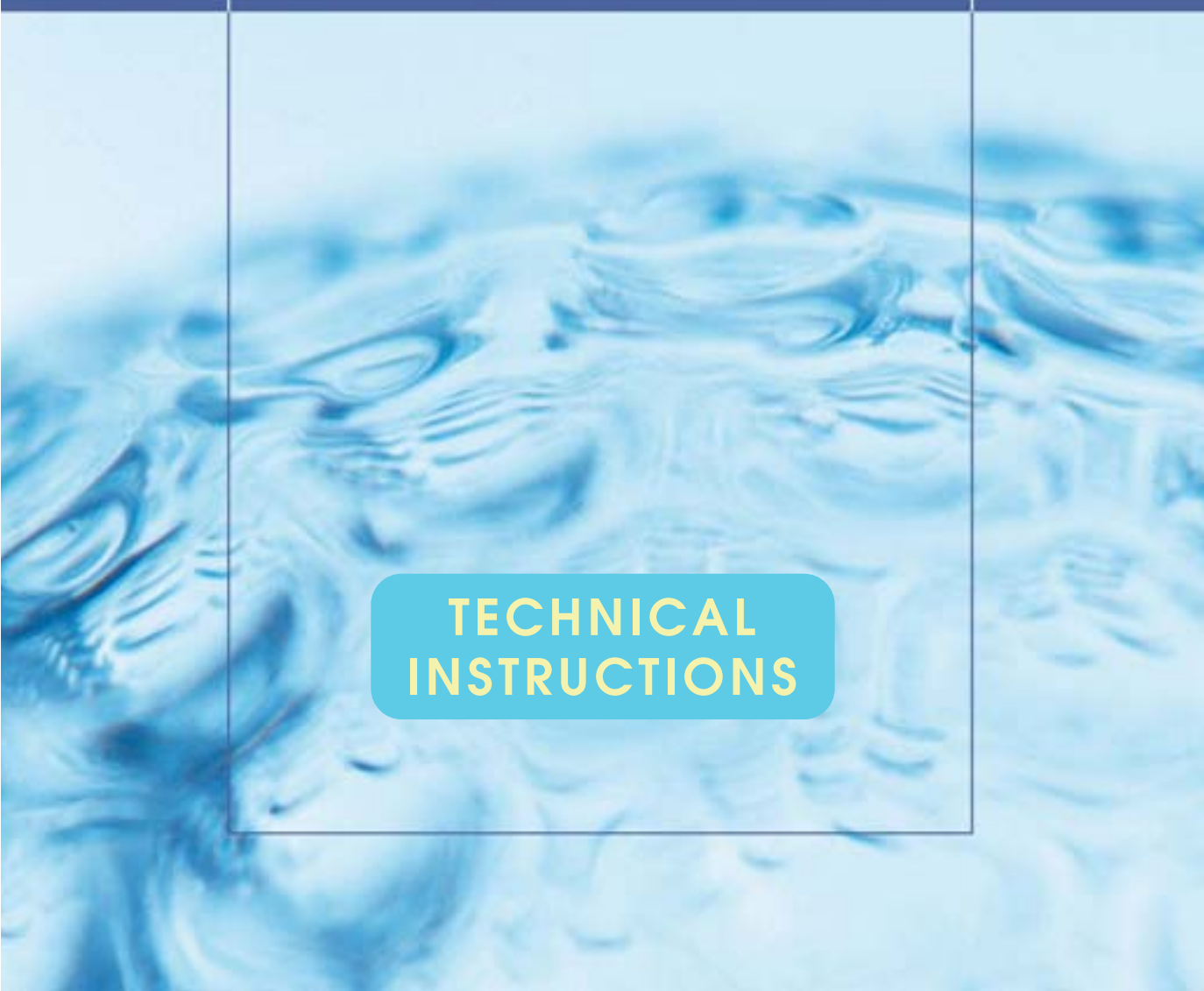
Noritake

Super Porcelain EX-3



TECHNICAL INSTRUCTIONS

Noritake

Super Porcelain EX-3

Tradition and Innovation in Ceramic Technology

Noritake has 100 years of successful experience in ceramic technology. It is world famous for its exquisite china. During the past few decades, it has used its expertise in applied ceramic science to become a world leader in ceramic electrical insulators and abrasive materials. In 1987, Noritake brought its knowledge and years of experience to the dental field by developing and introducing NORITAKE SUPER PORCELAIN EX-3, a complete dental porcelain system of the highest quality.

Clinical cases contributed by : Gerard. J. Chiche, DDS
Restorations fabricated by : Hitoshi Aoshima, RDT

- **Reproduction of Natural Tooth Color**
- **Outstanding Resistance to Fractures**
- **Outstanding Resistance to Greening**
- **Natural Fluorescence**
- **Exceptional Handling Characteristics**

Contents

Distinctive Features

Natural & Beautiful

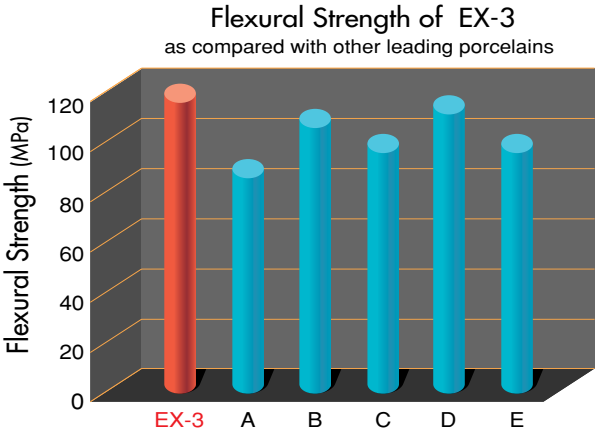
Before

After

Laminate Veneer Restorations using EX-3 and Screening Porcelain

Mechanical Properties

EX-3 has strong mechanical property among available PFM porcelains.



Paste Opaque EX-3

- Easy to use
- Thinner coat
- Allows more space for porcelain build-up
- Complete masking of metal oxides
- Prevents blackline at margin

Thickness comparison

Powder opaque

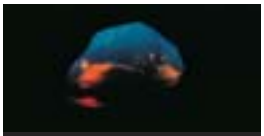
Paste opaque of other company

Among the baked layer, we can find random minute holes.

Noritake EX-3

Luster Porcelain

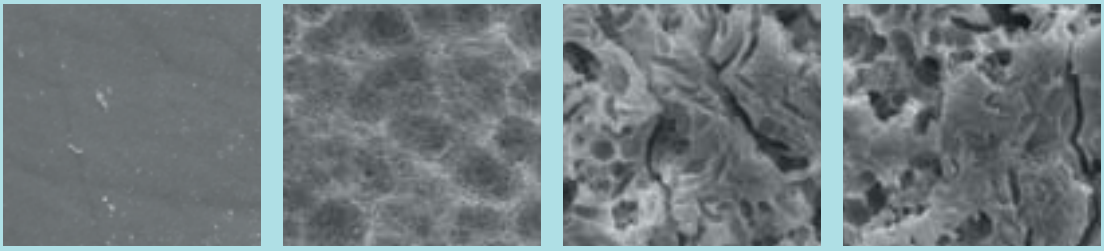
- **Natural opalescence**
- **Fine polishable surface structure**
- **Less wear of the opposing tooth**


Raw material of Luster Porcelain


Luster Porcelain under the transmissive light

Because of the fine particle size of its composition, Luster Porcelain can achieve the selective reflection which assures the Opalescence seen in the natural teeth.
Noritake Luster Porcelain exhibits minimal wear in the mouth due to the smaller and consistant particle size resulting in less wear of the opposing teeth.

Comparison with natural tooth and other low wearing porcelains


Natural tooth | Noritake Luster Porcelain | Company E | Company B

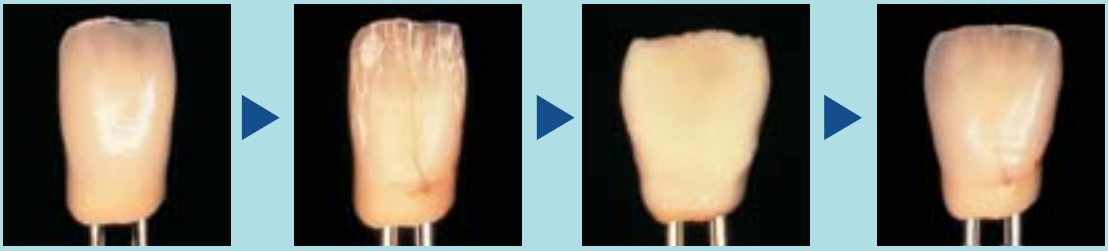
testing done after acid etching of porcelain with SEM at 3000 magnification

Internal Stain

Internal Stain was first developed by Mr.Hitoshi Aoshima.

