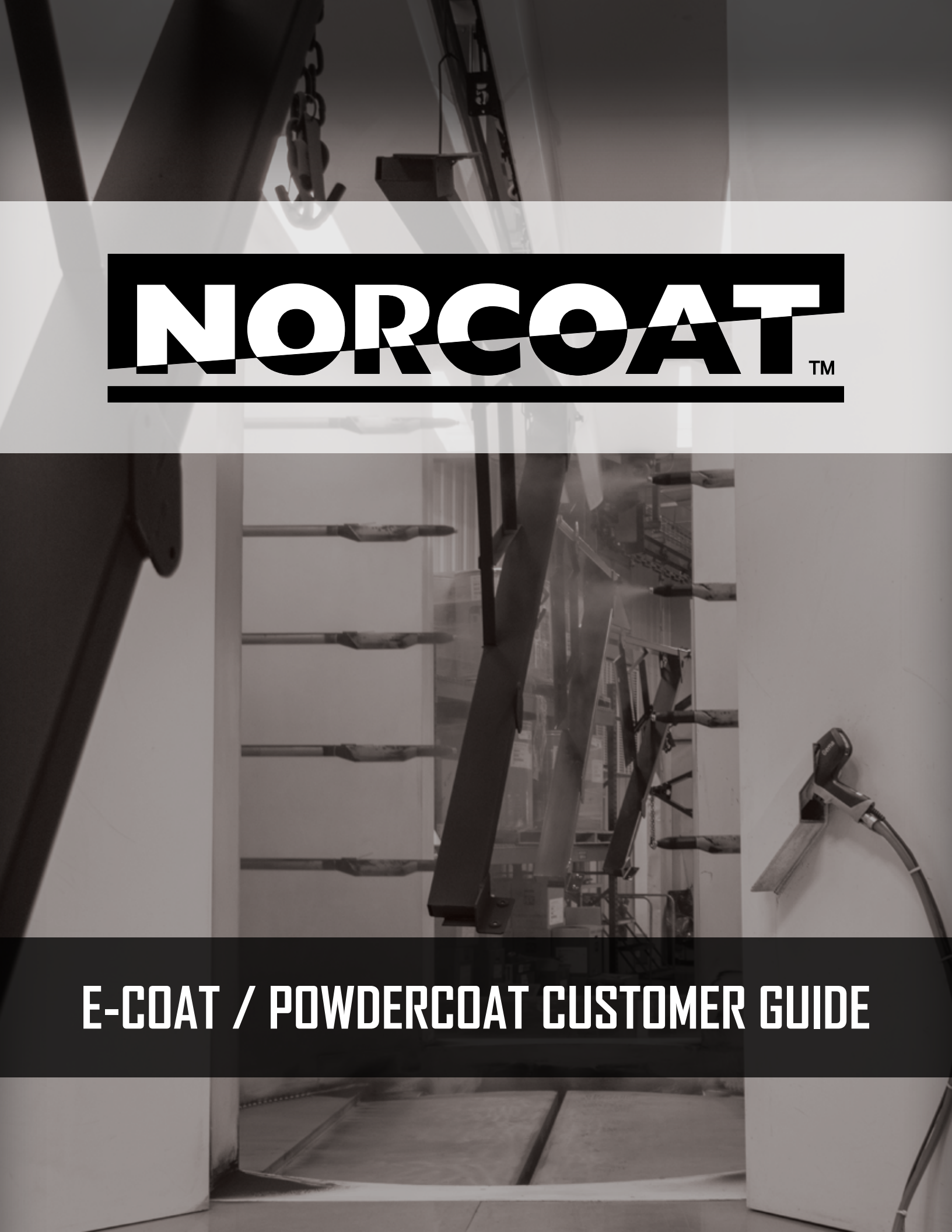

NORCOAT™

E-COAT / POWDERCOAT CUSTOMER GUIDE

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PPG POWERCRON 590-534 ELECTROCOAT

