



DuPont™ Cyrel® Global Process-of-Use Manual



DuPont Packaging Graphics
“Advancing Flexography”



The miracles of science™

Global Cyrel® Process-of-Use Manual

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Safety, Health, & Environmental For Cyrel®FAST Plates & Processing

Safety is always Number One. Making Cyrel®FAST flexographic plates is an industrial operation. The flexographic platemaking process can be a safe process when recommended safe handling and work practices are observed.

List of Recommended Personal Protective Equipment (PPE)

- Ultraviolet light – Never look directly at the lighted UV bulbs. If necessary, during maintenance,
 - Welding helmet, at least shade 6, or
 - Welding face shield, at least shade 6
- Condensate
 - Chemical resistant gloves
 - Safety glasses with side shields

Suggested Written Programs

- Hazard Communication
 - Easily accessible Material Safety Data Sheets (MSDS)
- Standard Operating Procedures (Employee Training)
 - PPE

Note: OSHA requires certification that a hazard assessment to determine appropriate personal protective equipment has been completed.

Safety Recommendations

- Posted safety signs
- Well ventilated, odor-free plateroom
- Neat, organized work area
- Unblocked access to eye wash station
- Easily available fire extinguisher
 - Are employees trained how to use fire extinguishers?
 - Are employees trained when to use fire extinguishers?

- Functioning safety shield in cutters
- Wooden blocks to hold razor blades
 - proper disposal of sharps in approved containers
- Sealed container for rags
- Material handling equipment for developer roll and plates/boxes
- Well-maintained equipment

Recommended Good Work Practices

- Always handle chemicals with respect
- Do not eat, drink or smoke inside the plate room
- Use appropriate personal protective equipment
 - Safety glasses with side shields, any time inside the plate room except when a higher level of eye protection is required
 - Protective gloves
 - Chemical resistant gloves (see note below)
 - when the potential for skin contact with unpolymerized plate material exists
 - removing plates from the processor
 - removing developer rolls from the processor
 - Leather gloves
 - when handling boxes of plate material
 - Welding helmet (shade 6, at least) or welding face shield (shade 6, minimum)
 - maintenance of exposure unit bulbs
 - maintenance of light finisher bulbs

Note: Chemical resistant gloves are made of polymeric material. Discard and replace the chemical resistant gloves at the first sign of swelling, cracking, deformation, or break-through.

Cyrel® Plates

The plate material consists of three layers, namely: the polyester support, the photopolymer layer and the coversheet. The polyester support and the coversheet provide good protection against contact with the photopolymer layer during handling, cutting and back exposure of the raw plate material. When the coversheet is removed from the raw plate material, a thin release layer or lams layer remains on the surface which minimizes direct contact with the photopolymer layer. The coversheet should not be used for other purposes and should be recycled or disposed of properly. Processed plates may be handled

without personal protective equipment. Handling for inked plates, however, could be different than handling newly processed plates. Check with the ink manufacturer for recommendations on handling their ink.

Potential Physical Hazards inside the Plateroom

Lifting

- Cyrel® Developer rolls, both new and used
- A box of plate material
- Flexographic plates

Know the proper way of lifting, use the buddy system and use materials handling equipment.

Flammability

- Solvent cleaners for negatives
- Rags contaminated with solvents

No smoking or matches are allowed inside the plateroom. Proper grounding for solvent transfer and for receiving of containers during solvent transfer should be used. Avoid producing static charges or potential ignition sources. Use proper flammable storage containers for small amounts. Implement good work practices.

Containers under Pressure

- Full and empty containers under pressure example: glass cleaners under pressure

Containers should be disposed of properly. A potential hazard is that a container may explode when burned.

Potential Radiation Hazards inside the Plateroom

Ultraviolet (UV) Light

What is UV light?

- Invisible band of electromagnetic radiation
- Just beyond the violet end of the visible spectrum

- Divided into three regions
 - Short wavelength (UV-C)
 - Middle wavelength (UV-B)
 - Long wavelength (UV-A)
- A natural part of our environment, most commonly found in sunlight

Everyone is exposed to UV light (natural and/or artificial) on a daily basis. The critical organs exposed to ultraviolet radiation are the **eyes** and the **skin**. Each region has a different effect upon the human body.

UV Sources in the Flexographic Platemaking Process

UV-C, the Short Wavelength (Light Finisher)

- Extends from 180 to 280 nanometers
- Has little penetrating power, however
- Can cause severe burns to the eyes and skin when viewed directly

When UV-C affects the eyes, the discomfort (intense heat on the eyes) is usually a delayed reaction (from 5–8 hours after exposure). The discomfort is commonly known as “welder’s flash” or “ground glass eyeball.”