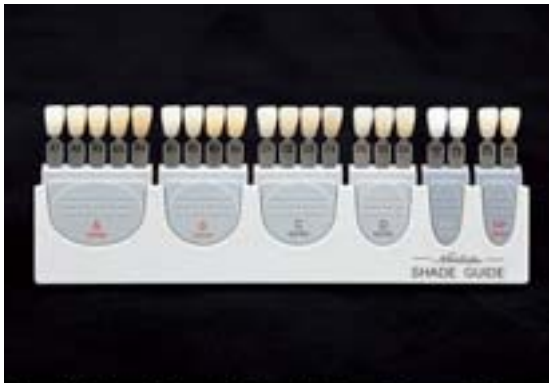
- **Easy to reproduce the characterizations of natural tooth structure**
- **Can see characterizations before baking**
- **Matched CTE for EX-3**

Steps for IS


Baked Body and Enamel | Apply IS as if drawing on a canvas. | After IS is baked, build-up with Translucent | Finished crown

Recreation of the natural dentition

With its outstanding resistance to greening and pinkish shade, Noritake Super Porcelain EX-3 has been proved to simulate the bluish white fluorescence of the natural dentition successfully by most analysis reports and ceramists. Furthermore, assured by the excellent chroma and brightness balance between Opaque and Body, even in the case of insufficient space of porcelain build-up, the natural simulation can be realized without the permeation of Opaque shades.



Noritake Shade Guide

Noritake Shade Guide is developed utilizing Noritake shade concept that is less greenish color and more pinkish color. It is composed of four basic shade series and two Noritake original shade series. Two series of Noritake original shade are intermediate shades ($NP_{1.5}$, $NP_{2.5}$) and bleached shades (NW_0, $NW_{0.5}$).

About n Color Shade

To improve the recreation of Noritake Shade, n color shade contains chroma intensified Body and Paste Opaque of the shade. With the intensified chroma, it even can be used in the case of insufficient space of porcelain build-up.

Metal Framework Preparation

Preparation Form of Abutment Tooth

Please make sure to keep an appropriate space for the incisal edge, the labial side and the lingual side in abutment tooth. Confirm the preparation form of abutment tooth. Wax the metal framework from for build-up of porcelain.

Metal framework adjustment

After the necessary adjustment of the metal framework, proceed a smooth surface treatment in order to keep the porcelain application in the same thickness. The appropriate thickness is 0.3mm for precious alloys and 0.2mm for Ni-Cr alloys. Use an alumina point or a carbide bur for precious and semi-precious alloys; use a carborundum point for Ni-Cr alloys. To ensure a good bond between the porcelain and the alloy, sandblasting is necessary with 50 micron of aluminum oxide. For the yellow color precious alloy, use the glass beads for the sandblasting.

Degassing

Follow the instructions of the metal manufacturers for degassing after the cleaning in aceton ultrasonically.
Do proceed the degassing in order to increase the bonding between the porcelain and the alloy.

Opaque Porcelain (Paste or Powder Type)

Paste Opaque

Scoop out the desired amount and the desired shade of Paste Opaque or base paste (POBA) and put it on the palette. The surface of Paste Opaque is covered with extra liquid in order to avoid drying. Please incline the jar and clip up from the no-liquid part.

Don't mix liquid with paste opaque inside the jar.
Don't dispose liquid from the jar.

attention When using semi-precious alloys containing high palladium with copper or Ni-Cr alloys without Beryllium or Co-Cr alloys, use Base Paste (POBA) for the first application to prevent greening of the porcelain. After POBA is applied, 100% of the metal coping's color should be hidden.

Wash Application (Shade Paste Opaque or POBA)

Be sure the surface of the metal framework is completely free of moisture. Using the tip of the brush, rub the surface with a small amount of Paste Opaque to form a very thin layer.

attention Only dry brush should be used. DO NOT mix with even a small amount of water.

1st Application (Shade Paste Opaque or POBA)

After a thin layer is rubbed, keep coating the metal framework with Paste Opaque.

Shade Paste Opaque : 70% of the metal color should be hidden.
POBA : 100% of the metal color should be hidden with thicker application.

Do not need too much condensation for paste opaque.

attention Dilute the desired amount of Paste Opaque with Paste Opaque Liquid. Be careful that over-dilute will lead to fractures after baking.

Clean Up the Internal Surface

Bake the metal framework after making sure that no residue remains. If Paste Opaque residue is found, use a dry brush to remove it from inside of the metal framework. After the first baking, the surface of the opaque should be a little glossy.

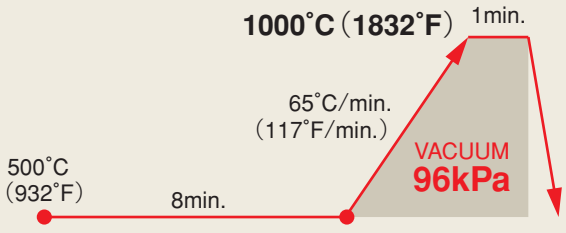
See page 37 (Baking Schedule Type A or B)

attention Set the idle temperature of the furnace to under 500℃ (932˚F) in order to avoid the rapid heating.

POBA Application

for Co-Cr alloys
Ni-Cr without Beryllium alloys
Semi-precious alloys containing high palladium with copper

Baking Schedule



Ideal Surface Situation

Before Baking After Baking

If you can't see glossy surface after POBA baking, please extend holding time by one more minute at 1000˚C (1832˚F) without vacuum.

2nd Application (Shade Paste Opaque)

Apply the second layer of Paste Opaque until the color of the metal framework is completely covered. When the first application was formed with POBA, the second application should be done with the desired shade of Paste Opaque. Be sure that no Paste Opaque residue remains inside of the metal framework. After the second baking, the surface should be a little glossy as seen after the first baking.

See page 37 (Baking Schedule Type B)

Paste Opaque Modifier Application

The Paste Opaque EX-3 Modifier can be mixed with Paste Opaque EX-3 to customize the shade or can be applied alone for minor modifications. When Base Paste (POBA) is applied as the first layer, only use Modifier during the second application after the base paste is baked. When Modifier is used as a stain, dilute it with Paste Opaque Liquid (PO Modifier Liquid) to make desired viscosity and apply during the second application.

attention Apply earth brown or reddish brown separately. If earth brown or reddish brown is mixed with other shades, the desired color can not be obtained after baking.
The desired color can be changed after baking due to the storage condition. Internal Stain can be used on Paste Opaque also.

Preparation of Opaque Mixture

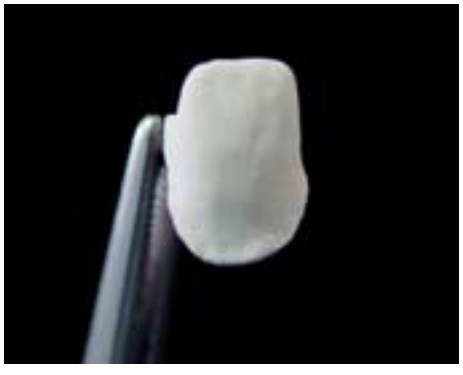
Pour the suitable amount of Opaque powder and mix it with Opaque Liquid.

attention DO NOT mix Opaque powder with Paste Opaque. If Opaque powder has to use with Paste Opaque, only apply Opaque powder after the first Paste Opaque is baked.

Wash Bake

Wet the metal framework surface with a moist brush. Then apply a thin layer of Opaque to the surface with an instrument or a brush and bake it.
Follow the baking schedule precisely.

See page 37 (Baking Schedule Type C)



Application of 2nd Opaque Layer

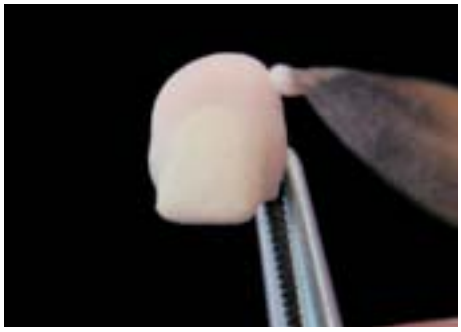
After the completion of the first Opaque layer, apply the Opaque of 0.3mm thickness to cover the metal color and bake it.

See page 37 (Baking Schedule Type D)

2nd Baking

The surface should have egg-shell gloss appearance after the second baking.

