GENERAL PROPERTIES OF MOLDING SANDS

1. Green strength. The green sand, after water has been mixed into it, must have adequate strength and plasticity for making and handling of the mold.
2. Dry strength. As a casting is poured, sand adjacent to the hot metal quickly loses its water as steam. The dry sand must have strength to resist erosion, and also the metallostatic pressure of the molten metal, or else the mold may enlarge.

GENERAL PROPERTIES OF MOLDING SANDS

3. Hot strength. After the moisture has evaporated, the sand may be required to possess strength at some elevated temperature, above 100 °C. Metallostatic pressure of the liquid-metal bearing against the mold walls may cause mold enlargement, or if the metal is still flowing, erosion, cracks, or breakage may occur unless the sand possesses adequate hot strength.
4. Permeability. Heat from the casting causes a green-sand mold to evolve a great deal of steam and other gases. The mold must be permeable, i.e. porous, to permit the gases to pass off, or the casting will contain gas holes.

GENERAL PROPERTIES OF MOLDING SANDS

5. Thermal stability. Heat from the casting causes rapid expansion of the sand surface at the mold-metal interface. The mold surface may then crack, buckle, or flake off (scab) unless the molding sand is relatively stable dimensionally under rapid heating.
6. Refractoriness. Higher pouring temperatures, such as those for ferrous alloys at 2400 to 3200 F, require greater refractoriness of the sand. Low-pouring-temperature metals, for example, aluminum, poured at 1300 F, do not require a high degree of refractoriness from the sand.

GENERAL PROPERTIES OF MOLDING SANDS

7. Flowability. The sand should respond to molding processes.
8. Produces good casting finish.
9. Collapsibility. Heated sand which becomes hard and rocklike is difficult to remove from the casting and may cause the contracting metal to tear or crack.
10. Is reusable.
11. Offers ease of sand preparation and control.
12. Removes heat from the cooling casting.

This list by no means includes all the properties which might be desirable. Obviously, the most important characteristic of a molding sand is that it facilitate the economic production of good castings.