



Process:	Specification	Applicable Locations: Berea, Davenport, Greensboro, Oswego, Richmond, Uhrichsville
Document No:	REF-04144	
Revision No:	7	

Procedure RSI Product Quality Specification

Title of the Procedure		RSI (Remelt Scrap Ingot) Product Quality Specification
Procedure RACI	Responsible	Recycling Analyst/SQRM Analyst
	Accountable	At a Location: Scrap Champion, Operations Leader For the Region: Director, Recycling Strategy
	Consulted	NNA Manufacturing Facilities, NNA Recycling Buyers
	Informed	Novelis Metal Suppliers
Reason for the Procedure		Novelis is a supplier to discerning customers of a wide variety of rolled aluminum products. Novelis' visibility in these markets depends on its ability to consistently supply aluminum of the highest quality. A major factor in our ability to meet this requirement is the quality of the raw material we purchase for our processes with RSI representing a meaningful percentage of our raw material mix. It is for this reason that we have developed this manual, the major purpose being to communicate as clearly as possible, the Novelis requirements for RSI. The philosophy of Novelis is to work with all of its suppliers to enable them to continuously improve the quality of materials delivered.
Associated Documentation		Disqualification Process

All RSI purchases must come with an Excel spreadsheet that contains chemistry and is provided via e-mail to the plants just prior to receipt of the material. For Berea, chemistry must be uploaded by heat / alloy into MPS by SRA after the SRA is created and prior to delivery.

All RSI loads are paid on shipped weight. Please be sure the weight in the system matches the weight on the BOL, as to be sure of the accuracy for payment.

Uhrichsville & Davenport sows can have a max of 0.004 calcium & 0.0003 for lithium. Any sows that have a calcium level above that will not be accepted at the Uhrichsville location.

All RSI loads must be tarped in the winter. Loads that are not are subject to rejection. This is important because road salt is an explosion hazard and can risk the safety of our employees. Please see section 5.0 below for specifics for each plant.

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1. RSI (Sow):

- 1.1. Must be low profile and a minimum weight of 1,500 lbs./piece. Any sow under 1,500 lbs. needs prior approval by the plant.
- 1.2. Sow profile is determined, see Figure 1, by calculating the ratio between a sow's width (w) and the sow's average height (h). Dividing the width by the average height will give you the ratio. If the ratio is ≥ 4 then the sow is considered low profile.

$$w = X + Y + X$$

$$h = (A * X + B * Y + A * X) / (X + Y + X)$$

$$w / h = \text{profile value}$$

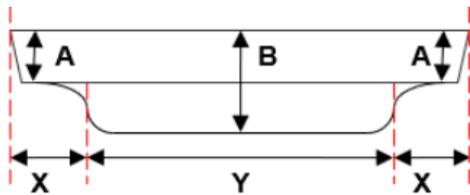


Figure 1. Sow profile calculation and dimension locations top diagram. In the photo there are high profile sows on the left and low-profile sows on the right.

- 1.3. Dimension A in Figure 1 must be thick enough so that sows can be easily lifted and handled without the sides breaking off.
- 1.4. Must be single poured and skimmed.
- 1.5. Must be free of excessive shrinkage cavities and large cracks.

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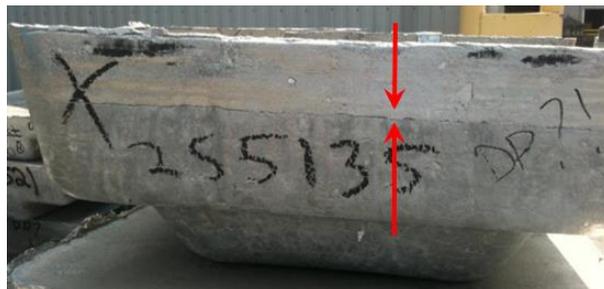
- 1.6. Must be clean and free of dirt, dross, excessive mold agents, oxides, oxidizers, pot room bath, non-aluminum contaminants, salts and excessive corrosion.
- 1.7. Each sow must be Stenciled and clearly marked with the alloy as provided by Novelis, see Figure 2. Using High Temperature Spray Paint or Heat Resistance Sticker is also accepted.
- 1.8. Alloy labeling must be distinct from heat number or weight. This can be accomplished by using thicker lines, different color, circling, and different media than other markings, see Figure 2.
- 1.9. The markings must be indelible and legible after preheating to 400 C°
- 1.10. The markings must be on at least the two shortest ends and at least 3" high.