Build-up Techniques of Porcelains



Cervical Porcelain

Build-up of Cervical Porcelain

Refer to Color Combination Table to mix Body and Cervical for the desired cervical color. Apply the mixture of Body and Cervical at the gingival and the proximal regions. After adequate condensation, place the crown onto the die. If Cervical is not used, apply Body in the same manner.

See page 35 (Color Combination Table)

Body Porcelain

Build-up of Body Porcelain

Build up with the desired Body color. Match the dimension and form to the symmetric tooth in order to recreate the shade precisely.

Build-up of Body porcelain is accomplished. Keep a 1.5～2.0mm thickness on the lingual side of the incisal edge in order to make the cut-back easy.

Cut-back

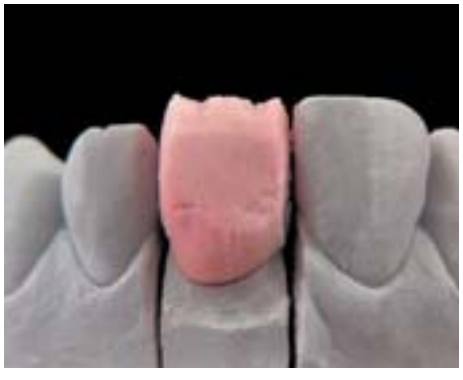
Cut back Body in order to make a space for building up Enamel Porcelain. First, divide the crown into three parts along the length and mark the guidelines with a knife.

On the labial surface, cut back one-third part from incisal edge (about 1.0mm to the lingual side) and connect the guideline. Then, divide the incisal edge into three parts from the mesial side to distal side and mark the guideline.

Cut back the central one-third part about 0.3mm on the labial surface.

Cut-back of Proximal Surface

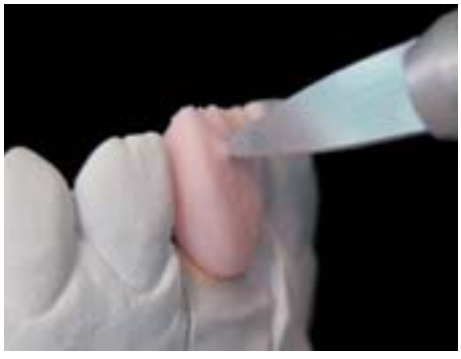
Cut-back the proximal area (about 0.5mm) with a cutting-knife to the lingual side.



Create the Mamelon Structure

Create the mamelon structure with reference to the three guidelines on incisal edge.

Some irregular structure can recreate natural feeling.



The Thickness Confirmation

Confirm the thickness of porcelain after the build-up of Body. The minimum thickness of Body porcelain should be at least 0.8mm.

Opacious Body, see page 21.

Enamel Porcelain

Build-up of Enamel Porcelain

Build up one-third of the cut-back incisal edge with Enamel Porcelain. Over-built-up of Enamel porcelain causes the whiter shade. Be careful of the build-up thickness.

Don't apply the Enamel porcelain to the lingual side. Smooth the lingual surface with an instrument.

Build-up of Translucent Porcelain

Build up translucent porcelain to cover the whole crown surface.

Luster Porcelain, see page 27.

With the consideration of shrinkage, build up the translucent porcelain to 10% larger than that of the symmetric tooth.

The translucency degree of the translucent porcelain is as below:

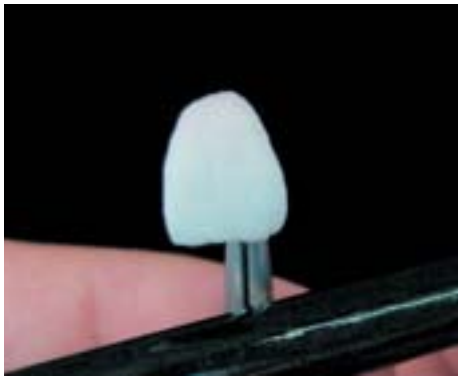
$T_x > T_0 > T_1 > T_2$

In four translucent shades, Tx shows the highest degree of transparency, and then, T_0, T_1, and T_2 shows the lowest degree of transparency.

Apply the translucent porcelain to the lingual side.

Build-up of Proximal Area

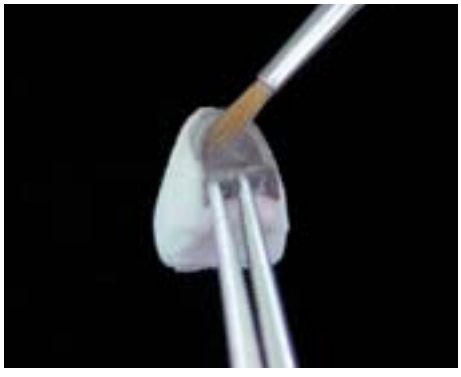
Remove the metal framework from the die and add the Translucent to the shortage part of the proximal area.



Condensation

To minimize shrinkage, hold the crown with tweezers and repeat the condensation with an instrument for 2 or 3 times.
Be careful not to do the condensation too much in order to avoid crumbling.

Brush off the excess porcelain with a dry brush.



Clean Up the Internal Surface

Examine the internal surface and eliminate the contamination with a dry brush.

Baking of 1st Body Porcelain

The surface should be egg-shell like appearance after the first body baking. Any shortage can be corrected by adding porcelain and baking again. In that case, the baking schedule should be as same as the first body baking. In the case of correcting the contact area with a little porcelain, the highest baking temperature should be about 10 degrees lower than the baking schedule.

See page 37 (Baking Schedule Type F, G, H)

Morphological Correction

Morphological Correction

First, start the morphological correction from the proximal area. Polish it by using the straight part of the Meister Point(DP-05), which makes it easy to modify the contact area.

Likely, create the labial groove with DP-05. Proceed it by vertical direction first, then by horizontal direction.

Use Meister Point(DP-02) to create the serration and the natural tiny grooves.

Use Detail Checker to check the surface texture and the shade in the middle of morphological correction. Glossy surface can be appeared by applying Detail checker thinly on the surface.

The Final Polish with Meister Cones

Perform the final morphological correction with the reference of the symmetric tooth. Polish the roughness specially on the proximal and margin area with Meister Cones.

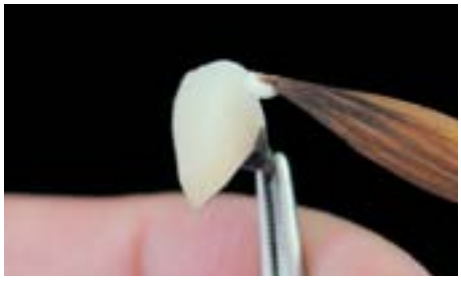
Polish with Pearl Surface C and the Glazing

Polish with Pearl Surface C before glaze baking.

See page 37 (Baking Schedule Type K, L)

Polish with Pearl Surface F

Perform a fine polish with Pearl Surface F to achieve a partial gloss after self glazing in a lower temperature (30-40℃ lower than the Body baking temperature).



Build-up of Add-On Porcelain

Any shortage can be corrected by adding Add-On porcelain (ADT, ADB) after the glazing. It can be done by baking it simultaneously with the glazing without vacuum.

See page 37 (Baking Schedule Type O)

ADDMATE, See page 29

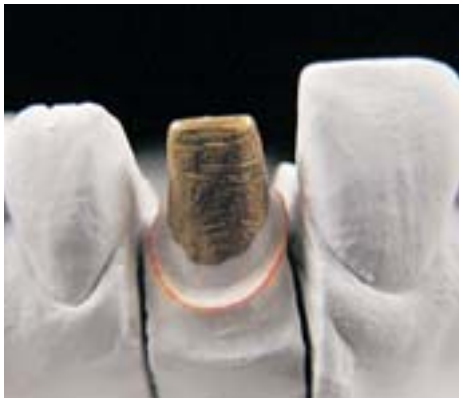
Completion

Finished crown in the mouth.

Margin Porcelain

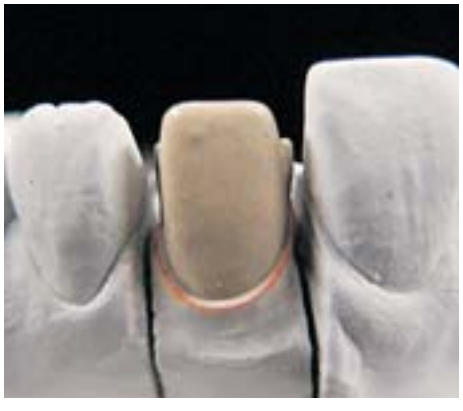
Special Features

① Because of its small shrinkage, the margin porcelain retains a good fitting after baking. Furthermore, it can avoid rounding off after the consecutive bakings of body porcelain.
② With its appropriate opacity, 13 basic shades can recreate the excellent natural chroma around the cervical area.
③ A new additional shade “Clear Margin” has been introduced to recreate a more vivid appearance.



