Casting Connection

• Your Link to Investment Casting News from Ransom & Randolph •

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Understanding Inclusions

A shell inclusion is normally considered to be a defect that results in ceramic breaking free from the shell and ending up in the casting. This defect leaves a void in the casting that will need to be welded or the part may be scrapped. There are a variety of causes for shell inclusions. The most common are as follows:

1. **Improperly dried shells** – if a shell is not dried properly between coats and after the seal coat, weak spots may occur. These weak spots can break free during dewaxing, burnout and casting.
2. **Out of control slurry** – an improperly controlled slurry can cause shell inclusions. If the shell is too weak (due to low binder solids), weak spots may occur. If the binder solids are high, the shell coat could have a gelled versus dried bond.

Inclusion (Ash or Dust)

3. **Improperly set up wax patterns** – the joints between sprues and patterns should be smooth and free of undercuts. Undercuts trap ceramic in thin fins. These fins can be broken off by the metal as it fills the mold.
4. **Pour cup breakage** – if the tree setup is such that the pour cup is formed during the dipping process, care must be taken to reduce inclusions. If the pour cup is made by dipping, it is important to build a uniform pour cup so that there are no jagged edges and thin areas that can be easily broken off.
5. **Shell firing** – shells

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Visit Us at ICI 2017

The Investment Casting Institute (ICI) is hosting their 64th Technical Conference & Equipment Expo in Covington, KY on October 16th & 17th, 2017.

We are pleased to offer SuspendaSlurry® materials and the Matrixcote® system at this year's show.

Meet us at the Expo in Booth 222 to learn more or to discuss your casting goals and how R&R can help you achieve those goals.

We look forward to seeing you at the show!

Dentsply Sirona

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R&R Welcomes Ortiz

Kelsey Ortiz
Product & Application Engineer

R&R is pleased to announce Kelsey Ortiz's appointment as Product & Application Engineer. She will be responsible for technical support to customers, providing comprehensive product solutions and troubleshooting process issues.

Kelsey joins the team with experience in customer technical support from Momentive Performance Materials and the Department of Polymer Engineering at the University of Akron.

Kelsey graduated from Trine University in Angola, IN, earning her Bachelor of Science in Chemical Engineering. Throughout her college career, she excelled as a student athlete, running cross country and track, while also providing leadership and guidance to fellow student athletes. She also enjoys kayaking, camping, hiking and volunteering in her community.

Shell Testing FAQs

MOR

Permeability

What is MOR? Why is it important?
Modulus of Rupture (MOR) is for determining shell strength at green, hot and post fired states. Wax test bars are dipped using a determined shell sequence, then tested in an MOR unit. Shell strength is normally recorded as MOR because the amount of load strength to break a test specimen is recorded per area of the specimen at the break site. Theoretically, no matter how thick or wide the test bars may be, the MOR strength of identical ceramic material should remain the same. This data is important because it gives a glimpse as to how the shell system is going to perform through the process.

What is shell permeability? What does it tell you about your shell system?
Shell permeability is the measurement of a shell's ability to allow fluids to pass through the material. The higher the reading, the more permeable your shell. Testing shell permeability is important as air trapped in the shell cavity during casting can lead to gas and non-fill defects.

Does R&R test MOR and permeability?
Yes, we test both MOR and permeability. R&R maintains the largest, most advanced product application and development laboratory, research foundry and technical staff for benefit of the industry. With unique testing equipment, we are the only industry supplier able to look at shell strength and flexibility properties in real-time and at temperature.

Shell Strength Measurement
- Room temperature up to 2192°F (1200°C)
- Modulus of Rupture (MOR)
- Adjusted Fracture Load (AFL)
- Stress-strain analysis
- Deflection

Investment Strength Measurement
- Green compressive strength
- Post fired compressive strength

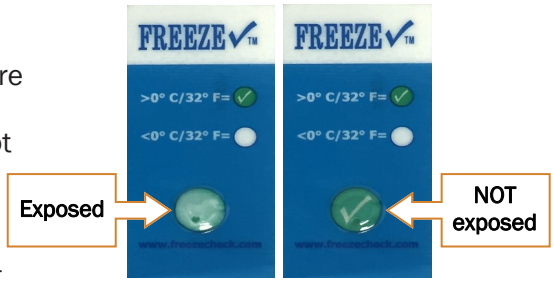
Shell Permeability
- Hot (up to 1832°F [1000°C])
- Green permeability (room temperature)

Investment Permeability
- Gas permeameter

Managing Freezable Shipments

During winter months, freezable materials, like colloidal silica based binders, should be shipped as early as possible in the week to ensure that they are continuously moving to their destination. While this does not guarantee product will not freeze, it reduces the risk associated with shipping over a weekend where product may sit at a freight facility unprotected from freezing temperatures.