Scrap Type	Sow
Label Location	Opposite Short Sides
Paint	X
Sticker	X
Heat Resistant Marker	X
Packing Slip	
Wired Tag	
Heat Resistant Crayon	X



Figure 2. Sow marking information.

- 1.11. Must have accompanying certificates of analysis and matching sample buttons.
- 1.12. Must be marked with heat, cast number, weight, and any special markings as directed by Novelis.
- 1.13. Novelis prefers stickers with the full analysis on each sow.
- 1.14. Double poured or sows showing non-continuous pouring will be rejected. Double poured, non-continuously poured sows will not be accepted at Novelis. Some examples of double poured sows follow in Figure 3.



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Figure 3. Double – multiple pour RSI examples.

1.15 Foreign Materials/Contamination:
All shipments of material to be charged into Novelis furnaces and/or in contact with molten metal are inspected prior to accepting the material. Process materials, shipping containers and delivery vehicle (truck, railcars) are inspected for contamination. Foreign materials or contamination examples are listed below.

- Residual fertilizers such as ammonium nitrate, dry fire extinguishing powders, reactive chemicals (nitrates, sulfates, oxidizing material, etc.) found on the metal and/or delivery vehicle. Any powdery material shall be a suspect. A thorough evaluation of any powdery material is made before the shipment is received.
- Residual mold release agents.
- Water or other volatile substances (liquid or solid)
- Heavy grease or oil
- Loads containing any types of desiccants (i.e. Silica gel)
- Garbage and trash that may contain cans, bottles or other objects that can trap moisture
- Salt fluxes that contain potassium chloride, sodium chloride, magnesium chloride or a form of cryolite.
- Nitrates, sulfates, and oxidizing chemicals
- Corroded or oxidized material
- Crimped or closed end pieces of tubing, extrusions or containers that may contain water
- Steel scrap
- Refractory
- Aluminum lithium alloys
- Scrap contaminated with hazardous or toxic materials (PCB's, selenium, lead, cadmium, and radioactive materials)
- Miscellaneous contaminants such as batteries, butane lighters, live ammunition, medical waste, and aerosol cans.

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Figure 4. Prohibited conditions or materials.

1.16 Mold Release Agent Focus. Mold release agents allow for easy removal of an ingot from casting mold. If the casting molds are in poor condition, it often necessitates the excessive use of mold release materials, see the photo above in Figure 4. Excessive residual calcium bearing mold release agents may contribute

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to elevated calcium in the melting process. Elevated calcium must be removed with expensive salt fluxes. Mold release agent residues are not permitted. Affected ingots are subject to rejection.

Possible Remedy for the Supplier: Supplier plant to replace warped or cracked molds and/or use less mold release material. Wash mold release agent from ingots before shipment to Novelis. Some RSI suppliers have had success using graphite as a mold release agent.

1.17 Sow skimming Focus. Un-skimmed or poorly skimmed ingots are unacceptable.



Figure 5. Well skimmed sow.



Figure 6. Poorly skimmed sow.

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Figure 7. Sharp flashing on the edges poses a hazard to employees. Flashing can be caused by poor skimming practices, over filling the mold or splashing during casting.

Placing dross and skim in the bottom of a mold to be filled is also not acceptable, see Figure 8 left. Packing dross against the mold wall of solidifying ingots is unacceptable, see Figure 8 right. Pouring molten aluminum onto dross or skim is a potential safety issue for the sow casting plant as well as for Novelis. Unskimmed ingots will be rejected. Poorly skimmed ingots and ingots with imbedded skim may be rejected.