PROPERTIES	TEST METHOD	PERFORMANCE
Color	0	Black
Film Thickness	—	.05-1.5 Mils
Gloss @ 60 Degree	ASTM D523	65-85
Pencil Hardness	ASTM D3363	2H Minimum
Direct Impact	ASTM D2794	100-lb Minimum
Reverse Impact	ASTM D2795	100-lb Minimum
Crosshatch Adhesion	ASTM D3359	4B-5B
Humidity	ASTM 1735	1000 Hours Minimum
Water Immersion	ASTM D870	250 Hours Minimum
Gravel meter	GM9508P	6 Minimum
Throw power	GM9535P	12-15 inches
PROPERTIES	**SUBSTRATE / PRETREATMENT**	**PERFORMANCE**
Corrosion Resistance	CRS / Zirconium	1-2 mm

POWDER COAT STANDARD BLACK ULTRA DURABLE

PROPERTIES	TEST METHOD	PERFORMANCE
Color	—	Black
Film Thickness	—	2.5+ Mils
Gloss @ 60 Degree	ASTM D523	27-33
Pencil Hardness	ASTM D3363	4H
Direct Impact	ASTM D2794	40-lb Minimum
Xenon Arc	ASTM G155-7A	3500 kJ> 80% Gloss Retention
Crosshatch Adhesion	ASTM D3359	5B

*Panels are sent to an independent, 3rd party lab testing facility annually for performance validation.

ELECTROCOAT HISTORY & TYPES

The first automotive electrocoat was an anodic product developed by Dr. George Brewer at Ford around 1957. However, there were drawbacks in the technology and PPG Industries introduced the first cathodic e-coat system for automotive bodies in 1973.

Acrylic, epoxy, and hybrid formulations are offered to match the desired quality, performance, cost, and environmental objectives that electrocoat paint manufacturers demand. Epoxy polymers are known for their corrosion and chemical resistance. Acrylic polymers are known for their ultraviolet durability and color control. Hybrids are a combination of epoxy and acrylic polymers that give a combination of properties. NORCOAT offers cathodic epoxy e-coat with optional powder coat topcoat. This gives us the best of the *four types* of electrocoating when you add powder for the UV durability:

ANODIC EPOXY ELECTROCOATING is the most corrosion-resistant anodic electrocoat that can be cured at less than 200°F. The low cure attributes of anodic epoxies make these electrocoat products an excellent finish for castings, engines, and temperature-sensitive substrates or assemblies.

ANODIC ACRYLIC ELECTROCOATING offers a single-coat application used for both interior and exterior environments and is available in numerous colors and glosses. In applications requiring a cost-effective way of applying a decorative or functional coating with good color control, anodic acrylic electrocoating may offer the best value. These products are used as a one-coat finish on toolboxes, air diffusers, hangers, and other indoor or mild exterior environments.

CATHODIC EPOXY ELECTROCOATING is the benchmark for corrosion resistance. Widely used in the automotive and automotive parts industries, they provide superior salt spray, humidity, and cyclic corrosion resistance. However, cathodic epoxy technologies generally require a topcoat to be protected from sunlight. Aromatic epoxy-type coatings are particularly prone to chalking and degradation by the UV components of sunlight.

CATHODIC ACRYLIC ELECTROCOATING is available in a wide range of glosses and colors to maximize exterior durability, gloss retention, color retention and corrosion protection. These products are used as a one-coat finish in the agricultural, lawn and garden, appliance, and air-conditioning industries. Cathodic acrylic electrocoating is typically used in applications where both UV durability and corrosion protection on ferrous substrates (eg. steel) are desired. Cathodic acrylics are also used in applications where light colors are desired.

FOUR STEPS OF THE ELECTROCOAT PROCESS

The electrocoat process can be divided into four distinct sections:

1. **Pretreatment**
2. **E-coat bath**
3. **Post rinses**
4. **Cure oven**

NORCOAT processes all parts as follows:

First, parts are cleaned and pretreated with a phosphate conversion coating to prep them for electrocoating. Parts are then dipped into a paint bath where direct current is applied between the parts and electrode. After the paint process, the parts are rinsed to reclaim undeposited paint solids. Rinsed parts go through a dehydration zone and are cured in a bake oven before packing and shipping back to the customer.