UV-A, the Long Wavelength (Exposure/ Post Exposure Units)

- Extends from 320 to 400 nanometers
- Can cause burns to skin and eyes
- Some people experience “blue haze” interference when viewing sources of UV-A due to the fluorescent effects in the ocular media

Personal Protection for Ultraviolet Lights

Recommended eye protection is a welding helmet or welding face shield (shade 6 minimum).

Regular vision glasses, regular safety glasses, or regular chemical splash glasses **do not provide** adequate protection of the eyes for *direct viewing* of UV light.

Special UV glasses are not adequate eye protection for direct exposure to UV light.

The protective quality of the eyeglasses needs to match the wavelength range of the UV light source. UV-A glasses will not protect from UV-C exposure and vice versa. It is easy to make a mistake. The intensity of the UV light source must also be matched. Intensity increases with the number of sources. Flexographic equipment has rows of UV lights in both the exposure unit and the light finisher.

A UV glass adequate for a single source will not provide protection for simultaneous multiple sources.

Ultraviolet Light Safety Information

- Do not defeat or bypass built-in equipment safety interlock features.
- Do not operate lamps with covers removed.
- Do not stare directly at the operating UV bulbs.
- Do not operate the equipment with covers or access panels removed.
- All personnel **OPERATING** the equipment should be thoroughly aware of the hazard.
- All personnel **MAINTAINING** the equipment should be thoroughly aware of the hazard.
- UV lamps contain Mercury. Dispose of them according to local, state, and federal regulations. Recycling is preferred.
- Be careful of reflected UV light, it is as hazardous.
- Use appropriate eye protection when observing through the viewing slots. Minimize viewing time as much as possible.
- Never look directly at the ultraviolet light sources. If necessary, during maintenance:
 - Wear the proper protective equipment—welding helmet or welding face shield, shade 6 at least
 - Cover exposed skin, face and arms
 - Minimize the time of exposure.

Chemical Safety Information

- Know the hazards, read the MSDS
- No food/no eating allowed inside the plateroom
- Properly designed plateroom HVAC
 - Proper plateroom equipment layout
 - Efficient workflow
 - Clean area
 - Do not recycle plateroom air
 - Proper exhaust systems
 - Seal all horizontal/vertical seams of the exhaust ductwork
 - Properly sized external exhaust fan, CFM and static pressure rating
 - Proper exit point of the exhaust system
 - exhaust directly to atmosphere

- Use personal protective equipment, as needed
 - Leather gloves
 - Safety glasses with side shields
 - Welding helmet

- Good work practices

Environmental Issues

Waste Disposal

Safety, environmental and product stewardship are areas in which DuPont has great expertise and resources. As such, the Cyrel®FAST System process includes the pickup of used Cyrel® Developer Rolls and Cyrel® boxes in the United States and Canada. Waste characterization, transportation, paperwork and incineration are all coordinated through DuPont for the developer rolls, and the boxes are recycled. In regard to the Cyrel® Developer Rolls, this reduces customer liability and brings peace of mind knowing the wastes are incinerated at an approved facility disposed of according to federal, state and local regulations. If you need additional information about the pickup program, call your Cyrel® Sales Representative or 1-800-345-9999 (1,4).

Air Permit

With the implementation of the Clean Air Act, air permitting plays an important role. It is DuPont's recommendation that, if required according to local, state, or federal regulations, an application for an air permit for the Cyrel®FAST Thermal Processing System be completed and submitted to the appropriate authority. This application allows the permitting board the opportunity to decide whether an air permit is required to operate the Cyrel® Platemaking System.

Additional Information

See the DuPont™ Cyrel®FAST Pre-installation, Installation, and Safety and Operating Manuals for full details on Safety, Health, and Environmental information.

Safety, Health, & Environmental For Solvent Plates & Processing

Safety is always Number One. Making Cyrel® flexographic plates is an industrial operation. The flexographic platemaking process can be a safe process when recommended safe handling and work practices are observed.

List of Recommended Personal Protective Equipment (PPE)

- **Solvent protection**
 - safety glasses with side shields
 - chemical splash goggles
 - chemical resistant nitrile gloves (8 hour stability after solvent contact)
 - respirators with organic vapor cartridges
- **Ultraviolet light protection**
 - welding helmet, at least shade 6, or
 - welding face shield, at least shade 6

Written Programs Required

- **Hazard Communication**
 - easily accessible Material Safety Data Sheets (MSDS)
- **Respiratory Protection Program**
- **Standard Operating Procedures (Employee Training)**
 - solvent spill
 - distillation
 - PPE

Note: OSHA requires certification that a hazard assessment to determine appropriate personal protective equipment has been completed.

