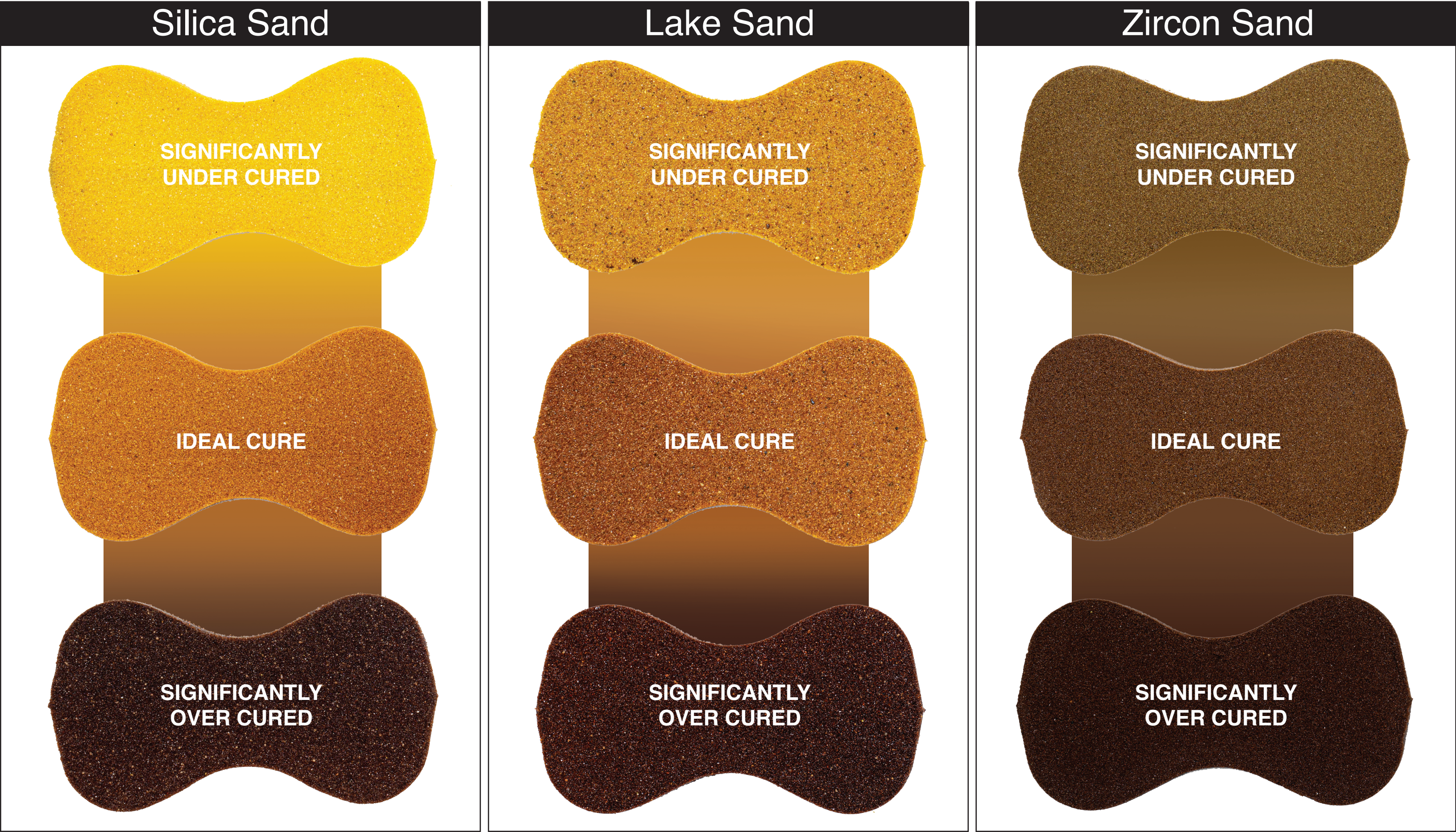


SHELL PROCESS PROPER DEGREE OF CURE



TROUBLESHOOTING THE SHELL PROCESS

Casting Related Issues

METAL PENETRATION

- **Low core density** – Increase blow pressure
- **Surface of core or mold too brittle** – Decrease cure cycle or reduce mold or pattern temperature to prevent overcuring
- **Sand too coarse** – Switch to a finer base sand; use refractory coating; add fines – iron oxide, clay