Preparation Form for Porcelain Margin

In order to fabricate a porcelain margin, a shoulder or a deep chamfer is required. The common bevel chamfer preparation is too thin, which might cause the breakage and make the color simulation difficult.

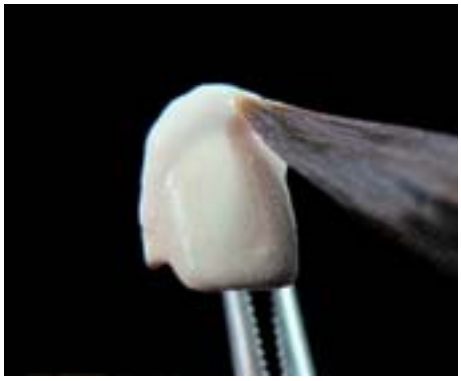


Metal Framework Form

The porcelain margin of the metal framework should be made approximately half (1/2) of the width on the shoulder. Following the instruction, apply Opaque and baking.

Magic Separator Application

Apply Noritake Stone Hardener or Cyanoacrylate thinly on the margin area of the abutment tooth. Remove the excess.
Apply Magic Separator after it is dried.



Build-up of Margin Porcelain

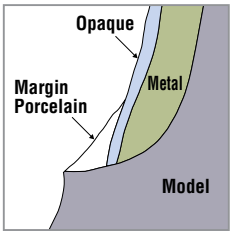
Mix Margin Porcelain with Forming Liquid or Magic Former.

Apply the adequate amount of Margin Porcelain to the gingival part. Make sure if the inside of the metal framework is clean. Then, put the metal framework onto the abutment die.

NOTE Margin Porcelain mixed with Magic Former becomes hard after drying.

Application on the Die

Press Margin Porcelain to the cervical area with a spatula. Do not apply too much Margin Porcelain in order to avoid the opacity.



Condensation

In order to minimize the shrinkage, repeat the condensation with an instrument.

Brush off excess Margin Porcelain with a dry brush.

NOTE Please dry enough when Magic Former is used.

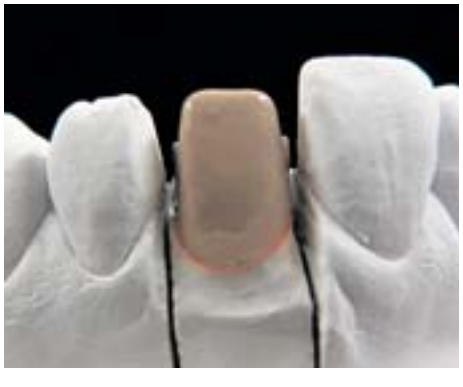
Removal form the Die

Carefully and gently twist and pull the framework upwards away from the die to remove.

Internal Examination and 1st Margin Bake

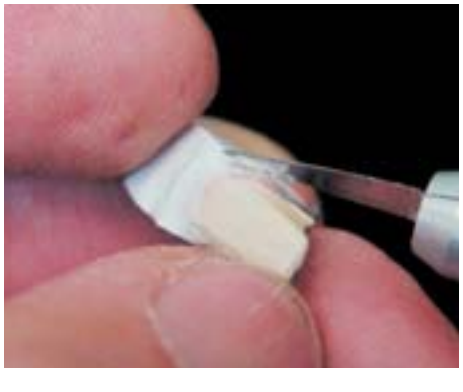
Carefully examine internal framework surface. Eliminate any excess particles using a dry porcelain brush, then fire on first Margin bake.

See page 37 (Baking Schedule Type E)



After 1st Margin Bake

Perform with additional Margin build-up if shrinkage occurs.



The 2nd Margin Application

Apply Magic Separator to the margin area of the die again and reseat the coping on the die. Next, create a slightly wetter, thinner mix of margin ceramic, apply it to the margin area and vibrate gently into the gap. Finally, brush away excess ceramic from the margins, examine the internal coping surface and bake as directed for the first margin bake.

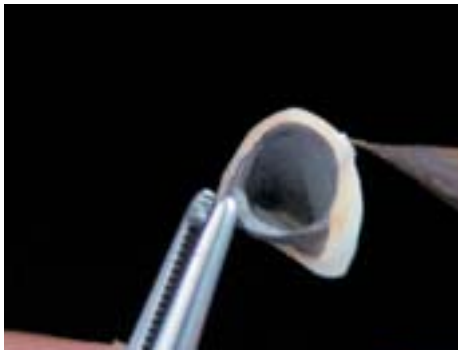
See page 37 (Baking Schedule Type E)

The 2nd Baking

The adequate view after the second baking shows that the metal framework and the porcelain join smoothly. If necessary, use Margin Porcelain Retouching Powder (MRP) to correct the shortage of the margin area after glazing.

attention MRP can't be used befor glazing because of its lower temperature.

Margin Correction with MRP



Build-up MRP

Apply a thin mixture of MRP(Margin Retouch Powder) porcelain to the marginal area of the restoration after glazing.

ADDMATE, See page 29

Remove the Excess

Re-seat the restoration on to the die, vibrate to condeuse the ceramic and ensure that the restoration is completly seated on the die.
Remove the excess MRP porcelain with a brush and took the crown from the die carefully. Then, bake it according to the baking schedule.

See page 37 (Baking Schedule Type N)

Morphological Correction

Polish the serration and roughness at the labial margin with a silicone point such as Meister Point(SF-41).

Opacious Body Porcelain

Special Features

Opacious Body Porcelain is formulated with an intermediate degree of translucency between that of opaque and body porcelain. By using opacious body, the degree of translucency can be easily controlled.

① In the cervical areas of tooth crown where thick body porcelain becomes too translucent, by using Opacious Body in this area, the degree of translucency can be easily controlled.
Some other different situations due to the different thickness area of porcelain.

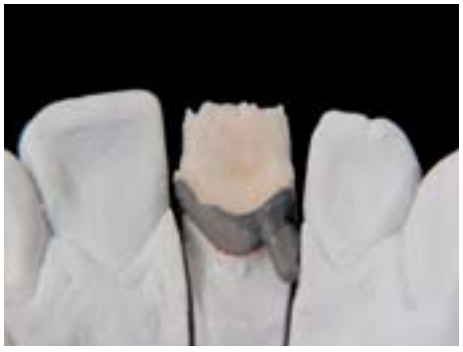
② a. The porcelain in the bonding basal surface area is thick and has a different translucency in the abutment tooth area.
b. In the case of a bridge, the porcelain in the abutment tooth area has a different translucency and thickness.

Application

Apply Opacious Body about 0.3mm thickness to the whole crown.

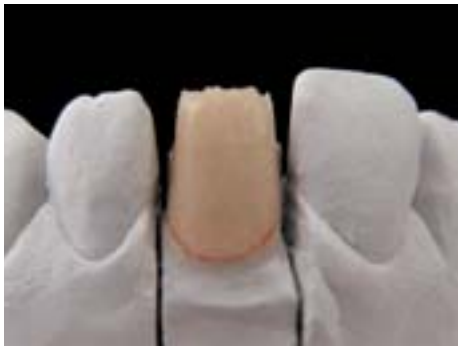
Labial Side

Build up the natural dentine incisal form.



Lingual Side

Clinically, it is widely used to the lingual side of anterior tooth and the occlusal surface of molar.



After Baking (Labial Side)

Bake it by following the baking schedule. Build up Body, Enamel and Translucent porcelain after baking.

See page 37 (Baking Schedule Type F, G, H)

A Case of Pontic

Compared with the translucency of abutment tooth, the porcelain on the pontic side looks very thick.

A Case of Modifying the Frame Thickness

In the case of making a bridge, Opacious Body can prevent the dispersion of translucency and shade color in the incisal area.

Stain Porcelain

Special Features

① The thermal expansion coefficient (CTE) of External Stain (ES) is almost the same as that of EX-3 porcelain. Therefore, ES cannot be detached from the tooth surface by tooth brushing for a long time after its oral insertion. A wide availability of ES will enable easy characterization.

② The IS has also has the same CTE as that of EX-3 porcelains. Bubbles and cracks cannot be generated by the baking of porcelain after IS application on the porcelain. It will not only produce very delicate colors but also prevent opaque color permeation by IS staining even when there is not enough space for porcelain build-up.

