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VIEWKOTE™ U042en\_02\_202004f © 2019, 2020 NIPPON STEEL CORPORATION

# Prepainted Steel Sheets

Our Prepainted VIEWKOTE<sup>™</sup> Steel Sheets are manufactured to fit the wide-ranging needs of our customers. These sheets offer innovative design and improvements in productivity, thanks to our leading-edge painting facilities as well as the effective combination of our independently developed broad range of paints and base steels.

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#### NIPPON STEEL CORPORATION

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Prepainted Steel Sheets

# VIEWKOTE

NIPPON STEEL's VIEWKOTE means high quality prepainted steel sheets. Featuring outstanding coating performance, VIEWKOTE offers substantial improvements in almost all usage scenes.





Superiority

We use a curtain flow coater to achieve coated surfaces that are both smooth and attractive. In addition, deposits of dust and debris are minimized by extensive cleanup measures, resulting in superior quality and coating performance.

### **Manufacturing Locations**



#### NIPPON STEEL CORPORATION

VIEWKOTE offers a wide range of products meeting the needs of all users thanks to its winning combination of specialized production lines and wide variety of proprietary coatings.

Beauty



VIEWKOTE gives users get a broad range of improvements, including reductions in processing as well as space- and energy-saving benefits.



NIPPON STEEL COATED SHEET CORPORATION

### **VIEWKOTE<sup>™</sup> Application Examples**



### **Creating an eco-friendly** environment by eliminating your coating process

#### By using VIEWKOTE, you can:

• Eliminate the coating operations, thereby improving the workplace

Eliminate global environmental problems caused by waste treatment of coatings, waste gas processing, and noxious odors,

Achieve great improvements in productivity by shortening and serializing the production process,

Use coating-related space for other purposes,

Create excellent designs that previously could not be achieved by the post-coating process.





#### Example of the manufacturing process



#### NIPPON STEEL CORPORATION

Main coater

### Product Menu and Fundamental Properties

Examp	les of	Pro	perties

Examples	of Proper	ties				O Excellent O Goo	d 🔺 Fair 🗙 Poo
			General type				
		Paint type		Туре II	Туре 🏾	Туре №	Type V
Evaluation items	Evaluation method Resin		Highly workable type	Balanced type in workability surface physical properties	Stain-resistance type	Highly workable, stain-resistant type (universal type)	Highly corrosion-resistant type
			High polymer polyester	High polymer polyester	High polymer polyester	High polymer polyester	Polyester
Surface hardness	Pencil hardness te	st	F∼H	НВ∼Н	н	F~2H	H∼2H
Workability	T-bend:	20°C (EG/Gi)	0T/2T	3~4T/5~6T	5~6T/—	1T/2T	>8T/—
(T-bend)	without cracking	0°C (EG/Gi)	4T/6~7T	8T/—	>8T/—	3T/5T	_
Corrosion resistance	Salt spray test, 240 hrs	(EG/Gi)	1~3/0~2	1~3/0~2	1~2/—	1~3/0~2	2~3/1~2
		Red	×		•	•~▲	<b>▲</b> ~X
Stain resistance	Marking ink check	Blue	•	•	۲	0~●	
		Black	<b>▲</b> ~X	•~▲		⊙~▲	
Waatharahility	Sunshine	Change of color ( $\triangle$ E)	1.5	1.3	1.9	0.5	1.5
weatheraphity	500hrs	Gloss-retaining rate (G.R.)	63	65	78	94	80
Chemical	5%NaoH × 24hrs	Gloss-retaining rate (G.R.)	85	95	100	96	98
resistance	5%H <sub>2</sub> SO <sub>4</sub> × 24hrs	Gloss-retaining rate (G.R.)	92	99	100	99	93
	Typical applications	5	Lighting equipment	Outdoor air-conditioner unit (back panel), showcase	Refrigerators	Flat-panel TV, digital recorder chassis, car audio chassis, air-conditioner unit, refrigerators, washing machines	Truck gate



### Standards 🛀

Types of coil and cut sheet are indicated as shown below, depending upon the type of substrate used and paint coating. Symbols indicating the type of substrate and the type of paint coating are as shown in (1) and (2).