Safety Recommendations

- Posted safety signs
- Well ventilated, odor-free plateroom
- Neat, organized work area
- Unblocked access to eye wash station

- Easily available fire extinguisher
 - are employees trained how to use fire extinguishers?
 - are employees trained when to use fire extinguishers?
- Functioning safety shield in cutters
- Wooden blocks to hold razor blades
 - proper disposal of sharps in approved containers
- Sealed container for rags
- Material handling equipment for solvent handling
- Well-maintained equipment

Recommended Good Work Practices

- Always handle chemicals with respect
- Do not eat, drink or smoke inside the plate room
- Use appropriate personal protective equipment
 - safety glasses with side shields, any time inside the plate room except when a higher level of eye protection is needed
 - chemical splash goggles
 - when removing plates from the processors
 - when moving drums of solvents, solvents with plate material or stillbottoms
 - when transferring solvents from one container to another container
 - any time a splash potential exists
 - chemical resistant gloves (see note below)
 - when the potential for skin contact with solvent or solvent with unpolymerized plate material exists
 - removing plates from the processor
 - transferring solvents
 - working with solvents during the distillation process
 - leather gloves
 - when handling solvent drums or boxes of plate material
 - welding helmet (shade 6, at least) or welding face shield (shade 6)
 - maintenance of exposure unit bulbs
 - maintenance of light finisher bulbs
 - respirators with organic vapor cartridges
 - during spill control and spill clean-up
 - during the distillation process
 - whenever the cooking pot is opened
 - whenever a task will be done inside the cooking pot

Note: Chemical resistant gloves are made of polymeric material. The flexographic plate is a polymeric material. The function of the solvent is to dissolve some polymeric material. The solvent can also attack chemical resistant gloves. Discard and replace the chemical resistant gloves at the first sign of swelling, cracking, deformation, or break-through.

Cyrel® Plates

The plate material consists of three layers, namely: the polyester support, the photopolymer layer and the coversheet. The polyester support and the coversheet provide good protection against contact with the photopolymer layer during handling, cutting and back exposure of the raw plate material. When the coversheet is removed from the raw plate material, a thin release layer or lams layer remains on the surface which minimizes direct contact with the photopolymer layer. The coversheet should not be used for other purposes and should be recycled or disposed of properly. Processed plates may be handled without personal protective equipment. Handling for inked plates, however, could be different than handling newly processed plates. Check with the ink manufacturer for recommendations on handling their ink.

Potential Physical Hazards inside the Plateroom

Lifting

- A drum of virgin solvent, used solvent and/or stillbottoms
- Boxes of plate material
- Flexographic plates

Know the proper way of lifting, use the buddy system and use materials handling equipment.

Flammability

- Class III A combustible liquid
 - North America Solvents:**
 - OptiSol® In-Line
 - flashpoint about 154F /68 °C
 - OptiSol® Rotary
 - flashpoint about 196F /91 °C
 - Cylosol

- Flashpoint about 144F / 62°C

EMEA Solvents

- Flexosol In-Line
flashpoint about 133F / 56 °C
 - Flexosol Rotary
flashpoint about 142F / 61°C
 - Unisol In-Line
flashpoint about 145F / 63°C
- Solvent cleaners for negatives
 - Rags contaminated with solvents
 - Transferring solvents
 - Wiping plates inside the dryer

No smoking or matches are allowed inside the plateroom. Proper grounding for solvent transfer and for receiving of containers during solvent transfer should be used. Avoid producing static charges or potential ignition sources. Do not wipe plates inside the dryer. Use proper flammable storage containers for small amounts. Implement good work practices.

Containers under Pressure

- Full and empty containers under pressure, e.g., glass cleaners under pressure

Containers should be disposed of properly. A potential hazard is that a container may explode when burned.

Potential Radiation Hazards inside the Plateroom

Ultraviolet (UV) Light

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- Invisible band of electromagnetic radiation
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- A natural part of our environment, most commonly found in sunlight

Everyone is exposed to UV light (natural and/or artificial) on a daily basis. The critical organs exposed to ultraviolet radiation are the **eyes** and the **skin**. Each region has a different effect upon the human body.

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UV-A, the Long Wavelength (Exposure/ Post Exposure Units)

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Special UV glasses are not adequate eye protection for direct exposure to UV light.

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UV lights in both the exposure unit and the light finisher. A UV glass adequate for a single source will not provide protection for simultaneous multiple sources.

Ultraviolet Light Safety Information

- Do not defeat or bypass built-in equipment safety interlock features.
- Do not operate lamps with covers removed.
- Do not stare directly at operating UV bulbs.
- Do not operate the equipment with covers or access panels removed.
- All personnel **OPERATING** the equipment should be thoroughly aware of the hazard.
- All personnel **MAINTAINING** the equipment should be thoroughly aware of the hazard.
- UV lamps contain Mercury. Dispose of them according to local, state, and federal regulations. Recycling is preferred.
- Be careful of reflected UV light, it is as hazardous.
- Use appropriate eye protection when observing through the viewing slots. Minimize viewing time as much as possible.
- If you have to look directly at the ultraviolet light sources,
 - wear the proper protective equipment—welding helmet or welding face shield, shade 6 minimum
 - cover exposed skin, face and arms
 - minimize the time of exposure.