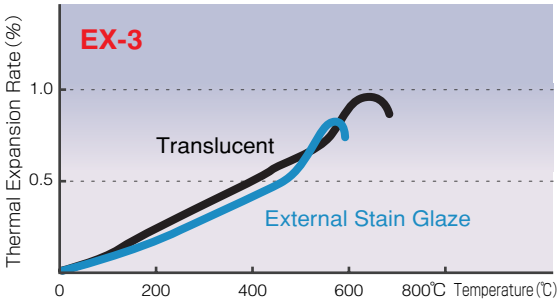
Remarks Internal Stain is made exclusively for internal staining and does not make the porcelain surface glossy by itself. External Stains are recommended for the staining on the porcelain surface.

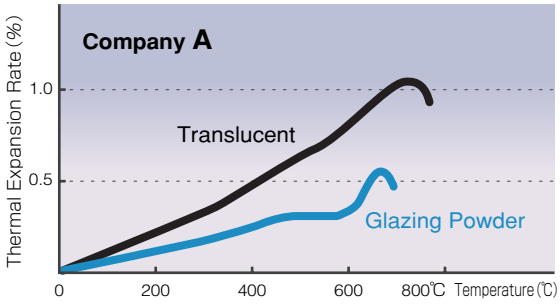
③ Finer grain size due to our new technology will further improve reproduction of more natural delicate colors.

④ The newly introduced A+, B+, C+ and D+ in ES and IS will intensify chroma of the build-up porcelain.

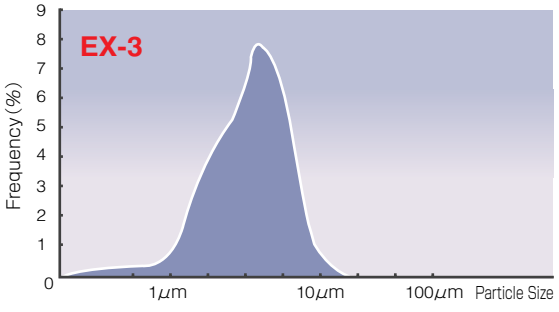
⑤ ES and IS have an ideal fluorescence as EX-3 porcelain does.

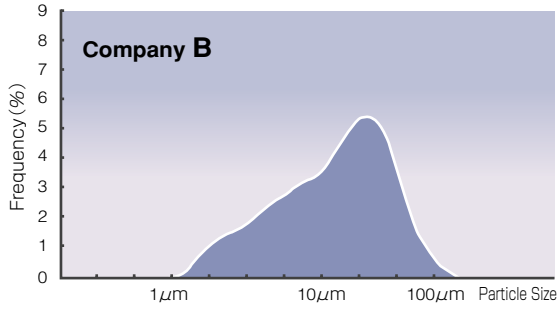
■Thermal Expansion Curve





■Particle Size Distribution





Remarks

① Confirm if there is no dust or grease on the tooth. When applying IS after morphological correction, clean the tooth ultrasonically in acetone solution or water.

② There is a risk of blackening when using the stain liquids of other manufacturers. Be sure to use "Noritake IS liquid" for Internal Stain and "Noritake ES Liquid" for External Stain.

③ After mixing Stains with liquid on the palette, avoid letting it sit for a long time and avoid making repeated additions to the original mixture.

④ Using stain from which too much moisture has evaporated will result in bubbles.
IS Liquid contains ingredients which may dissolve some plastics. Please handle with extreme caution in the presence of plastic materials.

Color Variation

External Stain		Internal Stain	
Pure White		Pure White	—
White	—	White	
Gray		Gray	—
Black		Black	—
Blue		Blue	—
Incisal Blue 1	—	Incisal Blue 1	
Incisal Blue 2	—	Incisal Blue 2	
Green 1		Green 1	—
Green 2		Green 2	—
Yellow		Yellow	—
Orange 1		Orange 1	—
Orange 2		Orange 2	—
Mamelon Orange 1	—	Mamelon Orange 1	
Mamelon Orange 2	—	Mamelon Orange 2	
Cervical 1		Cervical 1	
Cervical 2		Cervical 2	
Cervical 3		Cervical 3	
Earth Brown *1		Earth Brown	
Reddish Brown *2		Reddish Brown	
Salmon Pink		Salmon Pink	
Pink		Pink	—
Red		Red	
A^+		A^+	
B^+		B^+	
C^+		C^+	
D^+		D^+	

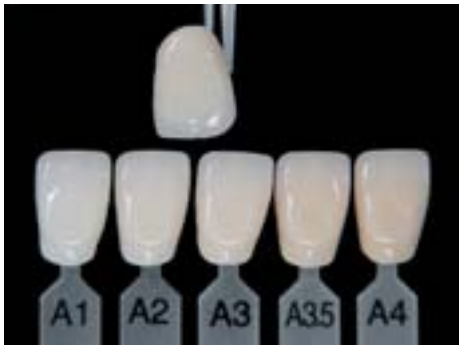
*1: ES Earth Brown is a new name for former Brown 3. *2: ES Reddish Brown is a new name for former Brown 4.

Operation Procedure

1. Build-up and bake the Opaque layer.
2. Build-up and bake the Margin layer.
3. **Internal staining on the Opaque layer if desired.**
4. Build-up and bake the Body and Enamel layers.
5. Create the mamelon structure in the incisal edge.
6. Steam and/or ultrasonically clean.
7. **Bake the first application of Internal Stain.** *1
8. **Bake the second application of Internal Stain.** *2
9. Build-up and bake the Translucent/Luster translucent layers.
10. Make morphological corrections.
11. Steam and/or ultrasonically clean.
12. **Bake the application of External Stain (Glaze).**
13. Polish/Natural Glaze.

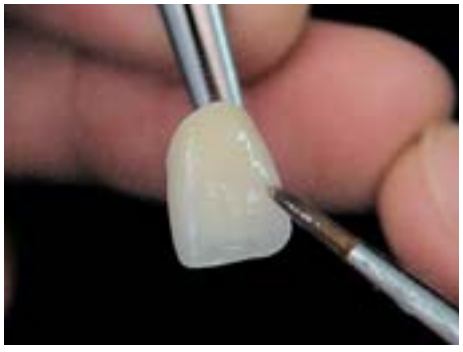
*1: Stain the white bands,the cervical area and proximal region in a horizontal direction.
*2: Stain vertical check-lines if any.

External Stain



Chroma Intensifier (A+, B+, C+, D+)

If more chroma is needed after morphological correction,intensify chroma using External Stain A+ in order to match the exact shade of A3.



After steaming or ultrasonically cleaning, apply Noritake ES liquid first. Then, apply ES A+ on the tooth.

In order to match the shade exactly,apply ES A+ comparing shade with Noritake Shade Guide.

Internal Stain

Internal Staining on Opaque/OB/Margin

Application of IS directly on cervical, incisal or occlusion area of Opaque/OB/Margin is very useful for producing natural color in less porcelain space area.

Surface Treatment of Body and Enamel

After baking Body and Enamel, make the mamelon structure and internal shape with discs or points where necessary. After shape correction, clean the surface with aluminum oxide sandblast (0.3MPa), ultrasonically or steam clean.

1st Application and Baking of IS

Wet the surface with IS Liquid before application of IS. First application of IS should be in a horizontal direction. In this case, apply the mixture of Incisal blue 2 and Bright (Dilution) on the mesial and distal angle. The ratio is 1:1. And apply A^+ on cervical and central area of lingual side. After finish of first IS application, bake it according to baking schedule.

2nd Application and Baking of IS

Apply second IS in a vertical direction. In this case, apply the mixture of Mamelon Orange 2 and White to create enamel crack. The ratio is 2:1. In order to model the crack, apply Incisal Blue 2 very slightly beside the crack.
After baking IS, it looks whitish. When confirming the actual characterizations after IS baking, wet the surface with Noritake Detail Checker or IS Liquid.

Completion

After baking Translucent or Luster Porcelain, make morphological correction.
The characterizations of natural tooth structure is reproduced very easily.

Luster Porcelain

Special Features

① Luster Porcelain reproduces the fine surface structure and luster of natural tooth.
② A unique combination of fine surface particles produces a selective reflection of light which results in the same opalescence seen in natural teeth.
③ Luster Porcelain has transparent, bright, vivid colors, therefore, darkening at the incisal edge or at the occlusal surface will not occur.
④ Color changes in natural teeth caused by aging have been thoroughly studied. Luster Porcelain features a complete line of colors consistent with these changes.