Note: (\*) N is used when the front side is the surface side of a cut sheet (or the outside surface of a coil), while R is used when the front side is the back side of sheet (or the inside surface of coil).

#### [1] Types of Base Sheet and Symbols

The type of base sheet and their symbols are as shown in Table 1.

#### Table 1. Types of base sheet and symbols

Type of base sheet		Symbol (for products sold by NIPPON STEEL)	Nominal thickness (mm)
	For general use	NSGCC	0.30 or more, 1.2 or less
	Type 1 for drawing	NSGC270C	0.40 or more, 1.2 or less
	Type 2 for drawing	NSGC270D	0.40 or more, 1.2 or less
Hot-dip galvanized	Type 3 for drawing	NSGC270E	0.60 or more, 1.2 or less
(DI IRGRIP)	Type 4 for drawing	NSGC270F	0.60 or more, 1.2 or less
	Type 5 for drawing	NSGC270G	0.60 or more, 1.2 or less
	Grade 400N for structures	NSGC400	0.40 or more, 1.2 or less
	Grade 440N for structures	NSGC440	0.40 or more, 1.2 or less
	For general use	NSACC	0.50 or more, 1.6 or less
	Type 1 for drawing	NSAC270C	0.50 or more, 1.2 or less
Hot-dip galvannealed	Type 2 for drawing	NSAC270D	0.50 or more, 1.2 or less
steel sheet and strip	Type 3 for drawing	NSAC270E	0.50 or more, 1.2 or less
(DURGRIP)	Type 4 for drawing	NSAC270F	0.60 or more, 1.2 or less
	Type 5 for drawing	NSAC270G	0.60 or more, 1.2 or less
	Grade 400N for structures	NSAC400	0.50 or more, 1.2 or less
	Grade 440N for structures	NSAC440	0.50 or more, 1.2 or less
	For general use	NSDCC	0.30 or more, 1.2 or less
Hot-dip zinc-aluminium-	Type 1 for drawing	NSDCD1	0.40 or more, 1.2 or less
magunesium alloy-coated	Type 2 for drawing	NSDCD2	0.40 or more, 1.2 or less
steel sheet and strip	Type 3 for drawing	NSDCD3	0.60 or more, 1.2 or less
(SuperDyma)	Grade 400N for structures	NSDC400	0.40 or more, 1.2 or less
	Grade 440N for structures	NSDC440	0.40 or more, 1.2 or less
	For general use	NSCC	0.40 or more, 1.2 or less
	For drawing	NSC270D	0.60 or more, 1.2 or less
Cold-rolled	For deep drawing	NSC270E	0.60 or more, 1.2 or less
steel sheet and strip	For super deep drawing	NSC270F	0.60 or more, 1.2 or less
	For ultra-deep drawing	NSC270G	0.60 or more, 1.2 or less
	For high-strength processing	NSC390N	0.40 or more, 1.2 or less
	For general use	NSECC	0.40 or more, 1.2 or less
	For drawing	NSEC270D	0.60 or more, 1.2 or less
Electrolytic zinc-coated	For deep drawing	NSEC270E	0.60 or more, 1.2 or less
(ZINKOTE)	For super deep drawing	NSEC270F	0.60 or more, 1.2 or less
((0 · _)	For ultra-deep drawing	NSEC270G	0.60 or more, 1.2 or less
	For high-strength processing	NSEC390N	0.40 or more, 1.2 or less
Electrol de la childre	For general use	NSNCC	0.40 or more, 1.2 or less
Electrolytic zinc-nickel	For drawing	NSNC270D	0.40 or more, 1.2 or less
steel sheet and strin	For deep drawing	NSNC270E	0.40 or more, 1.2 or less
(DURZINKLITE)	For super deep drawing	NSNC270F	0.60 or more, 1.2 or less
·/	For ultra-deep drawing	NSNC270G	0.60 or more, 1.2 or less

Notes: 1) The types of the base sheets and their symbols conform to NIPPON STEEL sales product specifications.

