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Irasburg Bridge Fire Accident – December 2023

- On December 4, 2023, a propane tanker crashed in Irasburg, VT, resulting in a fireball that burned for 36-hrs several feet from a VT-14 bridge.
- The fire caused extensive damage in the exterior bridge girders and VTrans determined to replace the bridge after evaluating the postfire condition.



Figure 1. Photos of (a) Bridge VT 129 during fire, and (b) after fire extinguishing.

Residual Strength Assessment of the Bridge Steel Girder

- This project aims to evaluate the performance of a severely-distorted steel I-girder from the fire.
- Performance assessment employs 1) geometric laser scanning, 2) surface condition assessment, 3) mechanical and toughness testing, 4) metallographic analysis, and 5) patina characterization.



Figure 2. Girder layout depicting flange.

Experimental Results

Geometric laser scan: Rapid lidar scan revealed 11.6 inches flange sweep in fire-exposed girder.

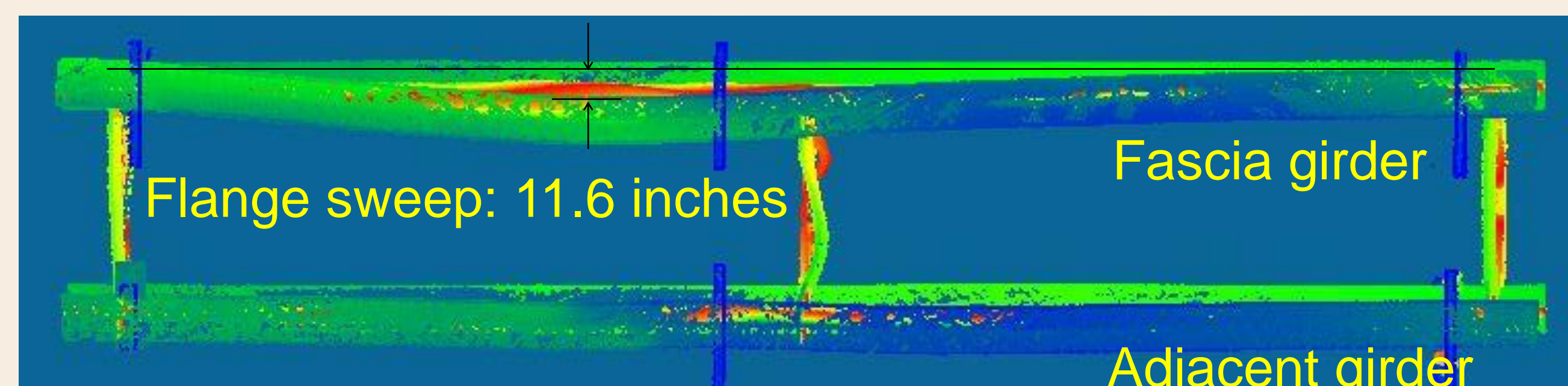


Figure 3. Rapid lidar scan of the 42-ft girder line depicting distortions.

Metallographic analysis: Prolonged fire exposure caused significant grain recrystallization, though the crystalline structure remained ferrite and pearlite dominant post-fire.