Chemical Safety Information

- Knowledge of the hazards, read the MSDS
- No food/no eating allowed inside the plateroom
- Properly designed plateroom HVAC
 - Proper plateroom equipment layout
 - Efficient Workflow
 - Solvent contaminated area
 - Clean area
 - Location of supply air
 - Opposite the solvent contaminate area
 - “Sweep” the room with fresh supply/make-up air – okay to recycle plateroom air, but pick-up from the clean area of the plateroom
 - correct exhaust systems

- seal all horizontal/vertical seams of the exhaust ductwork
- properly sized external exhaust fan, CFM and static pressure rating
- correct exit point of the exhaust system
- exhaust directly to atmosphere
- avoid cross-connections
- to supply air intake
- to recycled air intake
- Use personal protective equipment, as needed
 - gloves
 - respirators
 - splash goggles
- Good work practices

USA Environmental Issues

RCRA Regulations

Wastes generated in the use of the Cyrel® solvent solutions in the USA do not meet the federal EPA's (Environmental Protection Agency) definition of hazardous wastes under the RCRA (Resource Conservation and Recovery Act) regulations.

Waste Disposal

Solvent residues from a distillation recovery unit may contain a small amount of liquid. DuPont opposes the landfill disposal of any federal non-RCRA material that does not meet the EPA's definition of a solid.

The recommended disposal method for distillation waste is incineration by:

- local municipal incinerator
- commercial direct incineration (EPA permitted TSDF)
- commercial incineration as fuel for energy

This method of disposal eliminates future potential liability in the face of increasing landfill regulations.

Safety, environmental and product stewardship are areas in which DuPont has great expertise and resources. As such, DuPont has developed the Cyrel® Waste Network available to Cyrel® customers in North America. The Network helps participants to safely handle wastes, such as distillation residue from processing solvent, wet rags, spent solvents, and empty drums. Waste characterization, transportation, paperwork and incineration are all coordinated through DuPont. This reduces customer liability and brings peace of mind knowing the wastes are incinerated at an approved facility and the ash disposed according to federal, state and local regulations. If you need

additional information about the Cyrel® Waste Network, contact your Cyrel® Account Managers.

Clean Air Act

The OptiSol® /Cylosol alternative solvents do not contain and do not emit a hazardous air pollutant (HAPS). However, the OptiSol®/Cylosol solvents do emit some volatile organic vapors (VOCs).

Air Permit

With the implementation of the Clean Air Act, air permitting plays an important role. It is DuPont's recommendation that an application for an air permit for the Cyrel® Solvent Platemaking System be completed and submitted to the State or Local Air Quality Management Board prior to the installation of the equipment.

SARA Title II

The components of the OptiSol®/Cylosol solutions are not listed in the toxic chemicals under section 313 of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA). Section 313 Form R reporting is not required when the OptiSol® /Cylosol solutions are used.

Cyrel® Material Safety Data Sheets

The most recent copy of Material Safety Data Sheets (MSDS) for Cyrel® products other than plate material and developer roll (see below) can be found on the DuPont Corporate Website. After accessing the website www.dupont.com, click on “MSDS” at the top of the webpage, choose a country, and then type Cyrel® in the product name box. You can also contact your Cyrel® Representative for information.

Cyrel® Plate Material and DuPont™ Developer Roll

OSHA’s Hazard Communication Standard covers the Cyrel® flexographic plates and developer roll under its article exemption. Under paragraph 29 CFR 1910.1200 (b) (6) (iv), OSHA exempts articles from the requirements of the Hazard Communication Standard. Cyrel® flexographic plates and developer roll meet the OSHA definition of an “article” under paragraph (c) of the Hazard Communication Standard 29 CFR 1910.1200.

29 CFR 1910.1200 (c) Definitions:

“Article” means a manufactured item:

- i) which is formed to a specific shape or design during manufacture;
- ii) which has end use function(s) dependent in whole or in part upon its shape or design during end use; and
- iii) which does not release, or otherwise result in exposure to, a hazardous chemical, under normal conditions of use.

29 CFR 1910.1200 (b) (6) (iv) states:

“This section does not apply to articles.”

Thus, a material safety data sheet (MSDS) is not required and is not available for the Cyrel® flexographic plates and DuPont™ Developer Rolls.

Spill Procedure for Cyrel® Processing Solutions

1. Evacuate spill area immediately.

- Have someone notify supervision and area contacts.

2. Attend to anyone that may be contaminated.

- Contaminated clothing must be removed and contaminated skin flushed with water for at least 15 minutes.

3. Wear proper personal protective equipment.

- Nitrile gloves
- Chemical coverall splash goggles
- Respirator with organic vapor cartridge

NOTE: If you detect the solvent odor while wearing the respirator, leave the spill area immediately, change cartridges, re-check respirator fit, or use a self-contained breathing apparatus before returning to the spill. Discard and replace gloves at the first sign of swelling, cracking or deformation.