Coating mass depends on the specifications for individual substrates.

3) Chemical composition values are regulated by the various substrates. Cast analysis values are assumed unless otherwise regulated. 4) The tensile test of VIEWKOTE takes place before the coating of the base sheet.

① Tensile tests are not guaranteed for base sheets for general use.

Tensile tests guarantee only tensile strengths in Type 1 for drawing, for structural uses, for drawing, and for high-strength processing.

Product side (surface side) (\*) Symbol indicating the type of back side paint coating (2) Symbol indicating the type of paint coating on front side

#### [2] Types of Paint Coating and Symbols

The type of paint coating and their symbols are as shown in Table 2.

#### Table 2. Types of paint coating and symbols

Type of paint coating	symbols
Highly workable type	1
Balanced type in workability/surface physical properties	2
Stain-resistant type	3
Highly workable, stain-resistant type (universal type)	4
Highly corrosion-resistant type	5
Heat resistant, non-stick type	6
Highly corrosion- and weather-resistant type	7
Type with initial anti-end-surface corrosion measures	8
Without backing coat **1	0
Type capable of adhesive bonding	Α
Rubber adhesive application process-eliminating type	В
Ultra-deep drawable type	С
Semi-heat resistant/stain resistant type	D
Electroconductivity type	E
Heat absorption type	F
Lubrication type	J
High reflection type	К
With backing coat *1	S
Agreed standard products	Х

of prepainted sheets in order to provide a minimal degree of corrosion resistance.

### Available Size Ranges

#### [1] Coil Products (Thickness, Width)

#### **1**DURGRIP base sheets

(for general use, Types 1-3 for drawing)



DURGRIP base sheets (400N grade for structural applications)



#### 3 Cold-rolled sheets / ZINKOTE / DURZINKLITE base sheets



The items mentioned above are standard products; please consult us if you have requests for other substrate specifications or sizes.

### Precautions in Use

#### 1. Forming

#### 1 Die design

When working with prepainted steel sheet, the die coming in contact with the paint coating should preferably be coated with hard chromium, and it is recommended that the die surface be ground as finely as possible to prevent galling or scoring from occurring on the paint coating.

#### 2 Clearance

The adjustment of the clearance between punch and die should be based on the thickness of the base sheet plus about 70% of the combined thickness of the paint coating and the protective film.

#### 3 Blank holding force

Because the coating surface is slippery, better results will be obtained by applying a somewhat stronger blank holding force than usual.

#### 4 Lubricants

To choose the right press oil best suited for each fabricating condition, it is necessary that press oils be checked in advance by tests or some other means.

Please contact us before using press oils.

#### 5 Heated forming

As a rule, the design of a paint system takes the service environment into consideration. Generally speaking, the formability of the paint coating is dependent on temperature and should therefore be improved by heating.

#### 6 Handling after forming

When prepainted sheet is moved after forming, it is recommended that paper, foam plastic sheet or the like be used to avoid damage to the paint coating.

#### 2. Joining Methods

For effective use of VIEWKOTE, it is desirable for product design to take into consideration joining methods and forms of construction that allow cut edges to be hidden from view.

#### 1 Mechanical joining

A wide range of joining/fastening methods are available, including screws, bolts, rivets, lock seaming, and jointing.

#### **Examples of Joining Methods**



#### 2 Electrical joining

When using an existing spot welding process, the paint coating in the weld area must be removed prior to welding. Remove the paint coating with a grinder or a sandpaper or by burning. Special welding practices such as projection welding (ring-shaped projection also available) and stud welding are applicable. These welding methods allow the reverse side of VIEWKOTE to be welded to other metal without damaging the surface of the paint coating.