To help you ensure that the product you receive has not been damaged, R&R applies a freeze check indicator, which features a check mark in a green circle. Temperature-sensitive liquid is encased in a clear bubble over the check mark. The fluid will turn opaque and the check mark is no longer visible once it has been exposed to subfreezing temperatures.



Note: This does NOT mean that the material in the package has been frozen; it only means the package has been exposed to freezing temperature.

If this occurs, immediately:

1. Make a notation on your carrier delivery receipt prior to the carrier leaving your facility: ***"POSSIBLE CONCEALED DAMAGE – PRODUCT HAS BEEN EXPOSED TO FREEZING TEMPERATURES"***

   Always accept a damaged shipment unless the damage has made the goods worthless. In cases of partial damage or loss, accept the entire shipment, document the loss/damage on the carrier receipt and follow the instructions on How to Handle Lost or Damaged Shipments at: ransom-randolph.com/winter-weather-reminder.html.

2. If able, test the specific gravity of the material as soon as possible. Material may be used if it falls within the limits noted below. If you are unable to test specific gravity, contact R&R customer service to have a freeze test kit sent to you.

	Specific Gravity Acceptable Limit		Specific Gravity Acceptable Limit		Specific Gravity Acceptable Limit
Core-Hardener 2000™ binder	1.390-1.410	Keycote® binder	1.197-1.214	Plasticast® PT binder	1.385-1.407
Customcote® binder	1.145-1.155	Kwik-Core™ binder	1.108-1.112	Primcote® binder	1.177-1.183
EHT binder	1.322-1.328	Levasil® colloidal silica	1.200-1.230	Primcote® PLUS binder	1.173-1.179
Fascote® binder	1.146-1.152	Matrixsol® 30 colloidal silica	1.200-1.230		

R&R 2017 Holiday Schedule

Please consider these closing dates when planning for your material needs.

Contact R&R at 800.800.7496 if you have any questions regarding this schedule.

CLOSED for Thanksgiving
Thurs, Nov 23 & Fri, Nov 24

CLOSED for Christmas
Fri, Dec 22 & Mon, Dec 25

OPEN to take orders & ship materials
Tues, Dec 26 & Wed, Dec 27
Hours of operation
Customer Service & Shipping from Ohio: 10AM-3PM EST

CLOSED for New Year's
Thurs, Dec 28, Fri, Dec 29 & Mon, Jan 1

REOPEN for the 2018 New Year
Tues, Jan 2 at 8AM EST

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Founded in 1872, Ransom & Randolph is dedicated to advancing the investment casting industry. R&R has provided foundries with extensive process knowledge, exceptional technical expertise and innovative product technology since the 1800s. By coupling revolutionary product developments with experienced staff, manufacturing and warehousing facilities, R&R successfully helps customers become casting industry leaders. R&R is a wholly owned subsidiary of DENTSPLY International (NASDAQ: XRAY).

R&R's core businesses are composed of Ceramic Shell, Industrial Mold, Jewelry and Dental Investment Casting.

R&R takes great pride in providing customers with a pleasant procurement experience. R&R's Maumee, Ohio based customer service team services North America and US export customers. Our UK-based agent, HTM Tradeco, Ltd., provides service for the European Union. From initial order placement through delivery, R&R's customer service team takes responsibility for accurate and efficient processing of your material needs. As a result, R&R's customer service team is unmatched in the industry.

We're on the web!
www.ransom-randolph.com

Understanding Inclusions

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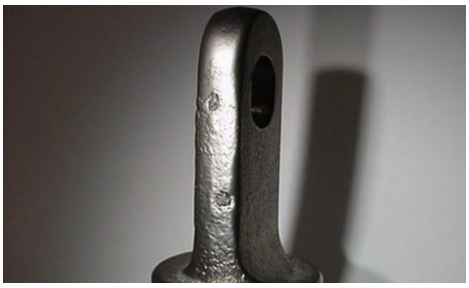
should be fired with the pour cups down. By firing the shells pour cup down, there is less likelihood for dirt and dust to get into the shell.

6. **Shell spalls** – a spall is a delamination of the shell where a number of coats break free and cause an inclusion. For more information, refer to: Spalling of Primary Shell Coats Technical Tips.
7. **Ash in the pattern material** – if the wax or other pattern material contains inert material, it will not completely burn out. This will lead to an effect similar to a ceramic inclusion.

Inclusion (Ceramic)



Inclusion (Slag)

Struggling with inclusions or other casting defects in your foundry ?

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