3. Clean up the spill.

- Stop and contain the cause of the spill as much as possible.
- Remove any ignition source of heat, sparks or flame.
- Dike spill—seal floor drains if necessary.
- Ventilate spill area.
- Soak up liquid with absorbent material such as blue shop towels, kitty litter, sand, oil or other commercially available absorbent materials.
- When spilled materials have been absorbed, use brush and scoop to place materials in an appropriate container. Polyethylene bags may be used for small spills. Five gallon pails or 20 gallon drums with polyethylene liners may be appropriate for larger quantities. Handle following your normal waste disposal procedure.
- Decontaminate the surface where the spill occurred with a mild detergent and water, when appropriate.

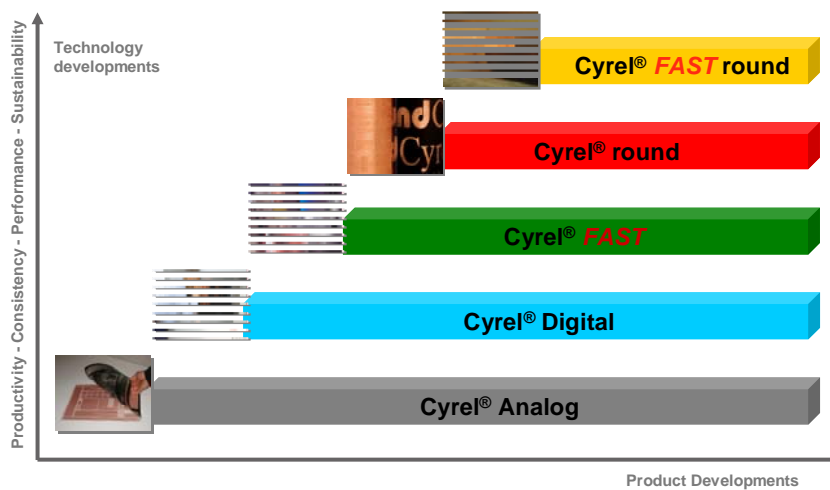
Supervision and Area Contacts are: _____

Cyrel® Flexographic Printing Plates

General

DuPont Packaging Graphics continues to be a global technology leader in supplying flexographic printing systems. Our scientists continue to develop unique solutions based on new technologies to assist our customers expand their business by taking advantage of new profitable packaging printing opportunities. DuPont Packaging Graphics portfolio of products includes a broad range of Cyrel® brand photopolymer plates in different thickness, hardnesses and materials for every kind of flexographic printing application. Platemaking equipment (solvent and Cyrel®FAST thermal processing), and Cyrel®round sleeves are also supplied.

Cyrel® Printing Plate Portfolio



Cyrel® Plate Manufacturing - ISO-9001:2000 Certification

Both the Cyrel® Manufacturing sites in Parlin, New Jersey (1990) and Neu Isenberg, Germany (1988) were among the first plants to be awarded ISO 9001 certification. Since then, the Cyrel® manufacturing plants, in Parlin, New Jersey and Neu Isenberg, Germany have continued to recertify, and are covered under an ISO 9001:2000 renewal certificate. ISO is used as a guideline to help maintain an effective Quality

Management System, and as an assurance to our customers that we meet all requirements with respect to quality through consistent products and services.

Features/Benefits

Image Quality–Cyrel® is known for its detailed graphics, fine line work, clean reverses and superior results on press.

Productivity–Outstanding exposure latitude for single exposure without masking for even the most critical designs. This means increased productivity and high quality.

Durability–Exceptional durability for consistent print quality over the longest press runs.

Dimensional Stability–Provided by the polyester support, assures accurate image registration.

