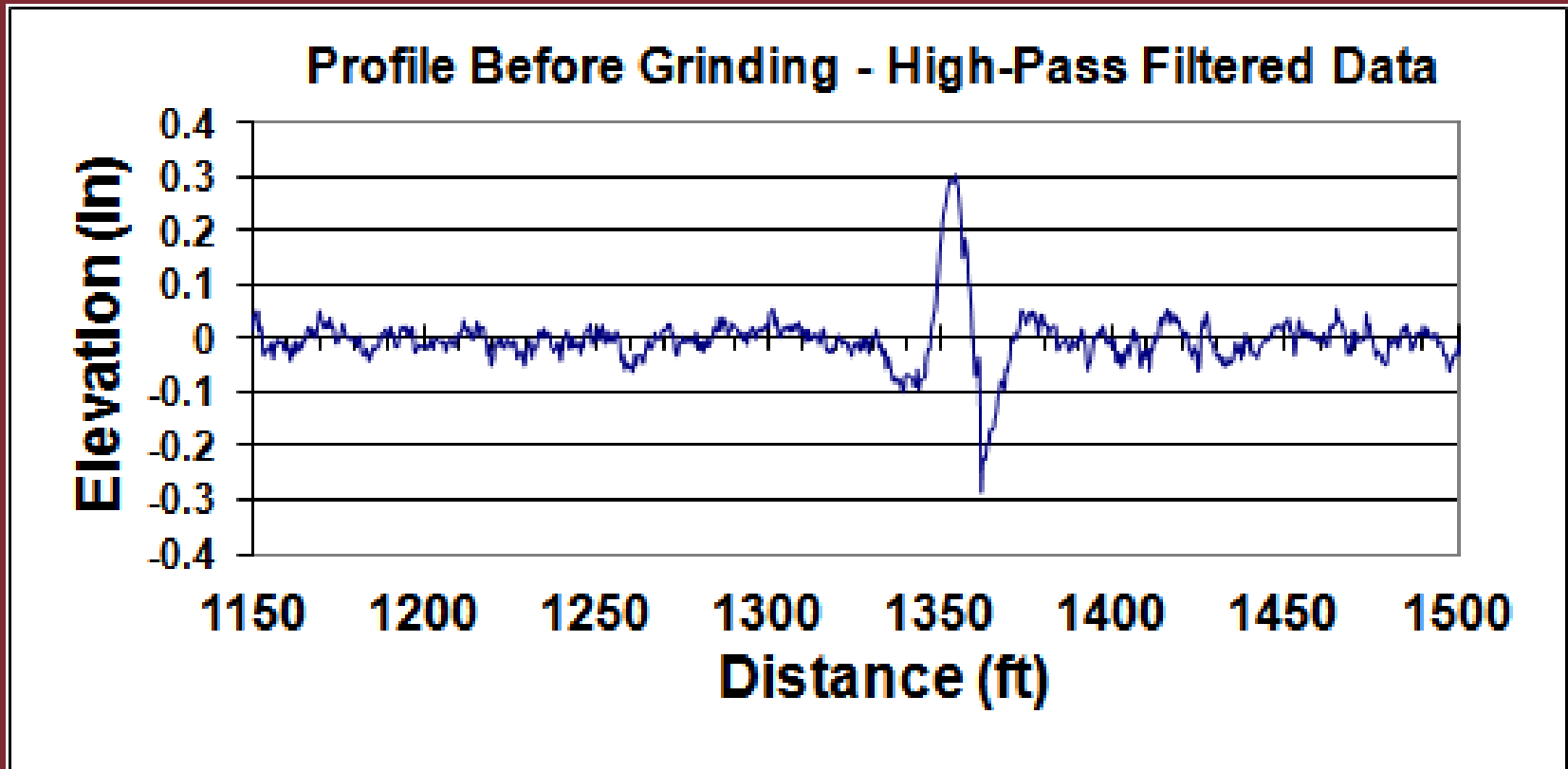
Wooden Form



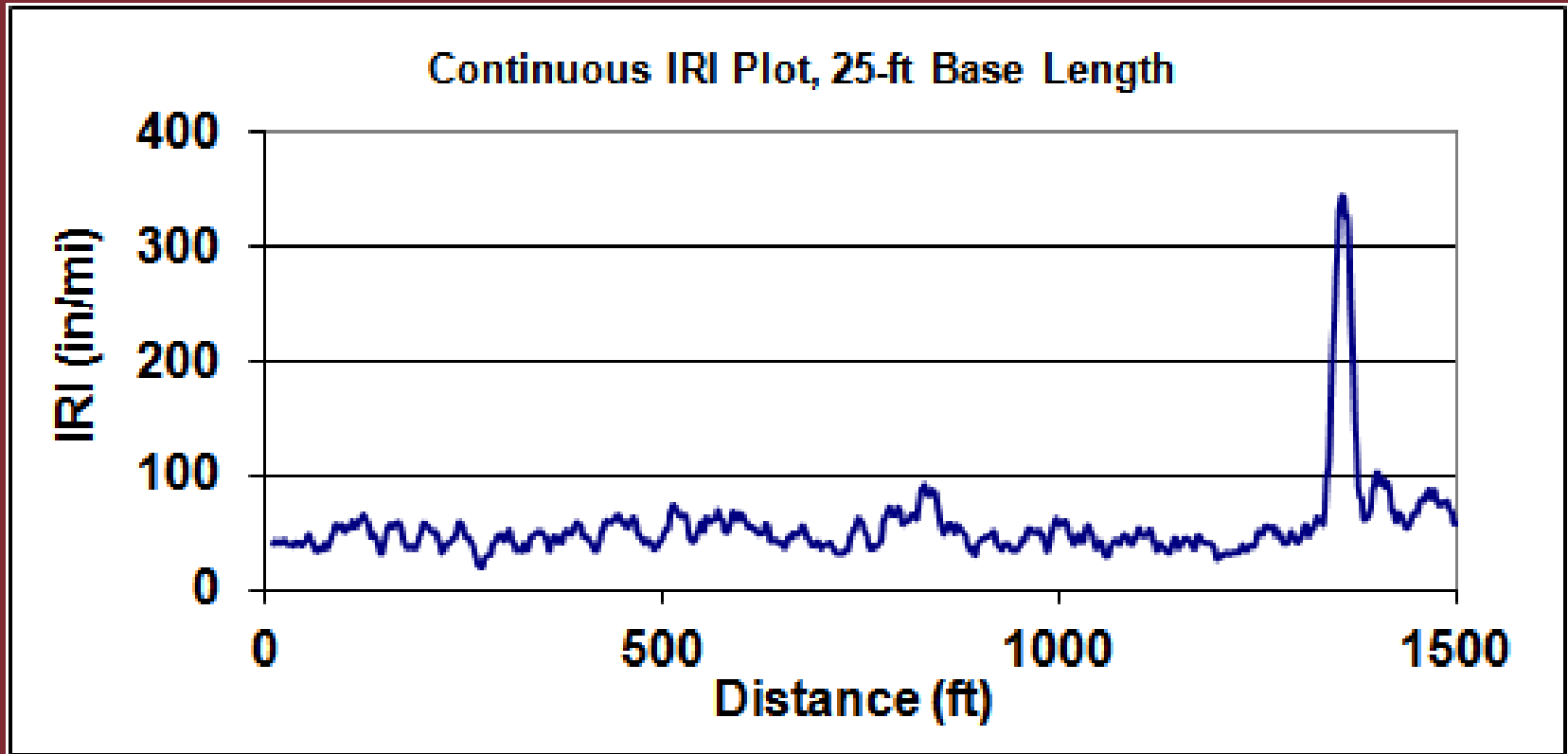
Cut-Back Method



Profile Over a Header, US-23



Continuous IRI Plot, US-23



ProVAL predicts peak IRI can be reduced from 340 to 180 in/mi by grinding

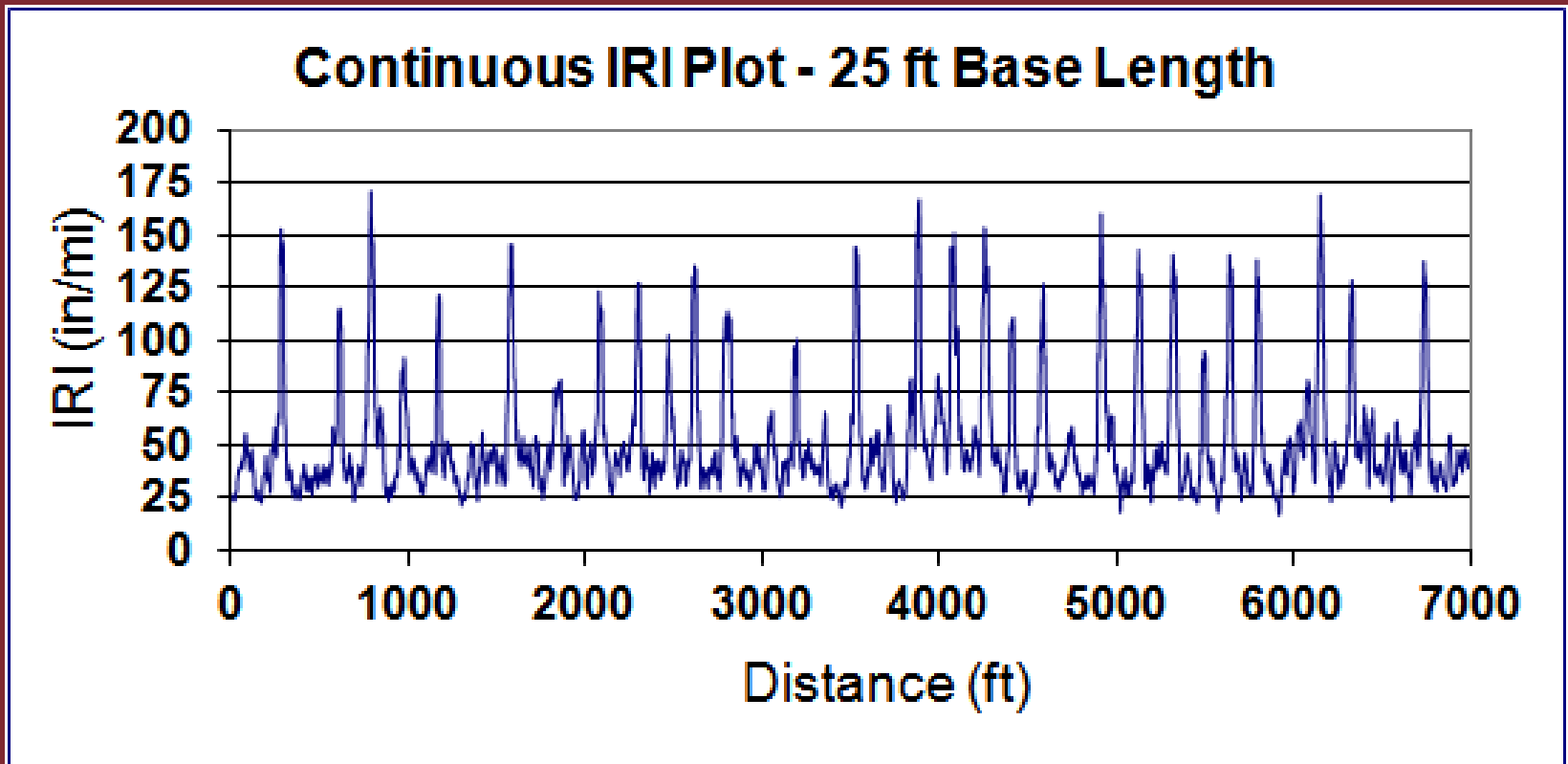