POWDER COAT HISTORY & PROCESS

Powder coating – the electrostatic process of coating metal with an organic powder – is environmentally friendly, durable, and can cover almost any metal surface. But it was not always this way.

Powder coating has a complicated history that stretches back over 70 years. Initially, in the 1940s, coatings were flame-sprayed onto metal surfaces, but there was growing concern in Europe over the environmental repercussions of liquid solvent pollution. In the early 1950s, German scientist Dr. Erwin Gemmer began to develop a solution called the "fluidized-bed application" which involved heating or melting thermoplastic resins so that they would bond to metals. It was a far more efficient process than flame-spraying. Gemmer applied for a patent in 1953, and it was issued in September of 1955.

FLUIDIZED BED PROCESS

The development of the fluidized bed application process was one of the most significant advancements in the history of powder coating. For the following decade, the approach was adopted around the world. It provided a thickness of 6 to 20 mils and was used primarily for electrical insulation.

The coatings protected metals from abrasion and corrosion. At the time, the materials used for coating included chlorinated polyether, polyethylene, plasticized PVC, nylon 11, CAB, and polyester. However, by the end of the 1960s, new technologies were being developed to meet commercial demands.

EPS PROCESS

Between 1962 and 1964, a new technique called electrostatic processing was commercialized. It used spray guns to spray powder particles over metals, almost like liquid. Afterward, as with powder coating today, the metal would be heated or "cured" to bind the coating and metal together. This development was created partly to meet commercial demands, but also because concern remained over the environmental effects of solvents in liquid paints. Between 1966 and 1973, thermosetting resins were also developed and can still be found today

Environmental pressures played a crucial role in technological advancements to powder coating. In the United States, The Los Angeles Air Pollution Control District Rule 66 was passed in July of 1966, restricting the emission of solvents. The federal Clean Air Act was passed in 1970 for regulating the emission of hazardous air pollutants. As a result, there was an acceleration in thermoset decorative powder coatings research, and more resources were invested in developing materials, equipment, and dry powder applications. In the 1980s, powder coating was more widely adopted in manufacturing, particularly in the United States and Japan.

Since the 1980s, the powder coating process has advanced continuously. Today's powder coatings contain no solvents and minimal, or often no, volatile organic compounds (VOC). Over the last 30-40 years, liquid coatings have continued to be replaced by modern powder processes. Today there are many more types of resin systems and crosslinkers. Trends suggest that coatings and application equipment will become even more sophisticated and efficient in the future.

In order to facilitate a smooth logistics process, we ask our clients for assistance in proper identification. By tagging the products in addition to matching paperwork, we will be able to provide a higher level of service. The following guidelines make all the difference.

RECEIVING

Preferred Protocol:

- Parts are delivered on forklift accessible skids.
- Parts are tagged with the following:
  - » Company name
  - » P.O. number
  - » Part number
  - » Quantity of each part
- Driver provides P.O. to the NORCOAT receiving team.
- P.O. includes:
  - » Company name
  - » P.O. number
  - » Part number
  - » Quantity of each part
  - » Special masking, packaging, and labeling instructions, if applicable

QUICK TIP

Our paint process specifically loads parts by size category. Separating parts by size when palletizing for shipment, significantly supports expedient processing of your order. Parts should be identified and separated based on their size. This may be done as separate lots on separate pallets, bins, baskets, and/or crates. The classifications are:

SMALL PARTS

1. .01" to 47" at its largest dimension.
2. Parts that are less than 25 lbs.

MEDIUM PARTS

1. 48" to 60" at its largest dimension.
2. Parts that weigh greater than 25 lbs. and less than 40 lbs.

LARGE PARTS

1. 61" to 110" at its largest dimension.
2. Parts greater than 40lbs.

PACKAGING

Unless otherwise specified, standard packaging methods are applied. By default, we bulk pack everything with minimal paper or foam if needed. We readily accommodate special packaging requirements. Please contact our account representative for assistance. We gladly work together to develop and quote a custom solution.

If regular pallets do not work, please deliver parts on returnable racking or crates that work for your application.