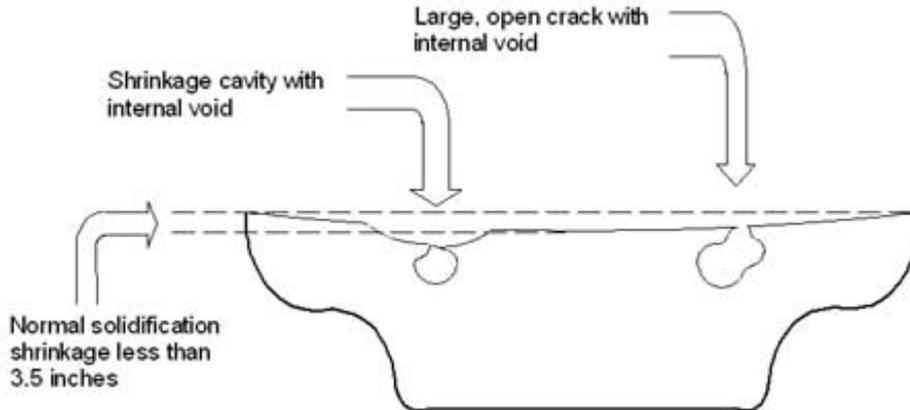
Figure 8. Poor skimming and dross removal practices.

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2. SHRINKAGE CAVITIES & VOIDS:



Top cooling of sows is not recommended if they are not 100% solidified. Top cooling produces larger shrinkage cavities, which make it more difficult to eliminate moisture during drying. Cooling from the bottom and sides of an ingot helps reduce the size of shrinkage cavities.

3. PLANT EXCEPTIONS:

- Greensboro does not accept sows with a length greater than 53", as their preheater cannot accommodate material longer than 53".
- Logan Aluminum has additional requirements. Please see buyer for additional instructions when shipping RSI into this facility.

4. RSI DOCUMENTATION POLICY:

- Bill of lading (BOL, manifest) must reference the following information:
 - SRA / Authorization Number
 - PO Number
 - Supplier's name
 - Shipper's name and address
 - Number of pieces of each alloy
 - Description and alloy identification of product
 - Gross, tare, and net weight for each alloy
 - Failure to include tare weight on the BOL will result in deduction of 100 lbs. per piece count.
 - Customer's name and shipping date
 - Carrier's name, vehicle number/rail car number and seal numbers
 - Certificate of analysis must accompany the BOL.
- The driver will be responsible for presenting the BOL.



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- All rail car shipments must have a copy of the BOL in an envelope attached to the “left” inside wall of the rail car, adjacent to the door.
- Novelis will not be responsible for any detention or re-weighing charges resulting from improper documentation.

5. SCRAP DELIVERY AND UNLOADING POLICY:

- **Vehicle type by plant**
 - **Oswego:**
 - Oswego accepts shipments of RSI in standard dry vans with barn doors. It is preferred that RSI is shipped in a van from December 1st – April 30th. Van-style trucks should be loaded for rear unloading at all times.
 - Oswego accepts rear-loaded flatbeds. A flat bed ***must have solid sides and a tarp if it is rear-loaded.***
 - Oswego accepts flat-bottom dumps. These dumps must be tarped and have an ICC bumper to lock into a dock lock so that a fork truck can drive onto the back of the dump. The dump must be loaded for rear unloading.
 - Oswego accepts side loaded flatbed trucks from May 1st – November 30th. Oswego will also accept side loaded flatbed trucks from December 1st – April 30th as long as prior authorization is obtained from the Oswego plant. Please be advised that any flatbed arriving in Oswego between October 1st – April 30th ***MUST*** be tarped. Please also note that flatbeds are unloaded outside, so approval during the winter months is often weather dependent.
 - **Berea, Greensboro, & Uhrichsville:**
 - Berea, Greensboro, & Uhrichsville accept flatbed trucks for RSI shipments. ***Flatbed trailers must be loaded from the side.*** A trailer that does not have rigid sides and is rear loaded will be rejected.
 - Flatbed trailers must be tarped from October 1st – March 31st every year. This prevents the sows from road salt contamination during the winter months. Un-tarped trucks during these months are subject to rejection.
 - **Richmond & Davenport**
 - Richmond & Davenport accept shipments of RSI in standard dry vans with barn doors. Van-style trucks should be loaded for rear unloading at all times.