#### (Example of projection welding)

This procedure is designed to concentrate the thermal energy of welding process locally and to complete the operation before the welding heat can spread to the surrounding area. For this purpose, the steel sheet to be deposited (attachment) is provided with globular or ring-shaped projections using punch and die. This permits the welding to be completed by a localized, short-term generation of heat, thus eliminating any deleterious effect on the resin paint coating.



#### **3** Adhesive joining

Since the selection of adhesives and coating systems depends on the type, intended use, and decorative design of the materials to be bonded, please consult us.

#### **3. Protective Film**

#### ① Effects on paint coating

Normally protective films do not affect the paint coating. On rare occasions, the surface of the paint coating immediately after removal of the protective film shows a somewhat higher level of gloss.

However, with the passage of time or by heating, the original gloss of the paint coating will return.

When VIEWKOTE with a protective film is subjected to localized pressure for a long period of time due to stacking or other storage condition, there may be instances when surfaces will look black or white through the protective film, and when the protective film is removed the surfaces may show uneven glossiness. The unevenness will return to normal as time passes or by heating.

#### 2 Bonding strength

Depending on the method or degree of fabrication, different levels of bonding strength of protective films can be selected. Since the bonding strength of some types of protective films is dependent on temperature, it is advisable that protective films be removed at temperatures ranging from 20° to 25°C

Removal of the protective film immediately after completion of the product is recommended. If the protective film remains bonded to the product for a long period of time, the film may be difficult to remove, or the properties or color of the coating may deteriorate. Particular care should be taken when VIEWKOTE is exposed to direct sunlight or ultraviolet rays or to environments with temperatures of 40°C or more.

#### Precautions in Use

#### 4. Protection of Cut Edges

- ① Starting from the design stage, we recommend using a construction method that hides cut edges to improve the appearance of the product.
- (2) We recommend shaping the structure so that water does not collect where cut edges are exposed.
- ③ We recommend shaping the structure so that water does not contact the cut edges even if water does collect where cut edges and other processing has taken place. (structural countermeasures such as hemming processing)

To ensure proper end face corrosion resistance, please consult us for recommendations of the right type of coating and the right coating mass for the substrate where VIEWKOTE is used, according to the usage environment and application.

#### 5. Cleaning

It is recommended that stains due to oil and the like be rinsed using alcohol, benzine or a neutral detergent.

Avoid the use of ketone, ether thinner or trichlene, because they may damage the paint coating. Great care should also be given to the fact that a hand- or sweat-stained portion, if left as it is, may discolor.

When a solvent or other chemical is used for cleaning VIEWKOTE, wipe it off thoroughly before packaging. If subjected to heating or similar treatments, VIEWKOTE should be packaged after it has cooled to normal temperatures.

#### 6. Storage

VIEWKOTE should be stored indoors in order to prevent rust due to wetness and also to prevent hardening of the paint coating due to low temperatures in winter or softening due to elevated temperatures in summer.

Storing VIEWKOTE for extremely long periods may pose problems in press-forming. When VIEWKOTE has been specified for delivery with a protective film attached, be sure to apply the first-in first-out method because the film may be hard to remove after the product has been stored a long time.

### Reference

#### Standard Mass Table of unit mass

			-
Nominal co	DUR	GRIP	ZINKOTE
Standard thickness mm	Z12	Z08	20/20
0.30	2.538	_	_
0.40	3.323	3.260	3.176
0.50	4.108	4.045	3.961
0.60	4.893	4.830	4.746
0.70	5.678	5.615	5.531
0.80	6.463	6.400	6.316
0.90	7.248	7.185	7.101
1.00	8.033	7.970	7.886
1.20	9.603	9.540	9.456

#### 7. Repairs

Especially when cutting, press-forming, roll-forming or handling VIEWKOTE during transit, use great care not to damage the paint coating. Should it be grazed or scratched by accident, please consult us for repair paint systems.