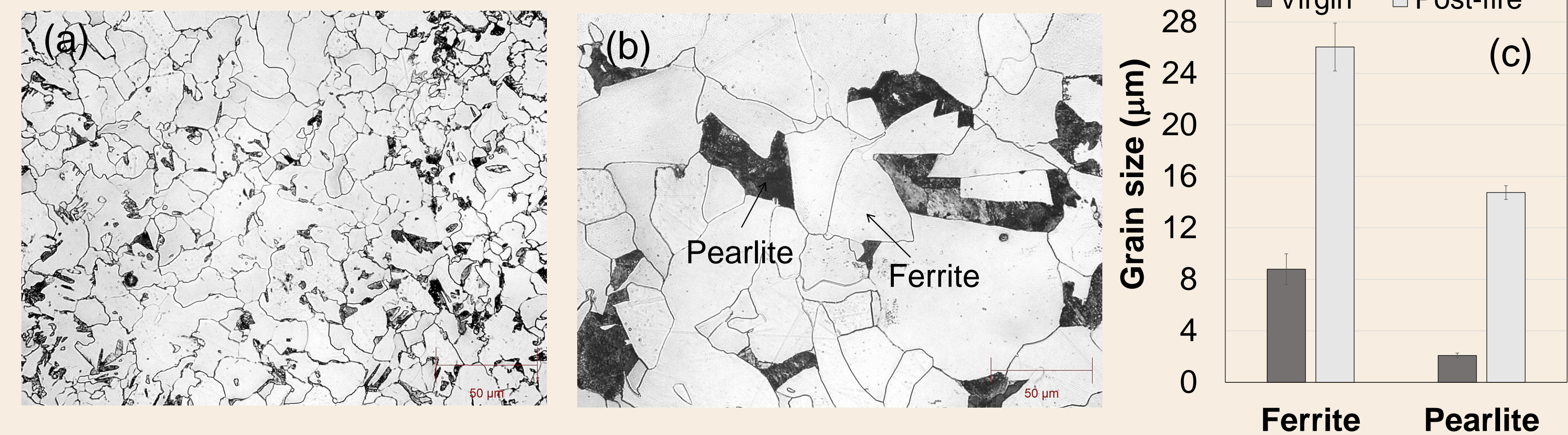


Figure 4. Microstructure of (a) virgin steel and (b) post-fire steel, and (c) grain sizes.

Patina characterization: Formation of significantly thicker oxide layer (almost 8 times the thickness of virgin steel patina) on the fire-exposed surface.

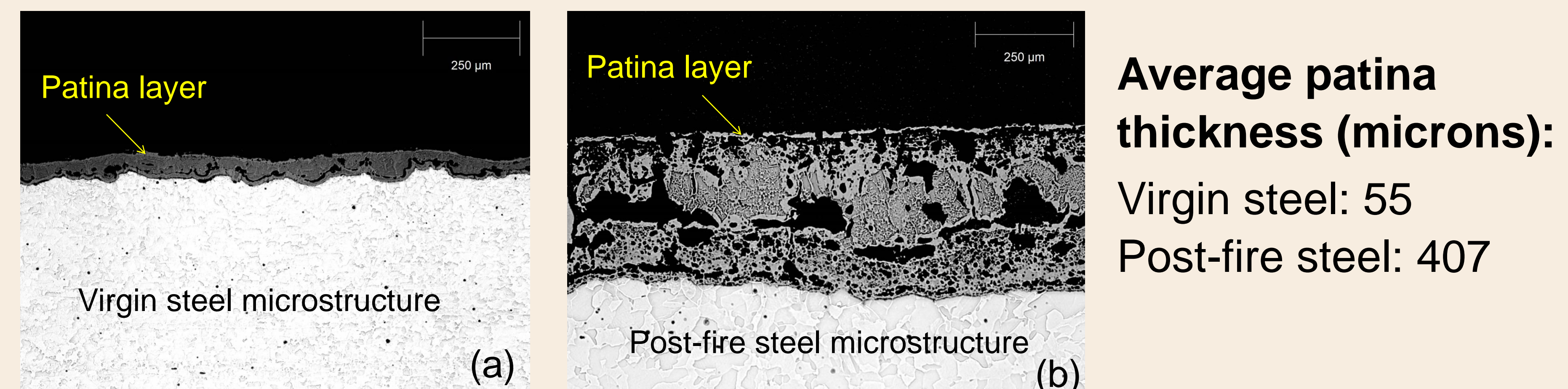


Figure 5. Patina layer in (a) virgin steel, and (b) post-fire steel.

Average patina thickness (microns):
Virgin steel: 55
Post-fire steel: 407

Conclusions from Ongoing Work

- Prolonged fire exposure caused approximately 11.6 inches flange sweep.
- Fire exposure resulted in nearly a 3 times increase in the steel ferrite and pearlite grain size. However, no metallurgical phase change occurred.
- The uncoated weathering steel's protective patina layer increased in thickness up to 8 times its normal thickness during the fire.

Acknowledgments

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