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- Flatbed trailers are accepted for RSI shipments. ***Flatbed trailers must be loaded from the side.*** A trailer that does not have rigid sides and is rear-loaded will be rejected.
- Un-tarped flatbeds during winter months of October 1st – March 31st are subject to rejection.

- **Secured Loads:**

- All material must be secured to prevent shifting during transit. If the load shifts, is unsafe, or would require twice (or more) the amount of time than is allotted to that load, the load will be rejected. Consistent demonstration of poor loading practices will result in disqualification. Please consult your buyer if there are any questions about the allotted unloading time.
- Please do not stack standard size sows more than 4 high for transport. Thicker sows should only be stacked three high.

- **Delivery Schedule:**

- In the interest of both parties as well as the shipping companies involved, efficient and safe delivery of material is critical for keeping shipping costs down. As a result, ALL MATERIAL must have a delivery appointment. Novelis is not responsible for any costs that may be incurred because a load arrives **before** a scheduled delivery appointment. Appointments must be scheduled for late arrivals. Unloading hours are 24 hours/day 7 days/week for Berea, Greensboro, & Oswego, unless specified. Please reach out to your Buyer or Recycling Management Specialist for receiving hours for Davenport, Richmond, & Uhrichsville. Plant delivery contact info is on the PO.
- All RSI deliveries, as well as any material purchased from an outside supplier, must log into MPS web system to create SRA# and delivery appointment for Berea, Greensboro, & Oswego. For Davenport, Richmond, & Uhrichsville all loads must be scheduled by calling or e-mailing the contact at each site noted on the PO.

6. RSI RADIATION POLICY & INDEMNIFICATION:

- The supplier warrants that none of the material purchased or delivered is or contains radioactive materials.
- The supplier agrees to defend, indemnify and hold Novelis and its subsidiaries, affiliates, and directors, officers, employees, agents and representatives ("Novelis Indemnities") from any and all claims, demands, damages, liabilities, costs, expenses and fees (including reasonable attorney's fees), arising out of, resulting from or relating to, in whole or in part, a breach of the foregoing warranty.
- The supplier understands that its material will be tested before and after acceptance by Novelis, and Novelis has the right to revoke the

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acceptance of the materials at any time. If radioactive material is discovered, Novelis may option, without prior notice or approval from the supplier, to undertake handling/disposal of and/or clean up the radioactive material. All costs, fees and expenses associated with the handling, disposal and cleanup, and the return of the shipment, whether or not undertaken exclusively by Novelis, will be the responsibility of the supplier, and the supplier shall release, defend, indemnify and exempt Novelis from any and all claims, demands, damages, liabilities, costs, expenses, fees and penalties arising out of, resulting from, or relating to, in whole or in part of: handling/disposal, and cleanup. Supplier further agrees to waive any claims, rights and defenses which it might otherwise have against Novelis Indemnities arising out of, resulting from, or relating to the handling, disposal of, and clean up of the radioactive material by Novelis.

- Each purchase order is contingent upon the supplier's acceptance of these terms. Supplier acknowledges that delivery of any material to Novelis is considered acceptance of these terms, and agrees that any terms and conditions contained in a proposal, quotation, acknowledgement, acceptance, invoice or other document of supplier which are different from or in addition to these terms and conditions shall not constitute a part of the purchase order and are hereby expressly rejected, and that no employee of the Novelis is authorized to or may waive or modify these terms.

7. RSI REJECTION POLICY:

- The Scrap Champion or Crew Leader determines if any part of the load is unacceptable for any of the preceding reasons involving safety, quality of material, signed purchase order, or delivery.
- The Buyer will notify the supplier in regard to the rejection. The supplier is responsible for all freight and reloading costs to ship the rejected load from Novelis. Photos showing the cause for rejection will be sent to the supplier.
- Rejected material must be removed promptly. If the rejected material is not removed within 5 business days, the rejected material will be sent collect to the vendor or location of the vendor's choice. This purchase order shall remain open subject to the original terms and conditions.