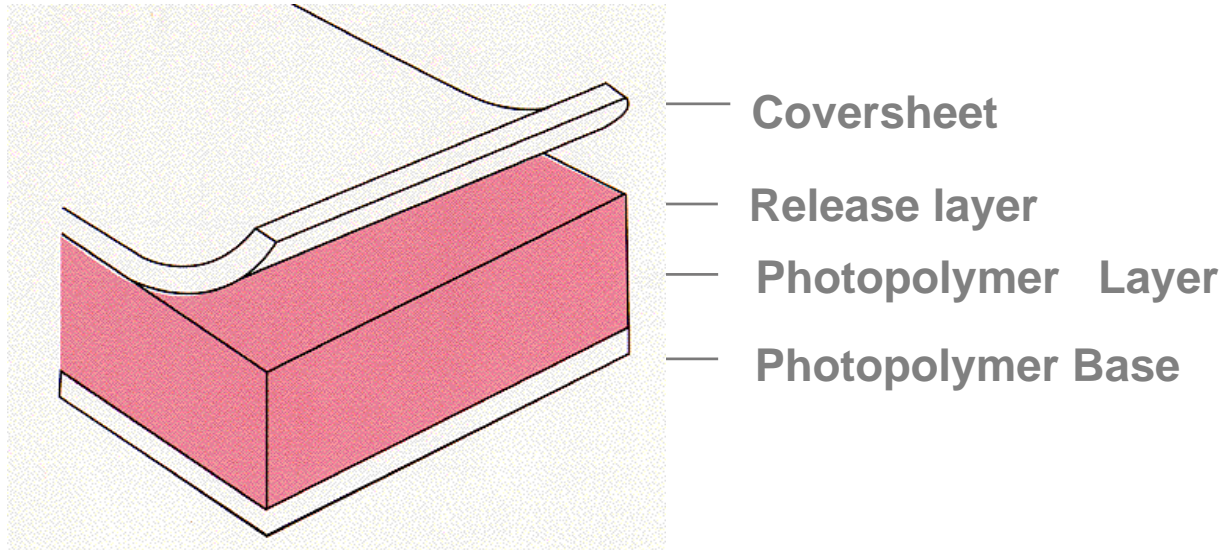
Thickness Uniformity–Uniform thickness assures minimum make-ready and good print quality.

Cyrel® Raw Photopolymer Plate Structure

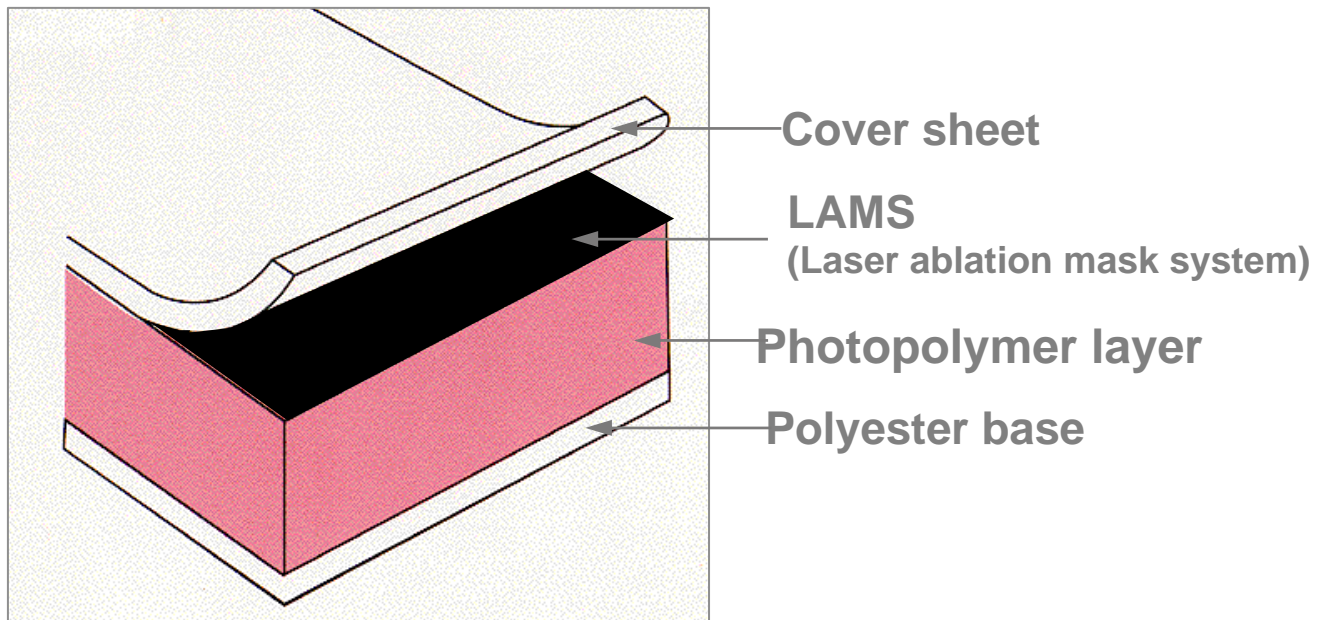
The Cyrel® plate is a sandwich-like structure consisting of several layers. An elastomeric bonding agent is applied to dimensionally stable polyester backing. A removable, polyester coversheet protects the plate against mechanical damage, dust, and the desensitizing effects of oxygen.

The photopolymer layer is strongly adhered to the polyester support base, which is responsible for the plate's mechanical strength and dimensional stability. Tight print register can, therefore, be obtained.

The elastomeric binder and light-sensitive compounds polymerize when the plate is exposed to ultraviolet light. The polymerization process causes the original physical properties of the raw materials to be modified in such a way that the bonding agent is hardened and cannot be removed.

Cyrel® Analog Raw Plate Structure

Analog plates have a very thin release layer under the coversheet that prevents the negative from sticking to the photopolymer surface.

