



# Assuring Stainless Steel Surface Quality

*3-A SSI 2018 Education Program –  
Exceeding Customer Expectations Through  
Hygienic Design*

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# What is the Nickel Institute?

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- Is the global association of leading primary nickel producers.
- Our mission is to promote and support the use of nickel in appropriate applications.  
[nickelinstitute.org](http://nickelinstitute.org)
- We provide “free” technical support to users of nickel containing materials, such as stainless steel, nickel alloys and nickel plating  
[inquiries.nickelinstitute.org](http://inquiries.nickelinstitute.org)
- Through our science division **NiPERA** Inc. we also undertake leading edge scientific research concerning nickel relevant to human health and the environment.  
[nipera.org](http://nipera.org)

# Why is Nickel Institute interested in stainless steel and food contact applications?

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- Two thirds of primary nickel production is used to make stainless steel  
(primarily stainless steels, such as Type 304 and 316)
- ~20% of SS goes into food contact applications

- **18 years in stainless steel distribution with**
  - 1989-1999 QA Manager & Application Metallurgist with Avesta Sheffield Canadian Operations*
  - 1999-2007 QA Manager & Application Metallurgist RASCO Specialty Metals; Integris Metals - Canada; Ryerson - Canada*
- **2008-2013 Senior Materials Engineer – Hatch Autoclave Technology Group**  
*(working with stainless steel, nickel alloys and titanium)*
- **2014 to present - Nickel Institute**
  - *Global Technical Inquiry Service Coordinator*  
[inquiries.nickelinstitute.org](http://inquiries.nickelinstitute.org)
  - *Stainless Steel Consultant*

## Comments from distributors

### Western Canada

- Have had very few complaints as far as SS sheets are concerned. The majority of our 304/316 sheet, 11ga and thinner, is from Taiwan.
- As far as Chinese material goes, I doubt Chinese origin would be huge issue as far as the light gauge fab shops are concerned.
- The main complaint has been getting #4 sheets where they did a belt change and a sheet or two were not fully finished. That has not happened in quite a while though. (this would typically be flagged by the polisher)

## Comments from distributors

### Toronto area

- Supply some large Restaurant/Food Equipment fabricators and can't think of the last mill surface related issue I had with either 2B or #4 polish
- Most of the #4 my customers get is North American origin.

### Southern Ontario

- Have not seen an increase in surface defects #4 or 2B. We sell (with great success) Chinese sheet.

## Comments from distributors

### Eastern Canada

- More problems with surface finish in the past 4 years than the previous 15 years. Majority of material is North American origin.
- Customers appear to have less issues with Chinese material (sold by competitors) and when compared to North American side by side, Chinese material appears brighter.

# Has sheet surface quality deteriorated? Comment from sheet polisher

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## **Independent stainless steel sheet polisher**

- Initially Chinese material had problems, now as good as North American mills
- Defects are random to all mills and random throughout a coil when present

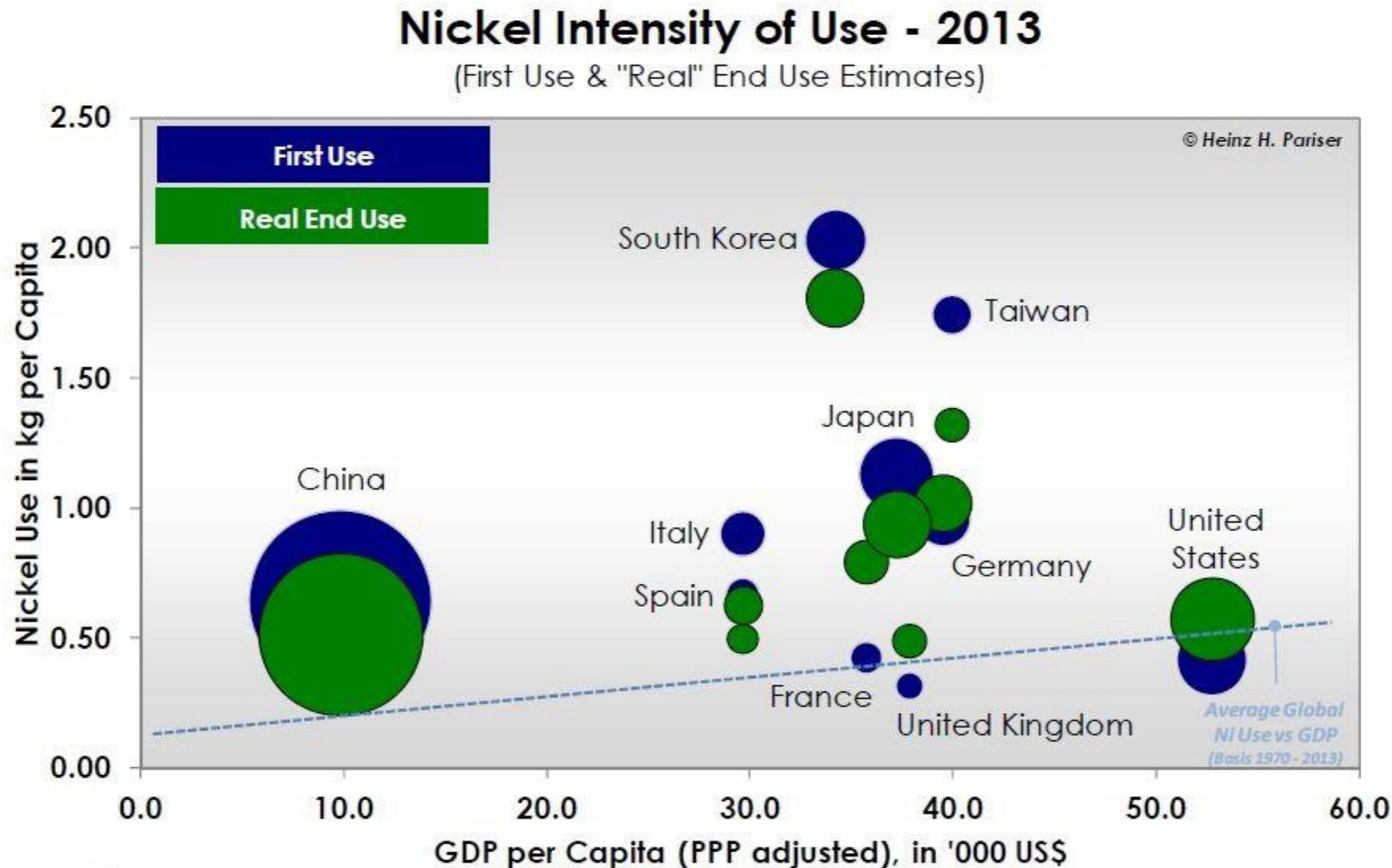
# Has sheet surface quality deteriorated? Is material national origin a problem?