Shades and Applications	
TBlue (Translucent Blue)	Use mainly at the incisal edge of juvenile's restoration to reproduce a pale blue and youthful transparency.
LT0 (Luster T0)	Use mainly for a highly transparent incisal edge and for the simulation of highly transparent enamel, likely to be seen through the dentin.
LT1 (Luster T1)	Effective for achieving the brightness of natural tooth enamel.
Incisal Aureola	Use to reproduce the "HALO EFFECT" caused by the full reflection of light at the incisal edge.
LT Natural	Use mainly on the incisal edge and proximal surface to reproduce a high transparency seen in the elderly.
LT Yellow	Use to reproduce a light "HALO EFFECT" to show a depth in the central occlusal surface. Apply LT Yellow on Mamelon Orange shade to avoid the permeation of Orange shade.
Creamy Enamel	Use mainly at the cusp of molars, and occasionally for the area from the distal and proximal surfaces adjoining the incisal edge of the front teeth through the area surrounding the angle of the incisal edge. combination with other shades.
Sun Bright	Use to reproduce the orange enamel like color at the incisal edge seen in the middle-age and elderly. Also, to reproduce a crown with a deep orange or amber enamel-like color.
Creamy White	Use to achieve a dense, milky color. Also, to be mixed and used in combination with other LP shades.

attention

When Luster Porcelain should not be used

① When the distance between the tip of a metal frame and the incisal edge of the porcelain is too short.
② When porcelain does not fully cover the molar occlusal surface.
③ When the thickness of the porcelain is extremely thin and, therefore, the opaque reflection rate is high.

For the above cases, the usual enamel and translucent porcelain should be used to produce a more natural appearance.

Application

LT_1 is the basic shade color in the Luster Porcelain. TBlue is applied at the incisal edge angle to achieve a strong blue enamel translucency. LT_0 is applied at the incisal edge to achieve higher translucency.

Use Creamy Enamel to create the natural enamel appearance showed in the center of the crown. Also apply Creamy Enamel on the marginal ridge of the lingual side.

Except the cervical area, apply the whole crown with LT_1. Also apply LT_1 or LT Yellow on the lingual side to create a depth.

Apply CCV-1 or CCV-2 on the cervical area to create the bright cervical color. Then, bake it.

See page 37 (Baking Schedule Type F, G, H)

Completion

Super Porcelain ADDMATE

Special Features

ADDMATE is a correction porcelain which can be used with any porcelain fused to metal (PFM) with a thermal expansion coefficient range of 12.0～13.0×10^{-6}／℃, except porcelain fused to titanium (PFT). ADDMATE makes even the most difficult porcelain corrections possible, such as post-solder corrections, fine morphological adjustments after glazing and the correction of air bubbles.

Applications and usage of ADDMATE	
Post-glazing Morphological Retouching and Correction	Build-up ADDMATE on contacts and areas of insufficient porcelain. Then, bake it. Note For large area correction or retouching which needs large amounts of porcelain, it is preferable to use regular Noritake Super Porcelain EX-3.
Correction of Areas Contaminated by Dust Particles	Remove dust particles lodged in the porcelain, often appearing as black spots, with a carbide bur. Clean the contaminated area by alumina sandblasting at 0.15MPa. After steaming or ultrasonic cleansing, build-up ADDMATE in a shade compatible to the area of correction. Then,bake it.
Correction of Bubbles	a. Correction of pinholes. Pinholes are pinpoint air bubbles that emanate from within the porcelain to the surface. The correction is made by using a tapered instrument to apply ADDMATE into the pinhole. Do not expand the size of the pinhole. Build up with slightly excessive ADDMATE in consideration of shrinkage then bake it. Grind away excess porcelain with a silicone point and polish it. b. Corrction of swollen air bubbles. (1) Grind away the swollen air bubble and surrounding porcelain with a carborundum point or carbide bur, widening the pit. To make the correction look natural, we recommend that the pit be ground vertically when the pit is near the incisal 1/3, and in the mesiodistal direction when the pit is near the cervical 1/3. (2) Sandblast the metal at the bottom of the pit by alumina sandblasting at 0.15MPa. (3) Build-up ADDMATE opaque to the same thickness as the surrounding opaque. Avoid excess build-up of opaque as shrinkage is minimal. Using a brush, thoroughly remove all excess ADDMATE opaque adhering to the body porcelain layer. (Excess opaque adhering to the body porcelain layer will cause a boundary line after baking.) (4) Before the opaque dries, build-up ADDMATE in a shade compatible with the body porcelain. Build-up ADDMATE slightly excess to allow for shrinkage after baking. (5) After baking, grind away excess porcelain and finish.
Correction of Cracks	Note When cracks are caused by the incompatibility of thermal expansion coefficients between the porcelain and the metal, corrections are not possible. a. Mix ADDMATE with slightly more ADDMATE forming liquid than usual. Apply a single layer to the area of the crack. b. Apply vibration using an ultrasonic condenser or a similar tool. c. Bake at a temperature 40℃ (72°F) lower than the normal glazing temperature of your PFM. For example, if your normal glazing temperature is 920℃ (1,688°F), bake at 880℃ (1,616°F). (For post-solder corrections, stabilize it with soldering investment.)
Correction of Porcelain Detached from Metal	a. Grind away porcelain in a gradient in order to facilitate additional build-up. b. Alumina sandblast the exposed metal area at 0.15MPa. c. As per "BAKING PROGRAM TYPE I (See next page)", apply opaque wash bake in one thin layer and bake it. d. Build-up ADDMATE opaque in the same thickness as the surrounding opaque. e. Before the opaque dries, build-up ADDMATE (in excess to allow for shrinkage) in a shade compatible with the body porcelain. f. After baking, grind away excess and polish to desired finish. (For post-solder corrections, stabilize with soldering investment.)
Correction of Margin Porcelain	a. Apply Noritake's ADDMATE Separator to the working model and fit the PFM to be corrected onto the model. b. Mix ADDMATE body and opaque at a ratio of 10 to 1 and build-up on the chipped area or portion of the margin which needs correction. c. Carefully remove the PFM from the working model and bake it at a relatively low temperature, to avoid glossiness or rounding of edges. Polish to desired finish.
Fine Correction of Porcelain Laminate Veneer (PLV) after Removal from the Refractory Model	a. Apply Noritake's Magic Separator to the master model. b. After fitting PLV to the master model, build-up ADDMATE to the deficient area. c. Remove PLV from the master model. Bake at a relatively low temperature on a porcelain mat, to avoid glossiness or rounding of edges. Polish to desired finish.

Baking Schedule

STEP / TYPE	DRY-OUT TIME	LOW TEMP.	HEAT RATE	HIGH TEMP.	VACUUM	RELEASE VACUUM	HOLD TIME
Wash bake of opaque	5min.	450°C	45°C/min.	700°C	96kPa	700°C	1min. UNDER VACUUM
		842°F	81°F/min.	1,292°F		1,292°F	
Correction after post-soldering	5min.	450°C	40°C/min.	660°C	96kPa	660°C	1-2min. UNDER VACUUM
		842°F	72°F/min.	1,220°F		1,220°F	
Correction on margin or PLV	5min.	450°C	45°C/min.	680°C	96kPa	670°C	0
		842°F	81°F/min.	1,256°F		1,238°F	
In case of self-glaze	5min.	450°C	40°C/min.	700°C	96kPa	690°C	0
		842°F	81°F/min.	1,292°F		1,274°F	

Note The above is only a guideline. Different porcelain furnaces may necessitate adjustments to ecommended temperatures. 96kPa=72cmHg

Color Table

Use the table below as a guide for achieving esired shades when using ADDMATE.

OPAQUE	CORRESPONDING SHADES
Light Opaque	A_1O, A_2O, A_3O, B_2O
Dark Opaque	$A_{3.5}O$, B_3O, B_4O

BODY	CORRESPONDING SHADES
Light Body	A_1B, A_2B, A_3B, B_2B
Dark Body	$A_{3.5}B$, A_4B, B_3B, B_4B

For shades other than those listed above, use one of the following ADDMATE shades.

E	For all enamel shades
T	For all translucent shades
LT	For Luster Porcelain translucent shades

Precautions when using ADDMATE

① ADDMATE is a low temperature fusing porcelain. The follwing precautions must be followed in order to avoid imperfections such as blackening or whitening of the porcelain.
   a. Use only ADDMATE forming liquid when mixing.
   b. Use only Noritake Magic Separator when separating PFM from the gypsum die.
   c. If tissue paper fiber mixes with the porcelain slurry during water absorption of the condense procedure, the fiber will not completely burn off. After drying, check to make sure that no residual tissue fiber remains.
   d. Always use freshly mixed porcelains.