Cyrel® Digital Raw Plate Structure

Cyrel® digital plates do not require the release layer, as no negative is required for digital platemaking. Instead, bonded directly onto the photopolymer layer is a black, laser-imageable LAMS (laser ablation mask system) layer.

Cyrel® Packaging and Developer Rolls

Printing Plate Boxes and Woodies

Cyrel® printing plates are supplied in reinforced boxes and/or reusable wooden crates that can be refurbished for reuse. These packaging methods ensure excellent protection for the fragile printing plates during transport and storage.

Customers in certain locations are offered the opportunity to return these materials for recycling *free of charge* to ensure that they are not deposited into the waste cycle. All internal components of the box, including the foam interleaving sheets between the raw plates, may also be returned with the boxes. Boxes should be handled with care so as to prevent damage to them. Contact your Cyrel® Sales Representative for information on this program.

Cyrel® Plate Packaging Label

In the following illustration you will see a sample of the label that is found on every box of Cyrel® plate material. Please notice and identify the Run Number/Batch location. Each box within a batch will have similar back exposure times. When you change batch numbers, a new back exposure step test is recommended to determine any shifts in back exposure time.

The label contains the following information:

- DU PONT Cyrel[®] FAST**
- Flexographic Printing Plates / Flexodruckplatten / Plaque d'impression en flexographie / フレキソ印刷用樹脂版 / Cliché flessografici / Flexografiska tryckplåtar / Placas para impresión flexográfica / 軟版印刷樹脂版材
- E.I. DuPont de Nemours & Company (Inc.) • DuPont / Technologies • Wilmington, DE 19898 / Made in U.S.A. / Printed in U.S.A.
- DFM** (Plate Type & Thickness)
- 1.7 MM** (Plate Thickness)
- 67 MILS** (Plate Thickness)
- PLATES 13P** (Quantity Plates/Box)
- 25X30 IN** (Size)
- 635X762 MM** (Size)
- MATERIAL CODE** (Global Material Code / Stock #)
- PH77160** (Global Material Code / Stock #)
- BOX NO.** (Batch Number)
- 0001** (Batch Number)
- BATCH** (Batch Number)
- 95503-06** (Batch Number)
- USE AFTER** (Use After Date)
- Feb 9** (Use After Date)
- 2005** (Use After Date)
- Icons: Upward arrows, umbrella, and a glass.
- NOTICE: POLYETHYLENE FOAM SHEETING NOT FOR PURPOSES OTHER THAN INDUSTRIAL PACKAGING.
- NOTE: LES FEUILLES DE MOUSSE POLYETHYLENE CONVIENNENT A RIEN D'AUTRE QU' AUX EMBALLAGES INDUSTRIELS.
- HINWEIS: POLYETHYLEN-SCHAUMPLATTEN SIND NUR FÜR INDUSTRIELLE VERPACKUNG.
- AVVISO: MATERIALE IN SCHUMA IN POLIETILE ADATTO PER SCOPI DIVERSI DALL'EMBALLAG INDUSTRIALE.
- AVISO: LAS PLANCHAS DE ESPUMA DE POLIETIL SON APROPIADAS PARA OTROS FINES EXCEPTO EMBALAJE INDUSTRIAL.
- ORIS: POLYETYLENSKUMMELLANLÄGGEN SÄR AVSÄNDING FÖR ANDRA ANVÄNDNINGAR ÄN INDUSTRIELL FÖRPACKNING.
- 注意: 聚乙烯泡沫板仅用于工业包装, 不适用于其他用途。
- 警告: 工業用梱包以外の使用には不適当ポリエチレン・フォーム・シート

Red arrows from the text below point to the following fields on the label:

- Plate Type & Thickness: DFM, 67 MILS, 1.7 MM
- Size: 25X30 IN, 635X762 MM
- Quantity Plates/Box: PLATES 13P
- Global Material Code / Stock #: MATERIAL CODE, PH77160
- Batch Number: BOX NO. 0001, BATCH 95503-06
- Use After Date: USE AFTER Feb 9, 2005

Used Cyrel®FAST Developer Rolls

Used developer rolls for the Cyrel®FAST thermal processing system can also be returned to DuPont *free of charge* depending on your location.

The used developer rolls should be stored in the same packaging material used to ship the new developer fabric. First, place the used developer fabric inside the plastic bag. Place the bag inside the corrugated box. Contact your Cyrel® Sales Representative for information on this developer roll return program.