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- In general, it appears that Chinese sheet is at least equal to and in some cases perceived to be superior to sheet of other origins
- China is a huge market with many stainless steel producers. Undoubtedly, quality control and production equipment will vary between these many producers.
- Suitability of material may vary due to which mills your supplier sources their material.

# Has sheet surface quality deteriorated?

## Nickel Intensity of Use Heinz H. Pariser, End-Use of Nickel 2004-2013



Each circle shows the relative amount of material produced or used in each country

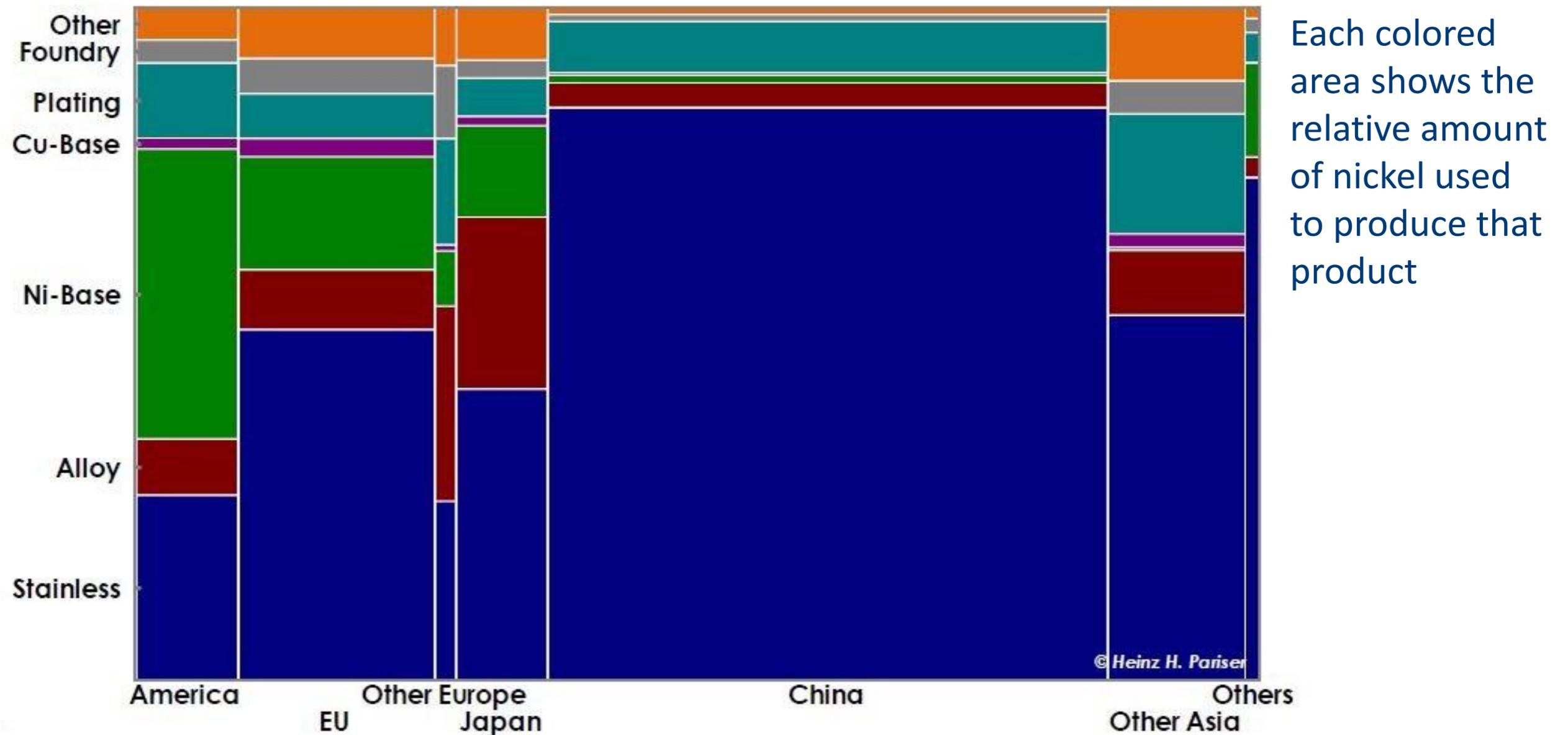
- **First Use** – where nickel is first used to make a nickel containing material such as stainless steel, nickel alloy, nickel plating...
- **Real End Use** – where that nickel containing material is actually used to make a product, such as a kitchen sink, pots and pans...