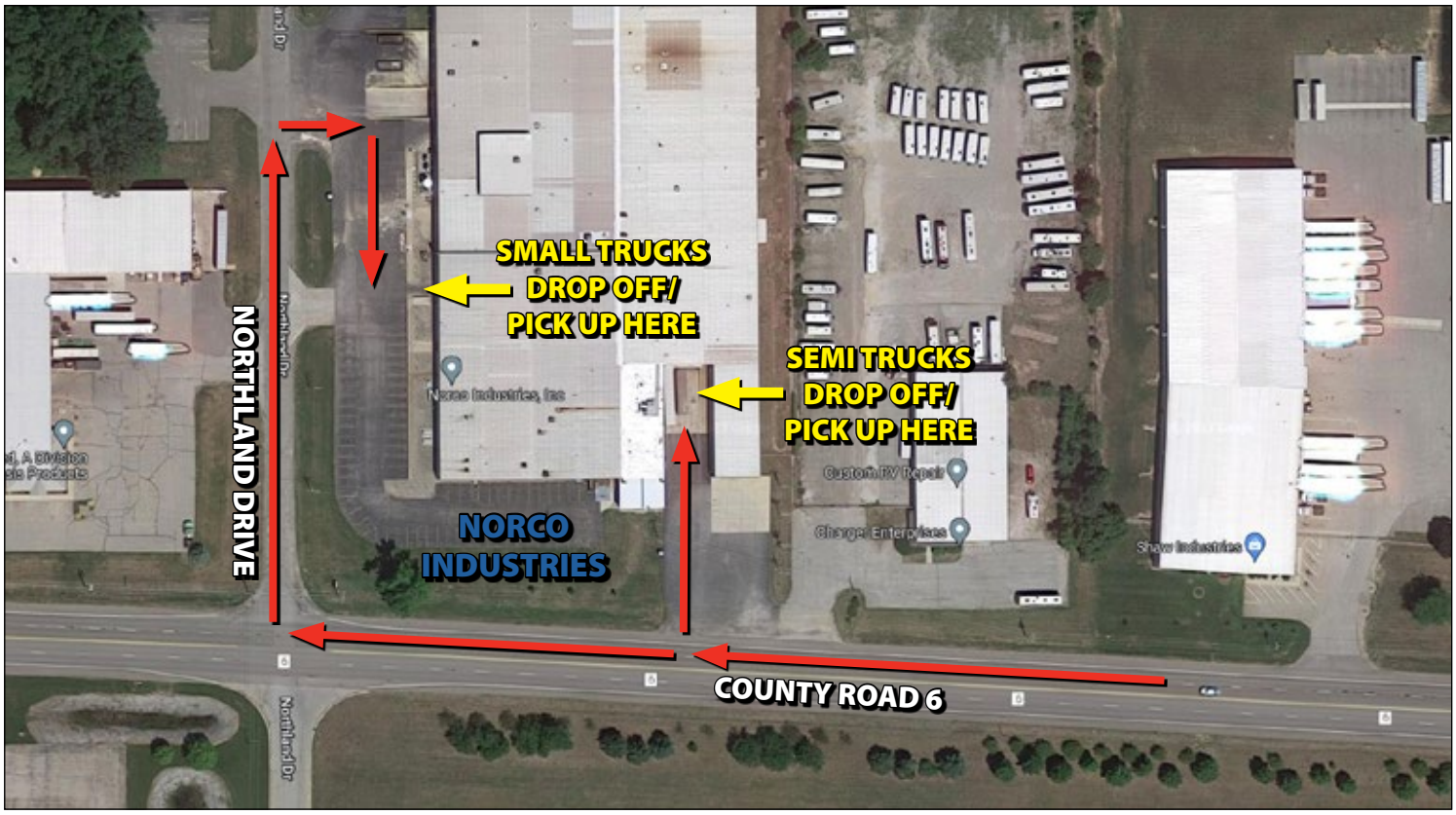
DROPOFF & PICKUP LOCATION

Our address is:

NORCOAT
2800 Northland Drive, Plant 15
Elkhart, IN 46514

We offer two loading options (please refer to map):

1. Small truck, surface loading (on the west side of our facility)
2. Semi-truck and trailer, loading dock (on the south side of our facility and accessible from CR 6)



MASKING

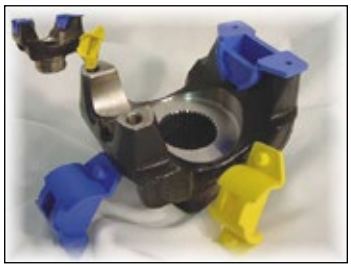
Several items might require masking. Specific masking tapes & plugs are made for electrocoat and powder coating applications.