② Periodically fire your porcelain furnace, while empty, at around 1,000℃ (1,832°F) to keep the interior clean.

③ Temperature variations of the porcelain furnace may be significant at lower ranges. Determine the exact baking program by test before actual baking.

④ To prevent deforming of the solder area when using soldering material of a low fusing temperature, first stabilize by using soldering investment. Avoid contact with porcelain. Then, proceed to correction baking.

⑤ When making corrections to areas near the solder, thoroughly remove flux, etc.

⑥ Do not build-up and fire ADDMATE on top of soldering material. Cracks may result.

⑦ After firing ADDMATE, do not subsequently bake any higher temperature porcelains such as Super Porcelain EX-3.

⑧ After use, tightly close ADDMATE jars and store.

⑨ Always use appropriate protection to avoid inhalation of porcelain dust.

⑩ Always use protective eye goggles when grinding or polishing porcelain.

case A

Kurt R. Schneider, DDS
Naoki Hayashi, RDT

before

after

case B

Alan Sulikowski, DDS
Aki Yoshida, RDT

before

after

case C

Yasukazu Miyamoto, DDS
Kazunobu Yamada, RDT

before

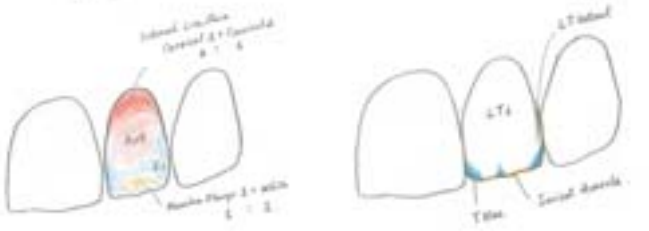
after

case D

Gerard J. Chiche, DDS
Hitoshi Aoshima, RDT

before

after

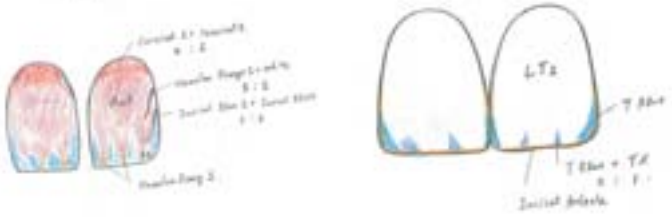


case E

Gerard J. Chiche, DDS
Hitoshi Aoshima, RDT

before

after



EX-3 Line-Ups

Paste Opaque	6g	POA_1	POA_2	POA_3	$POA_{3.5}$	POA_4
		POD_2	POD_3	POD_4	$PONA_1$	$PONA_2$
		$PONC_2$	$PONC_3$	$PONC_4$	$POND_2$	$POND_3$
Paste Opaque Modifier	3g	PO White	PO Gray	PO Orange	PO Earth Brown	PO Reddish Brown
Opaque (Powder)	10, 50, 200g	A_1O	A_2O	A_3O	$A_{3.5}O$	A_4O
		D_2O	D_3O	D_4O	-	-
Opaque Modifier (Powder)	10, 50g	OM Gray	OM Yellow	OM Orange	OM Brown	OM Dark Brown
Body	10, 50, 200g	A_1B	A_2B	A_3B	$A_{3.5}B$	A_4B
		D_2B	D_3B	D_4B	nA_1B	nA_2B
		nC_2B	nC_3B	nC_4B	nD_2B	nD_3B
Enamel	10, 50, 200g	E_1	E_2	E_3	Silky E_1	Silky E_2
Margin	10, 50g	MA_1	MA_2	MA_3	$MA_{3.5}$	MA_4
		$MNP_{1.5}$	$MNP_{2.5}$	-	-	-
Clear Margin	10, 50g	M Clear	M Peach	M Orange	-	-
Margin Retouching	10, 50g	MRP	-	-	-	-
Margin Dilution	10, 50g	MDL	-	-	-	-
Opacious Body	10, 50, 200g	OBA_1	OBA_2	OBA_3	$OBA_{3.5}$	OBA_4
		OBD_2	OBD_3	OBD_4	$OBNP_{1.5}$	$OBNP_{2.5}$
Cervical	10, 50, 200g	CV-1	CV-2	CV-3	CV-4	-
Clear Cervical	10, 50g	CCV-1	CCV-2	CCV-3	CCV-4	-
Mamelon	10, 50g	Mamelon 1	Mamelon 2	-	-	-
Translucent	10, 50, 200g	T_X	T_0	T_1	T_2	-
Luster	10, 50, 200g	LT0	LT1	T Blue	Creamy Enamel	Sun Bright
Modifier	10, 50g	White	Gray	Blue	Green	Yellow
Tissue	10, 50g	Tissue 1	Tissue 2	Tissue 3	Tissue 4	-
Add-on	10, 50g	AD-T	AD-B	-	-	-
External Stain	3g	Gray	Black	Blue	Green 1	Green 2
		Pure White	Pink	Salmon Pink	Red	A^+
	10g	Glaze	-	-	-	-
Internal Stain	3g	Incisal Blue 1	Incisal Blue 2	Mamelon Orange 1	Mamelon Orange 2	Reddish Brown
		A^+	B^+	C^+	D^+	Bright
Addmate	10g	Light Opaque	Dark Opaque	Light Body	Dark Body	Enamel

POB_1	POB_2	POB_3	POB_4	POC_1	POC_2	POC_3	POC_4
$PONA_3$	$PONA_{3.5}$	$PONA_4$	$PONB_1$	$PONB_2$	$PONB_3$	$PONB_4$	$PONC_1$
$POND_4$	$PONP_{1.5}$	$PONP_{2.5}$	$PONW_0$	$PONW_{0.5}$	POBA	-	-
PO Pink	PO Blue	PO Yellow	-	-	-	-	-
B_1O	B_2O	B_3O	B_4O	C_1O	C_2O	C_3O	C_4O
-	-	-	-	-	-	-	-
OM Pink	-		-	-	-	-	-
B_1B	B_2B	B_3B	B_4B	C_1B	C_2B	C_3B	C_4B
nA_3B	$nA_{3.5}B$	nA_4B	nB_1B	nB_2B	nB_3B	nB_4B	nC_1B
nD_4B	$NP_{1.5}B$	$NP_{2.5}B$	NW_0B	$NW_{0.5}B$	-	-	-
-	-	-	-	-	-	-	-
MB_1	MB_2	MB_3	MB_4	MC_2	MC_4	MD_3	MD_4
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
OBB_1	OBB_2	OBB_3	OBB_4	OBC_1	OBC_2	OBC_3	OBC_4
OB Enamel	OB White	OB Orange	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
Incisal Aureola	Creamy White	LT Natural	LT Yellow	-	-	-	-
Light Orange	Orange	Brown	Pink	Dark Pink	Coral Pink	-	-
-	-	-	-	-	-	-	-
-	-	-	-	-	-	-	-
Yellow	Orange 1	Orange 2	Cervical 1	Cervical 2	Cervical 3	Earth Brown	Reddish Brown
B^+	C^+	D^+	-	-	-	-	-
-	-	-	-	-	-	-	-
Earth Brown	Cervical 1	Cervical 2	Cervical 3	White	Red	Salmon Pink	-
-	-	-	-	-	-	-	-
Translucent	Luster Translucent	-	-	-	-	-	-

Color Combination Table

	A1		A2		A3		A3.5	
Paste Opaque (Powder Opaque)	POA1 (A1O)	POnA1	POA2 (A2O)	POnA2	POA3 (A3O)	POnA3	POA3.5 (A3.5O)	POnA3.5
Magin	MA1		MA2		MA3		MA3.5	
Opacious Body	OBA1		OBA2		OBA3		OBA3.5	
Body	A1B	nA1B	A2B	nA2B	A3B	nA3B	A3.5B	nA3.5B
Cervical	-		A2B+CV-1 (2+1)		A3B+CV-1 (1+1)		A3.5B+CV-1 (1+1)	
Enamel	E2		E2		E3		E3	
Luster (Translucent)								

	C1		C2		C3		C4	
Paste Opaque (Powder Opaque)	POC1 (C1O)	POnC1	POC2 (C2O)	POnC2	POC3 (C3O)	POnC3	POC4 (C4O)	POnC4
Magin	MC2+MDL (1+1)		MC2		MC4+MDL (1+1)		MC4	
Opacious Body	OBC1		OBC2		OBC3		OBC4	
Body	C1B	nC1B	C2B	nC2B	C3B	nC3B	C4B	nC4B
Cervical	-		C2B+CV-3 (2+1)		C3B+CV-3 (1+1)		CV-3	
Enamel	E2		E3		E3		E3	
Luster (Translucent)								