Use special care when handling VIEWKOTE because it is an integral part of the finished product and should be used in the condition it was received.

#### 8. Aging

Generally, steel sheets tend to show deterioration in quality over time e.g. degraded formability, stretcher stains, and coil breaks. To avoid this, usage at the earliest possible time is recommended. However, this problem can be avoided if products with aging resistance are selected.

#### 9. Attention 🚹

- When removing (cutting) coil binding hoops (bands) for use, make certain that the end of the coil is directly beneath the coil center in order to prevent the end of the coil from sudden springing out of the coil end; or, be certain to conduct the removal in a place where safety can be assured and no danger is posed if the coil end were to spring out upon release.
- Coils are formed by winding flat sheets. When the binding hoops or other external forces that keep the sheet in coil form are removed and the coil end is freed, the coil end will spring outward to return to a flat state. Further, there are also cases when the coil bindings become loose, allowing the coil to spring out. Such cases may endanger nearby workers and cause damage, so careful attention must be paid when removing the coil binding hoops (bands).

#### 📕 10. Warning 🥂 🛽

kg/m<sup>2</sup>

 Falling and rolling coils are very dangerous, as is the collapse of piled sheets. To prevent such accidents during storage, due care should be paid to storing products in a stable, secure state.

### **Guide for Making Inquiries**

Please furnish the following information:

Application, part identification
Shape of fabrication
Service environment
Existing materials in use
Required properties of paint coating, etc.
Surface color, gloss
Surface specifications
Whether a protective film is required or not
Sizes
Whether recoating is necessary or not

### Packaging and Marking Series

Products are shipped as packaged to protect them from damage during transit and in storage. Products are identified by a packaging label attached to one end of the package. The label is a good aid for acceptance and storage of products. The information on the label contains the following.

#### [1] Nominal Label

VIEWKOTE	
SPECIFICATION	COATING
PINSGU2/UU-42IN: DUA///DUVE2	208
0.50 X 1088 X C	Ö
ROSS MASS(THEO) GROSS MASS(THEO) 6.472KG 6.502KG	LENG
INSPECTION NO. CONTRACT NO. CASE NO. 5100967	

#### NIPPON STEEL CORPORATION KIMITSU AREA



#### [2] Example of Packaging



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lo.	Line No.	Information on the label
	Brand name	VIEWKOTE
	Specification	Code for specification and color symbol
	Coating mass	Symbol for coating mass
	Size	Ordered size is indicated
	Number of sheets	For cut sheets only
	Mass	Mass (actual or theoretical) is indicated, dependin on the conditions of contract
	Case No.	Package No.





VIEWKOTE<sup>™</sup>: NIPPON STEEL's Prepainted Steel Sheets Premium Series

# **High Reflection Type VIEWKOTE**

### **Features**

- Diffuse reflectivity of 92-98%.
- ② Can be deep drawn.
- It as excellent basic properties including corrosion and chemical resistance.
- Both electromagnetic shielding and temperature control can be achieved by selecting heat absorption types with good electroconductivity in the back coating.
- Chromate-free and eco-friendly.



#### Improved to diffuse reflectivity of 10% or more.

\* Can be designed with reflectivity of 92 or 98%, depending on the application.







Typical performances are shown below.

No.	Test item	Test conditions	Test results
1	Reflectivity Diffuse reflectivity, wavelength 555nm; Spectrophotometer UV-3100PC made by Shimadzu Corporation		92-98%
2	2 Workability Cylindrical drawing : Drawing ratio 2.0 / punch; die R3mm		No cracks
3	Corrosion resistance 8 hrs of salt spray + 16 hrs rest x 3 cycles		Nothing abnormal in appearance
4	Acid resistance 5% HCl drip : normal temperature, 24 hrs		Nothing abnormal in appearance
5	Alkali resistance 5% NaOH : normal temperature, 24 hrs		Nothing abnormal in appearance
6	Heat resistance	70°C, 240 hrs	Nothing abnormal in appearance

#### Test conditions

Diffuse reflectivity, wavelength 555nm, spectrophotometer UV-3100PC made by Shimadzu Corporation.