# Has sheet surface quality deteriorated?

## Nickel First Use Breakdown

Heinz H. Pariser, End-Use of Nickel 2004-2013

### Nickel First Use Breakdown 2013



- China produces more stainless steel than the rest of the world combined

- On March 1, 2018 Allegheny Technologies announced the formation of its joint venture with Tsingshan Group (the world's largest stainless steel melter)
- Tsingshan will provide stainless steel slabs from its new Indonesian stainless steel mill where it plans to produce 2 million tons of stainless steel slab per year
- Allegheny will produce 60-inch wide stainless steel sheet at its Direct Roll Anneal and Pickle Line in Midland, Pennsylvania. (projected production of ~270,000 tons per year)

- **ASTM A240**

*Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications*

[Defines chemical composition and mechanical properties](#)

evokes ASTM A480

- **ASTM A480**

*Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip*

- Heat treatment requirements for each grade of stainless steel
- Tolerances (thickness, width, flatness, ...)
- Material Certification
- Ordering information

Quantity

Grade (304L, 316L, ...)

Form (sheet, plate, or strip)

Dimensions (thickness, width, length)

## Finish

- 2D (cold-rolled, dull finish)
- 2B (cold-rolled, bright finish)
- #3 (Intermediate polished finish)
- #4 (General purpose polished finish)
- #8 (Mirror finish)

# What can be done to assure sheet quality?

## Definition of 2B and No. 4 finish - ASTM A480

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- *2B Finish* - Cold-rolled, bright finish

A smooth, moderately reflective cold-rolled annealed and pickled or descaled finish typically produced by imparting a final light cold-rolled pass using polished rolls. This general-purpose finish is more readily polished than No. 1 or 2D finishes.

- *No. 4 Finish* - General purpose polished finish, one or both sides.

A linearly textured finish that may be produced by either mechanical polishing or rolling. Average surface roughness (Ra) may generally be up to 25 micro-inches. There may also be overlap in measurements of surface roughness for both No. 3 and No. 4 finishes.

**These surface finishes are not quantifiable/measurable**

# What can be done to assure sheet quality?

## Workmanship – ASTM A480

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- The material shall be of uniform quality consistent with good manufacturing and inspection practices. The steel shall have no imperfections of a nature or degree, for the type and quality ordered, that will adversely affect the stamping, forming, machining, or fabrication of finished parts.

### **HOWEVER...**

- There is no ASTM standard that describes imperfections and their degree that will adversely affect the stamping, forming, machining, or fabrication of finished parts.
- Fortunately there is understanding between mills, distributors and end-users as to what are imperfections.
- Mills only accept responsibility for the cost of the material.

- Blips
- Dings
- Moons
- Crossbreaks
- Leveler stop mark
- Arbor buckle
- Chatter
- Boardmarks
- Out of flat
- Corrosion
- Pits
- Stains
- Damaged edge
- Slivers
- Hole
- Scratches
- Weld

- Sheets are cut from coil by either an independent cut to length operator or in-house at the distributor. Typically an adhesive surface film is applied in-line to protect the surface. Unfortunately, it is difficult and potentially costly to inspect coil surface quality during cut to length operation prior to application of film.
- Surface film provides surface protection during shipment, handling, fabrication and welding. Unfortunately, film makes inspection of surface prior to fabrication impossible.

- Surface finish is a not measurable requirement, its appearance can vary between suppliers. Thus, [ensure supplier understands your needs](#)
- Restrict sheet to mills of consistent quality and finish that meets your requirements (changing mill source due to price may incur costs elsewhere)
- Specify cut sheet with a paper interleaf so sheets can be inspected individually and then manually apply an adhesive surface film for protection during fabrication and welding. Recognize the additional time and expense.

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THANK YOU FOR YOUR ATTENTION

QUESTIONS?