ASPHALT PAVEMENT – TRUCKS BUMPING PAVER



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Trucks Bumping Paver



Using a Material Transfer Vehicle (MTV) will eliminate this problem

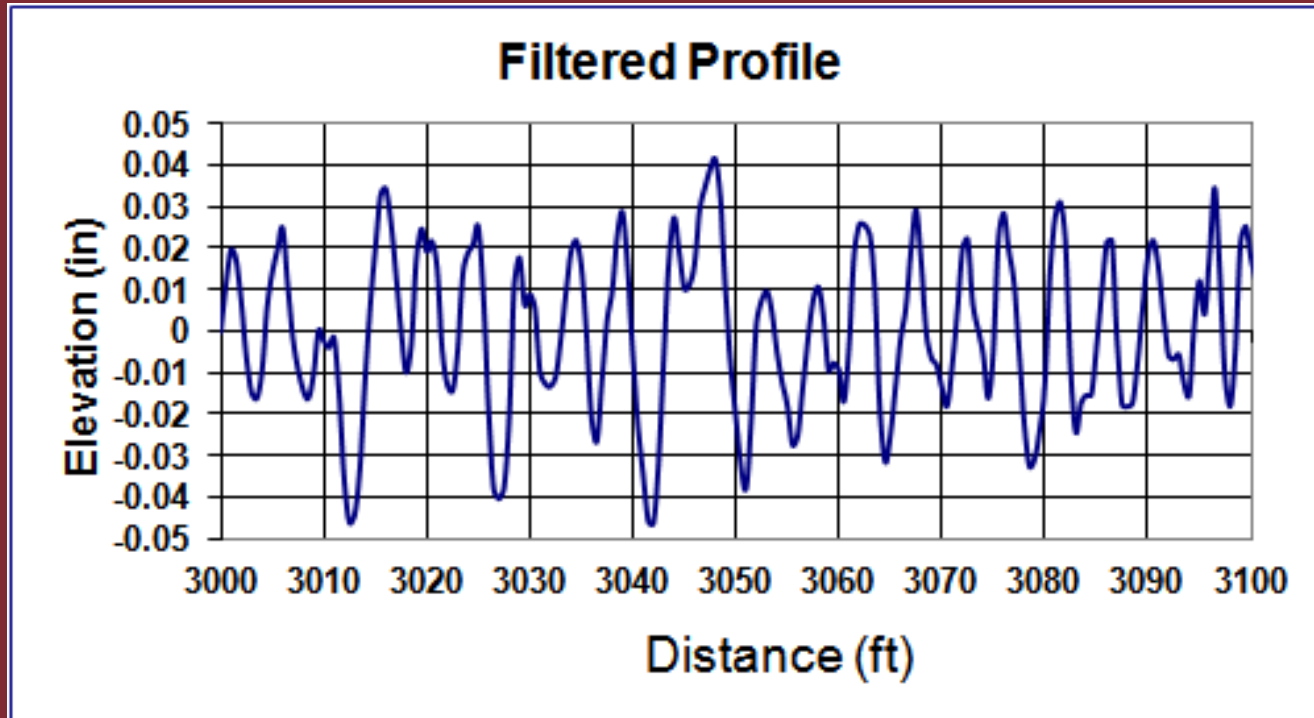


ASPHALT PAVEMENT – VIBRATORY ROLLER



