Misapplication of a Cautionary Guidance Document-ASTM 385

A recommendation to Remove Steel Chemistry Restrictions in Galvanizing Specs

A position brief for owners, specifiers, and project engineers

A troubling trend is spreading through owner-led infrastructure projects, including bridge work in Edmonton: project specifications are starting to mandate narrow silicon and manganese ranges for structural steel that will be hot-dip galvanized. This is not a best practice. It is an unintended and unsupported restriction, and owners and specifiers should remove it.

Where This Came From And Why It's a Misreading

The restriction is typically traced back to chemistry guidance in ASTM A385. That guidance was never meant to function as a procurement gate. ASTM A385 itself says only those certain elements, carbon above roughly 0.25%, phosphorus above 0.04%, or manganese above roughly 1.3% “may cause the production of coatings different from the coating typified by Fig. 1.” That is a description of possible appearance and coating-growth variability, not a prohibition.

This isn’t a matter of interpretation. The chair of the ASTM A05.13 committee the committee that governs both A123 and A385 has confirmed directly that the chemistry language in A385 was never intended by the committee to be restrictive or prescriptive. It flags that an atypical coating *may* result. It does not say the steel is unacceptable.

What Actually Governs Acceptance

Coating acceptance for hot-dip galvanized structural steel is now governed by ASTM A123/A123M; there is currently no equivalent Canadian standard. This standard sets minimum coating thickness and soundness requirements, verified non destructively per ASTM E376. The standard says nothing about mill heat chemistry. A galvanized part is compliant if its finished coating meets these measurable criteria, full stop. Steel chemistry is not, and was never meant to be, a pass/fail acceptance criterion.

It’s important to note that CSA G164 is now scoped specifically to the hot-dip galvanizing of irregularly shaped articles used in electrical and communication systems, and includes associated methods for testing and compliance.

The Real (and Manageable) Technical Question

Reactive steels, those with silicon or phosphorus outside ASTM A385, Section 3.2 recommended ranges (Si <0.04% or 0.15–0.22%; P <0.04%), do tend to form thicker, more intermetallic, often matte-gray coatings. The relevant technical questions, and their answers, are settled:

- **Is the bond weaker on reactive steel?** No, not in tensile bonding strength. The risk is that thicker coatings (above roughly 8–12 mils) can become more brittle and prone to flaking under impact. That’s a handling issue, easily repaired per ASTM A780, and it does not propagate after installation.

- **Is the coating more vulnerable to thermal cycling or stress?** No known issue specific to reactive steels, even in extreme-temperature service.
- **Does appearance affect service life?** No. Appearance has no bearing on corrosion protection. Service life correlates with average coating thickness, and reactive steels, if anything, often deliver thicker coatings, meaning longer time to first maintenance, not shorter.
- **Are there documented cases of coating failure on properly controlled reactive steel?** No cases of total coating failure. The only observed issue is localized flaking from rough handling on very thick coatings, repairable, not a durability defect.

Why the Restriction Backfires

Structural steel mills produce to CSA G40.20/G40.21 grade requirements, not to galvanizing-optimized chemistry windows. Heat-to-heat variation in Si, P, and Mn is normal and expected. Forcing narrow chemistry bands into a procurement spec doesn't make steel safer, it makes it scarce. The practical results are longer lead times, special-order tonnage minimums, higher cost, and material that is otherwise fully code-compliant and routinely galvanized successfully being rejected on paper before it ever reaches the kettle. For the modest quantities typical of secondary bracing and miscellaneous bridge steel, this restriction is frequently commercially unworkable.

What Owners Should Specify Instead

Manage reactivity through process control and verification, not procurement chemistry limits:

- Review mill test reports and confirm heat identification
- Use surface preparation (abrasive blasting per SSPC/AMPP SP 6 or SP 10) to manage coating growth on reactive heats
- Coordinate galvanizer process controls, bath chemistry, temperature, immersion time, racking and drainage
- Use trial coupons where reactivity is uncertain
- Accept the finished product against ASTM A123 thickness and soundness criteria
- Repair any localized damage per ASTM A780 and re-verify by thickness measurement

This approach addresses the actual risk, coating variability and handling sensitivity, without rejecting compliant steel based on a misapplied guidance document.

Key Take-Away

Si/Mn procurement restrictions derived from ASTM A385 are not a recommended practice that owners may optionally tighten, they are a misapplication of a cautionary guidance document, confirmed as such by the standard's own governing committee.

CGI will work with owners and specifiers to remove these clauses from specifications and replace them with the performance-based, process-control approach, as there is no technical basis for treating galvanizing of reactive steel as nonconforming.