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VIEWKOTE<sup>™</sup>: NIPPON STEEL's Prepainted Steel Sheets Premium Series

**Self-Cleaning Type VIEWKOTE** 



- Hydrophilic coating vastly improves resistance against rain drop stains.
- Offers high workability thanks to optimal substrate design.
- Iso offers excellent weatherability and stain resistance in processed areas.
- 4 A wide range of color variations, including metallic tones.
- Chromate-free and eco-friendly.



Steel Sheet

## Comparison of the Self-Cleaning Type and Conventional Type VIEWKOTE —

Below are the results of comparisons of resistance to raindrop stains. For outdoor applications, the Self-Cleaning Type was found to be superior to conventional VIEWKOTE.

#### Flat sections



Processed sections



Outdoor exposure for 1.5 years at Kimitsu City, Chiba, Japan (industrial zone)

After one month of outdoor exposure at Kimitsu City, Chiba, Japan (industrial zone) (Conditions: plate thickness 0.5mm, zinc coating Z08, steel grade SGCO2, drawing ratio 2, BHE 1t)

### Examples of Applications

• For outside panel of hot-water supply system, outside panel of outdoor air-conditioner unit, range hoods, etc. However, not recommended for paint refinishing applications

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VIEWKOTE<sup>™</sup>: NIPPON STEEL's Prepainted Steel Sheets Premium Series

# **Antistatic Type VIEWKOTE**

### **Features**

- Prevents static electricity caused by friction from conveyors and rubber suction disks in the processing/production process.
- Reduces dust adhesion caused by static electricity.
- Seduces electric shocks caused by static electricity.
- Ohromate-free and eco-friendly.

## Comparison of Electrostatic Properties with Conventional VIEWKOTE

#### • Example: Comparison of charged voltage



#### Experiment conditions

Measurement of the charged voltage of the coating surface by non-contact type static electricity measuring apparatus immediately after VIEWKOTE sample (70×150mm) makes contact with a piece of neoprene resin (50×100mm) and is then detached.

### Prevention of Dust Adhesion

In the past, most antistatic coatings simply facilitated the discharge of the electric charge.

Antistatic Type VIEWKOTE does more. It actually prevents objects from becoming charged with electricity from friction.

Thus, Antistatic Type VIEWKOTE prevents dust adhesion, even during electric charging.

• Example: Prevention of dust adhesion (marks left by rubber suction disks)



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### Example of Application

Refrigerator side panel, etc.





Steel

Sheet



**VIEWKOTE™: NIPPON STEEL's Prepainted Steel Sheets Premium Series** 

**Orange-Peel-Surfaced VIEWKOTE** 

### **Features**

- A pebbled surface like that of an orange peel is achieved by special beads in the coating. These beads then melt during heating when the coating is enameled.
- This coating improves processing yield by making handling scratches less visible.
- Its workability, chemical resistance, and other basic properties are the same as conventional VIEWKOTE. (Can also include antistatic property.)
- Ohromate-free and eco-friendly.



Examples of Basic Properties and Improvement of Yield •

#### Example of basic properties

Example: Orange-Peel-Surfaced VIEWKOTE

Name	Pencil hardness scratch test (see Note 1)	T-bend at 20°C (see Note 1)
Orange-Peel-Surfaced VIEWKOTE	${ m HB} \sim { m F}$	$1T \sim 4T$

Note 1: Determined by visual inspection

Example of yield improvement

	Conventional VIEWKOTE	Orange-Peel-Surfaced VIEWKOTE
Defect rate from scratches during handling	> 5%	nent < 2% (▼3%)

\* Example measured on the same production line



#### Examples of Applications

 Outside panel of outdoor air-conditioner unit, oil-fired hot-water supply, refrigerator, washing machine, etc.



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