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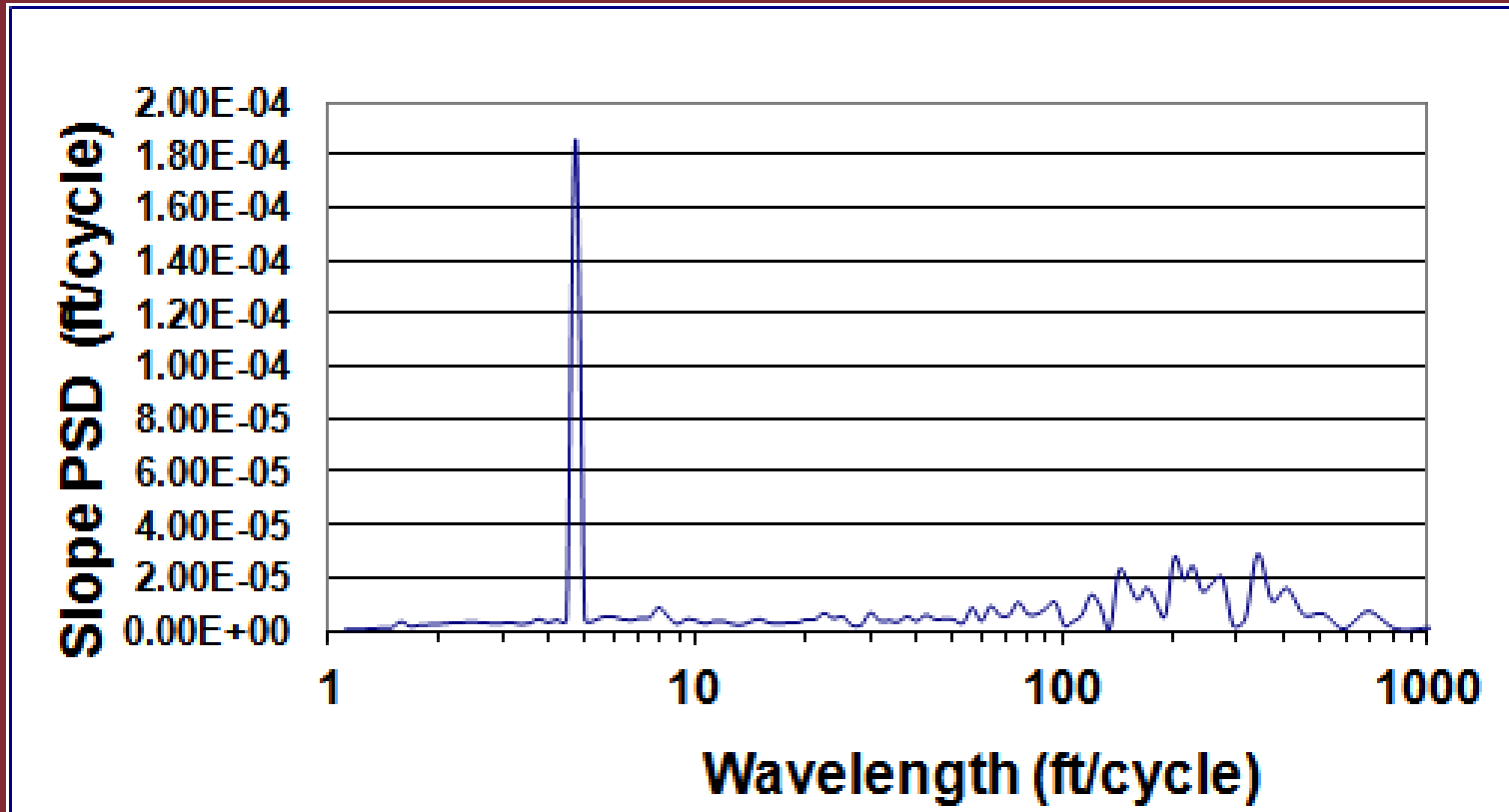
Effect of Vibratory Roller



- Filtered profile shows wave pattern with 4.7 ft wavelength
- Caused by incorrect operation of vibratory roller



Vibratory Roller – PSD Plot



Wavelength of 4.7 ft dominates profile causing high IRI



CONCLUSIONS



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Conclusions

- Profile each day's paving and evaluate profile data.
- Repetitive features in pavement can be easily detected from profile data.
- If you wait until the project is completed to profile, entire project will be affected if there is a paving problem.
- Detecting and correcting problems early will avoid costly grinding and avoid paying penalties.



Conclusions

- Profile data analysis can be performed using FHWA program available free on the web at: <http://www.roadprofile.com/>



Questions?



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