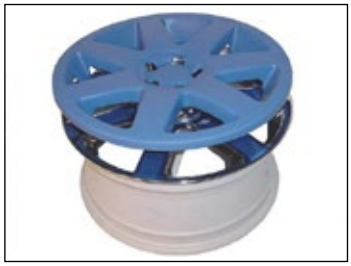
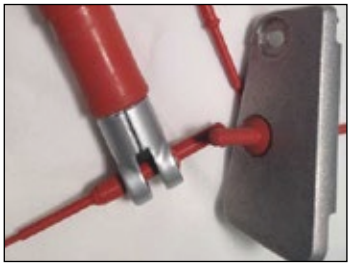
They are as follows:

- High heat tape die-cut tapes
- High heat silicone caps and plugs
- Thread masking for bolts and nuts
- Custom masking can be produced for any configuration of your masking need

We recommend one of our partners, **Hi-Tech Flexible Products**, for masking supply options. See examples below.




QUICK TIP

Standard masking tape, duct tape, & scotch tape are not to be used in the electrocoating or powder coating process. These tapes do not have the properties to withstand the coating process. If used in the coating process, the standard masking will create defects on more than just the part it is on.

PART LABELING AFTER PAINT

If needed, our team can label parts as they come off the paint process. Our account representative will gladly collaborate with your team to determine the labeling requirements and provide a quote.

Preferred Protocol:

- Your provided labels can be attached to the tag that is used to identify the palleted parts.
- Please provide labeling instructions with prints and photos. This will assist us with proper installation.

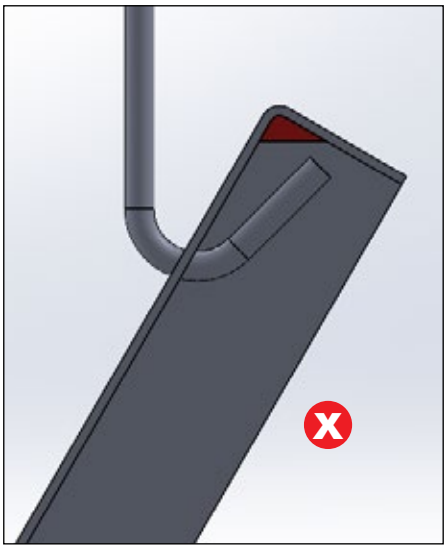
Once parts are received with applicable labels, our receiving team will mark the parts with an indicator to let our production team know that labels will be required.

PART DESIGN REQUIREMENTS

Since parts are suspended by hooks, proper hanger points are required.
Depending on size and weight of the part, we may require one or two hook points.

CATEGORY	SIZE	WEIGHT	HOOK POINT
Small	.01" to 47"	< 25 lbs.	One hole, 1/4", on one side
Medium	48" to 60"	25 < 40 lbs.	One hole, 1/4", on one end
Large	61" to 110"	40 lbs. <	Two holes, 3/8", 72" on center*

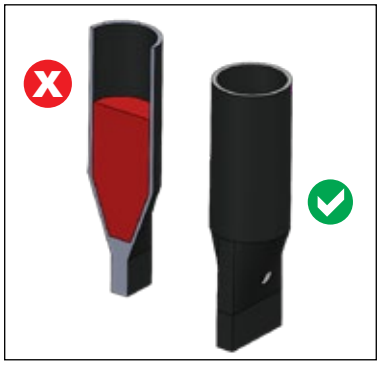
*In some cases, heavier parts will need larger hang holes.