A4		B1		B2		B3		B4	
POA4 (A4O)	POnA4	POB1 (B1O)	POnB1	POB2 (B2O)	POnB2	POB3 (B3O)	POnB3	POB4 (B4O)	POnB4
MA4		MB1		MB2		MB3		MB4	
OBA4		OBB1		OBB2		OBB3		OBB4	
A4B	nA4B	B1B	nB1B	B2B	nB2B	B3B	nB3B	B4B	nB4B
CV-1		-		B2B+CV-2 (2+1)		B3B+CV-2 (1+1)		CV-2	
E3		E1		E2		E3		E3	

LT1 (T1)

D2		D3		D4		NW0	NW0.5	NP1.5	NP2.5
POD2 (D2O)	POnD2	POD3 (D3O)	POnD3	POD4 (D4O)	POnD4	PONW0	PONW0.5	PONP1.5	PONP2.5
MD3+MDL (1+1)		MD3		MD4		MB1+MDL (1+2)	MA1+MDL (1+1)	MNP1.5	MNP2.5
OBD2		OBD3		OBD4		-	-	OBNP1.5	OBNP2.5
D2B	nD2B	D3B	nD3B	D4B	nD4B	NW0B	NW0.5B	NP1.5B	NP2.5B
D2B+CV-4 (2+1)		D3B+CV-4 (1+1)		CV-4		-	-	-	NP2.5B+CV-1 (2+1)
E2		E3		E3		Silky E2	Silky E2	E2	E2

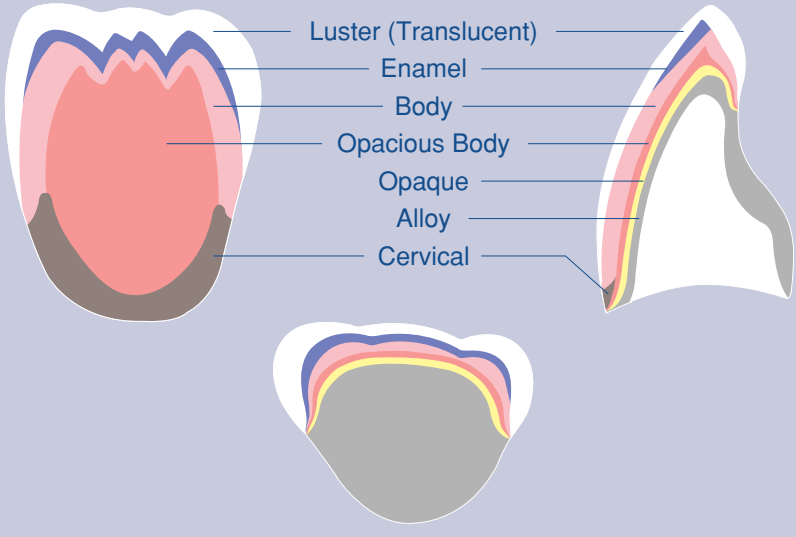
LT1 (T1)

Baking Schedule

	Dry-out time	Low Temperature		Start Vacuum		Heat Rate		Vacuum Level	Release Vacuum		Hold Time	High Temperature		Cool Time
	min.	˚C	˚F	˚C	˚F	˚C/min.	˚F/min.	kPa *1	˚C	˚F	min.	˚C	˚F	min.
A POBA	8	500	932	500	932	65	117	96	1000	1832	1 (with vacuum)	1000	1832	0
B Paste Opaque 1st and 2nd	8	500	932	500	932	65	117	96	980	1796	1 (without vacuum)	980	1796	0
C Powder Opaque 1st	3	650	1202	650	1202	55	99	96	960	1760	0	960	1760	0
D Powder Opaque 2nd	5	650	1202	650	1202	55	99	96	950	1742	0	960	1760	0
E Margin Porcelain 1st and 2nd	5	650	1202	650	1202	55	99	96	935	1715	0	945	1733	0
F Body/Enamel/Translucent (1-3 units)	7	600	1112	600	1112	45	81	96	920	1688	0	930	1706	0
G Body/Enamel/Translucent (4-6 units)	10	600	1112	600	1112	45	81	96	925	1696	0	935	1715	0
H Body/Enamel/Translucent (Over 7 units)	15	600	1112	600	1112	45	81	96	930	1706	0	940	1724	0
I Body(Minor Adjustments)	7	600	1112	600	1112	45	81	96	910	1670	0	920	1688	0
J Internal Stain 1st and 2nd	3	650	1202	-	-	55	99	0	-	-	0	830	1526	0
K Self Glaze only	5	650	1202	-	-	50	90	0	-	-	0	930 *2	1706 *2	0
L Self Glaze with after-polishing	5	650	1202	-	-	50	90	0	-	-	0	890 *3	1634 *3	0
M Extenal Stain/Glaze powder	5	650	1202	-	-	50	90	0	-	-	0	910	1670	0
N MRP	5	650	1202	-	-	55	99	0	-	-	0	850	1562	0
O Add-on	5	650	1202	-	-	55	99	0	-	-	0	880	1616	0
P Addmate (Minor adjustments)	5	450	842	450	842	45	81	96	690	1274	0	700	1292	0
Q Degassing for NORI-VEST (Using a burnout furnace only)	0	300	572	-	-	30	54	0	-	-	20	1080	1976	0
R Wash bake for Refractory	10	600	1112	600	1112	45	81	96	940	1724	0	950	1742	4
S Body for Refractory	10	600	1112	600	1112	45	81	96	940	1724	0	950	1742	4
T Glaze for Refractory	10	600	1112	-	-	45	81	0	-	-	0	950	1742	4

Note The above program is only a guideline. Baking temperature may be varied with the peculiarites of different furnace.
*1 96kPa = 72cmHg (29 inchesHg) *2 This case is for 1-3 units. Set the high temperature the same as Body baking.
*3 This case is for 1-3 units. Reduce 40˚C(72˚F) from the high temperature of Body baking.

Layering



Precaution for Handling EX-3

1. Follow the alloy manufacturer's instructions for handling metal framework.
2. This porcelain is for metal framework, PJC or PLV restorations. Do not apply it to Alumina, Zirconia or Titan frameworks.
3. Do not mix with other porcelain, either other Noritake porcelain or other manufacturers' porcelain.
4. The purpose of excess liquid in Paste Opaque jar is to avoid drying. Do not mix excess liquid and Paste Opaque in the jar.
5. Before applying the Paste Opaque or Opaque Powder, clean the metal framework ultrasonically in acetone solution.
6. Use only Noritake Forming Liquid, Meister Liquid or distilled water with EX-3 porcelain powders.
7. For adequate bonding strength, it is necessary that the first layer of Powder Opaque is a wash bake layer.
8. EX-3 is properly finished when the surface has a slight gloss after baking. Please adjust your furnace to achieve this result.

Read the instructions carefully, keep them in a safe place for future reference.

Notes on Safety

1. When mixing or grinding porcelain, use an approved dust mask and a vacuum air filter to protect the lungs from breathing dust.
2. When mixing or grinding porcelain, wear safety glasses.
3. It is non-edible. Keep it out of the reach children.
4. Avoid eye contact with all liquids. In the event of eye contact, immediately rinse with a copious amount of water and consult a physician.
5. Do not touch items heated by the furnace with your bare hands.
6. Keep Paste Opaque, PO Liquid, IS Liquid and ES Liquid away from flames and high temperatures. They are flammable.
7. Keep Paste Opaque and all liquids in a dry and cool place, avoiding direct sunlight.
8. This porcelain is for dental use only. Do not use for other purposes.
9. For use only by dentists and dental technicians.

All products mentioned in this manual are part of EX-3 system and are covered by its registered trade mark.

■SYMBOLS USED IN A LABEL

SYMBOL	MEANING
	MANUFACTURER
	USE BY
LOT	BATCH CODE
	CAUTION, CONSULT ACCOMPANYING DOCUMENTS. ATTENTION, SEE INSTRUCTIONS FOR USE.
EC REP	AUTHORISED REPRESENTATIVE IN THE EUROPEAN COMMUNITY

· Contraindications

If the patient is hypersensitive to Dental Porcelain or any of the other components, this medical product should not be used. Or it should be only used under the strict supervision of the patient's doctor/dentist.

· EU Authorized Representative

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