

## Q: Does hot-dip galvanizing affect the mechanical properties of steel?

**A:** There have been several studies that have observed the effects hot-dip galvanizing has on the mechanical properties of various types of steels. Here are the results from a few of these studies:

### ***Does Galvanizing Affect Steel Strength?***

By Industrial Galvanizers Corporation Pty Ltd.

The aim of this study was to determine if hot-dip galvanizing processes affect the yield strength of high strength steel. Uncoated (black) steel and pre-galvanized sheet steel were also tested. The pre-galvanized sheet was first pickled to remove the existing zinc coating and was then put through the normal galvanizing steps prior to being dipped into the kettle.

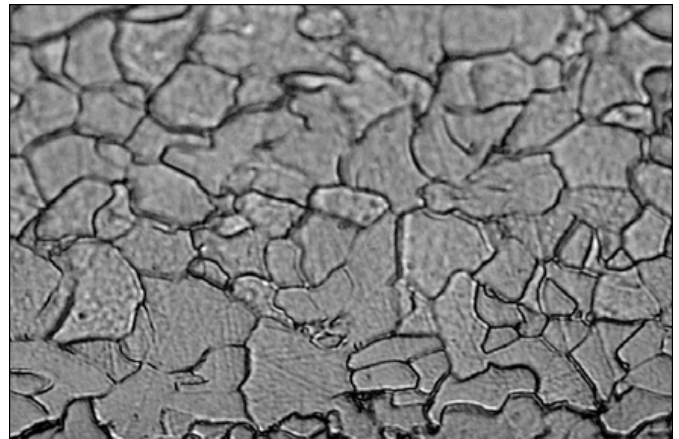
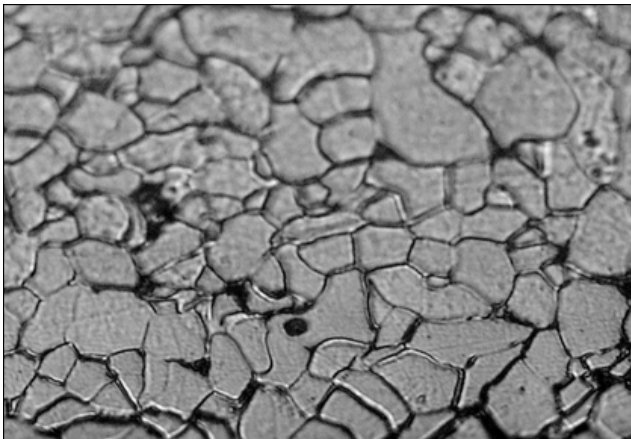
The results of the tests for both the black steel and pre-galvanized sheet steel that had been pickled and then re-galvanized showed the difference between the non-galvanized steel and pre-galvanized sheet steel had a variation in yield strength of less than 1%, which was within the accuracy tolerance of the testing procedure. In other words, the tests conducted in this study found galvanizing did not affect the yield strength of either black steel or pre-galvanized sheet steel that had been stripped and then re-galvanized.

### ***Influence of Hot-Dip Galvanizing Technology on the Properties of Hot-Dip Galvanized Steels***

By Mittal Steel Ostrava, Vysoka Skola Banska

In this study four types of steel were put through the galvanizing process to determine the effects of individual steps during the galvanizing process on the mechanical properties, impact strength, and microstructure of the tested steels.

Testing of mechanical properties included upper yield point, ultimate strength, and ductility. The results of the test concluded differences in mechanical properties of steels that were not galvanized and those that were galvanized was negligible and galvanizing does not have any effect on mechanical properties of steel.



(Left) Microstructure of steel after hot rolling; (Right) Microstructure of steel after hot-dip galvanizing. A side-by-side examination of the two images reveals the mechanical properties of the steel do not significantly change after the hot-dip galvanizing process.



Fracture properties in this test included absorbed energy and notch toughness. Results of the tests showed measured differences between galvanized steel and steel that was not galvanized were very small and most likely attributable to microstructure heterogeneity. The overall conclusion was hot-dip galvanizing does not have any influence on fracture properties of steel.

No differences were found in microstructure of galvanized steel compared to steel that had not been galvanized.

### ***Galvanizing Characteristics of Structural Steels and their Weldments – Chapter Four: Data Sheets – Properties***

By BNF Metals Technology Centre and ILZRO

Testing conducted in this study determined hot-dip galvanizing does not affect tensile strength, proof strength, bend, or impact properties of structural steels. Small changes in some mechanical properties were detected after steel that had been cold worked went through the galvanizing process. Larger bend radii were found to lessen these effects on cold worked steels that were later galvanized.

### **Conclusion**

From the research presented, it is possible to conclude hot-dip galvanizing does not significantly change the mechanical properties of steel.

These studies and additional studies that discuss mechanical properties of steel in relation to hot-dip galvanizing are available from the AGA Technical Department. Please call 720-554-0900 x 21 or send an email to [technical@galvanizeit.org](mailto:technical@galvanizeit.org) for additional information.