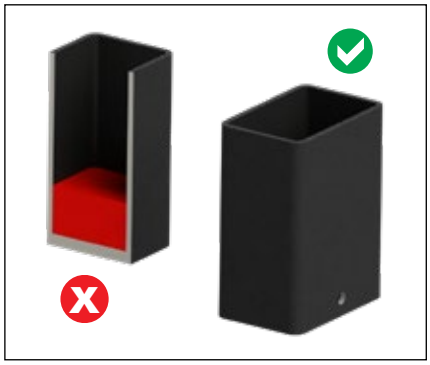
The largest part that we can paint will need to fit in a working envelope of:

30-inch-deep x 54-inch-tall x 110-inch-wide.

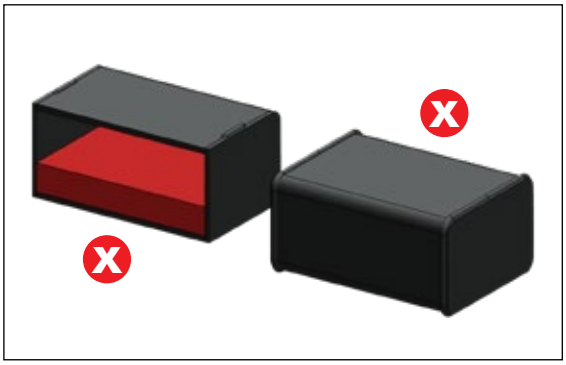
QUICK TIP Fluid retention and air pockets can cause major paint defects. All parts that have tubes or pockets within the part will need proper drainage or air relief. To avoid quality problems, please follow the following design guidelines.



Smashed tube without / with drain hole



Welded box without / with drain hole



Welded box without / with completely welded seams

QUICK TIP Nylon washers or spacers between parts could potentially melt in our oven process.

THINGS TO AVOID BEFORE & AFTER PAINTING

Before the paint process:

- Spray painting
- Standard tape for masking on any substrate
- Liquid anti-spatter spray left on parts after welding for extended periods of time in the heat
- WD-40 or any silicone-based spray lubricant
- Paraffin coolants or oils for cutting or stampings
- Material defects for cosmetic parts (pitting, die lines, etc.)
- Rust or heavily pitted materials from rust
- Designs that hold liquid or air (this can cause serious paint defects)

After the paint process:

- Part modifications
- Welding
- Bending
- Cutting

There are some limitations to the number of substrates that we can paint. The following table illustrates our capabilities.

SUBSTRATE	PAINTABLE	NON-PAINTABLE
Cold rolled steel	✓	
Hot rolled steel	✓	
Aluminum	✓	
Galvanized	✓	
Galvanneal	✓	
Zinc Plated	✓	
Black Zinc Dichromate	✓	
Yellow Zinc Dichromate	✓	
Rhodium Plated	✓	
Hot dip Galvanized Materials	✓	
Structural Steel Unpainted	✓	
Copper	✓	
Brass	✓	
Tin	✓	
Nickel	✓	
304 Stainless Steel	✓*	✗
306 Stainless Steel		✗
316 Stainless Steel		✗
Anodized materials		✗
Powder Coated Materials		✗
Chrome Plated Materials		✗

*Some 304 stainless steel will not paint due to its alloy composition.

On some substrates, laser scale can be an issue. Cutting at higher heat will create more scale than can be removed by our system. Having parts pickled and oiled will remove laser scale and is highly recommended for products needing maximum paint performance.

REQUEST A QUOTE

NORCOAT's main objective is to provide its customers with quality painted products. Our services are a value-added process at a reasonable cost. We continuously strive to improve our processes and customer experience. Within our system's constraints, NORCOAT will comply with your paint standards. All quotes will be processed by our NORCOAT team in a timely manner. Please feel free to reach out to your NORCOAT CSR or sales associate to get your quote processed. Kindly review your project and provide us with the required items and information. This way we can give you the best value for your project.

Please provide a print or photo with the following information:

- Overall size of part
- Material type
- Hole sizes and locations
- Material thickness
- Powder requirements
- Masking requirements
- Packing requirements
- Labeling requirements

Your NORCOAT sales representative can be reached at:

2800 Northland Drive
Elkhart, IN 46514
574-266-4305 (phone)
574-266-3401 (fax)
norcoat@norcoind.com

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