CASTING POROSITY

- **Undercured mold or core surface** – Lengthen cure time
- **Excessive gas generated at metal/sand interface** – Decrease resin and/or hexa level
- **Permeability of base sand is too low** – Use a coarser base sand
- **Inadequate venting of cores or molds** – Add vents where needed
- **Need for a gas scavenger** – Add iron oxide to the mix

VEINING & THERMAL SHOCK

- **Pouring temperatures too high** – Monitor temperatures
- **Stress areas in cores or molds** – Check ejection system; check uniformity of cooling
- **Cores or molds are overcured** – Shorten cure cycle
- **Cores or molds are excessively brittle** – Use a plasticized resin; reduce hexa content
- **Cores too strong** – Reduce resin content
- **Base sand does not allow for enough expansion** – Try alternate base sand
- **Uneven mold bonding** – Check to see if locators are lining up properly
- **Cores or molds are too cold** – Review storage conditions
- **Core or mold weights are too low** – Increase weights by lengthening invest cycle; possibly sand is cold
- **Cores or molds have thin walled spots** – Check for peel back or lamination; maintain an even depth of cure

Core Making Related Issues

PEEL BACK

- **Hot or cold spots in core box or on pattern** – Hot spots–rearrange heaters; Cold spots–add beryllium copper inserts
- **Entire core box is too hot or cold** – Adjust temperature
- **Low melt point sand** – Contact HAI
- **Core air pressure too high or low** – Adjust air pressure settings; use pulsating blow; change blow angle
- **Moisture in sand** – Adjust blower air line moisture traps
- **Cold sand** – Do not store in extremely cold area
- **Dirty patterns or core boxes** – Clean to improve heat transfer
- **Improper core density** – Maintain full head of sand in magazine or dump box

WEAK CORES OR MOLDS

- **Low resin content** – Check resin content and LOI of sand; increase resin level of sand
- **Low hexa content** – Check hexa content, increase hexa level
- **Cores or mold over or under cured** – Check cure cycle and pattern temperatures

STICKING

- **Core or mold is over cured** – Decrease cure cycle, decrease temperature
- **Release build-up in the core box or on the pattern** – Clean the core box or pattern; spray release less often
- **Scored core box or pattern** – Repair damaged boxes or patterns; minimize damage
- **Insufficient release agent in sand** – Add more release
- **Dusty resin coated sand** – Monitor sand handling practices, minimize sand abrasion potential

POOR FLOWABILITY OR BLOWABILITY

- **Plugged vents** – Check vents regularly; change type of vents
- **Not enough vents** – Change type or number of vents
- **Pattern or core box too hot** – Lower temperature
- **Low coated sand melt point** – Contact HAI
- **Moisture in air line** – Check moisture traps on a periodic basis
- **Insufficient amount of release agent in sand** – Add more release
- **Sand magazine partially filled** – Maintain a full magazine or dump box

EXCESSIVE BUILD-UP

- **Too hot a pattern or core box** – Lower temperature
- **Melt point of sand is too low** – Contact HAI
- **Cores not draining properly** – Vibrate during drain
- **Too long an invest cycle** – Decrease invest cycle

UNEVEN BUILD-UP


- **Poor heat distribution** – Check arrangement of heaters
- **Cores drain poorly** – Vibrate during drain
- **Dirty patterns or core boxes** – Clean patterns and boxes regularly
- **Poor blow pattern** – Check location of vents and blow inlets
- **Plugged vents** – Check boxes periodically; try other types of vents

LACK OF BUILD-UP


- **Cool box or pattern** – Raise box or pattern temperature
- **Melt point of sand is too high** – Contact HAI
- **Cold sand** – Increase invest cycle and review sand storage conditions
- **Too short an invest cycle** – Increase invest cycle

ODOR

- **Lack of deodorizer in the coated sand** – Use deodorized sand
- **Eliminate vinsol** – Use non-vinsol plasticized sand if required



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THE RESULTS WE DELIVER

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