Return Program Availability

	Plate Boxes	Plate Woodies	Packaging Material	FAST Developer Rolls
United States	X	X	X	X
Germany	X	X	X	-
Canada	X	X	X	X

Customer Feedback Survey

DuPont continues to research new techniques and technologies to meet customers' changing quality and productivity needs. This manual is intended to provide the most up-to-date information and proven techniques available to optimize your use of Cyrel® products and systems. To be continuously successful, we need your input!!! Please E-mail, fax or mail a copy of this form to:

DuPont™ Cyrel® Packaging Graphics
 Customer Technology Center
 P.O. Box 80702
 Wilmington, DE 19880-0702 USA
 Fax: (302) 999-4579
 E-mail: Charlotte.M.Cushing@usa.dupont.com

or

Du Pont de Nemours (Deutschland) GmbH
 Customer Technology Center
 Hugentottenallee 173 -175
 63263 Neu-Isenburg, Deutschland
 Fax. +49(0)6102-18-3968
 E-mail: Ute.Doeppner-Buchholz@dupont.com

Company _____

Submitted by _____ Title _____

Address _____ Telephone _____

City _____ State _____ Zip _____

Please indicate a response which best reflects your opinion of the Cyrel® Process of Use Manual.
 Please place an "X" or circle and/or write response (reference section, if necessary).

	Poor	-----			Excellent
▪ Ease of Use					
▪ Content	1	2	3	4	5
▪ Organization	1	2	3	4	5
▪ Illustrations/Diagrams/Charts	1	2	3	4	5
▪ Coverage of the flexo process (creation to print)	1	2	3	4	5

What information do you find most valuable? _____

What topic(s) do you find least useful and why? _____

What else would you like to see in our Manual? _____

What is your overall satisfaction level with the value you receive from Cyrel® flexographic plates and related products/systems that you purchase from DuPont? What one thing would you most like to see improved? _____

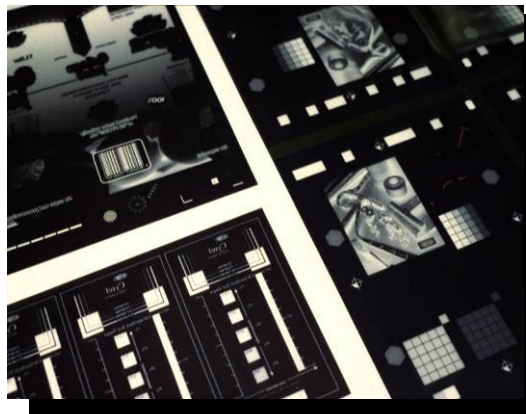
What actions could DuPont take to better understand your customers' up and coming trends and needs in order to better satisfy your requirements for flexographic printing equipment and consumables? _____

Other comments or upgrades: _____

A sincere "Thank You" for your feedback!

Film Negatives

Each Cyrel® plate is an original and can only be as good as the negative from which it was produced. The plate cannot be changed after it is produced. There are basic specifications that film must meet in order to produce the highest quality Cyrel® printing plates. Always check the negative for these requirements before imaging the plate.



High Matte Surface—Only films with a high matte surface will ensure that the air between the plate surface and the film is extracted without leaving any air bubbles, and that sufficient contact between film and plate is achieved. Matte level can wear after repeated use of the film. This would adversely affect the plate image.

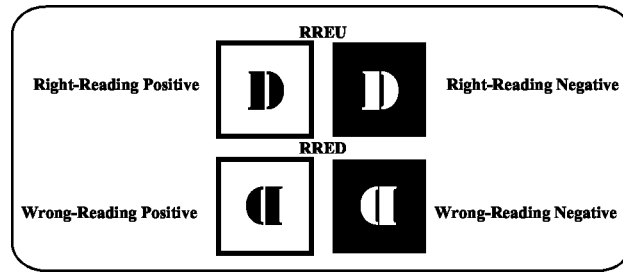
Dmin (Minimum Density)—A Transmission Densitometer reading of .05 or less in the clear area is required. This assures that the negatives are fully translucent in the transparent areas in order that fine image elements will be properly exposed and reverses are clean.

Dmax (Maximum Density)—A Transmission Densitometer reading of 4.0 (4.50 for Cyrel®FAST) or more in the black area is recommended for analog Cyrel®FAST plates to achieve the highest quality printing plates. Density lower than 4.0 will cause burn-through during plate exposure. This will lead to loss of relief and unwanted image on the floor of the plate.

Proper Image Orientation—A right-reading, emulsion-up negative (RREU) is oriented for face printing while the reverse-reading, emulsion-down negative (RRED) is for reverse printing. Normal surface printing generally requires right-reading negatives. They produce a wrong-reading printing plate and subsequently a right reading printed image.

Right-Reading = readable from the matte film emulsion side.

Wrong Reading = readable from the glossy, back side of the film.



Scratches and Pinholes—Negatives should be free of scratches, pinholes, or any other marks on the clear area of the film. These marks will reproduce on to the photopolymer plate. This is usually caused by the change in Dmin or from the removal of some of the emulsion from the film. Opaque should always be applied to the base side of the film only. Retouching on the emulsion side of the film can cause poor contact between the negative and the plate.

Kinks—A kink in the image area will reproduce on plate. Care in handling the film will reduce the possibility of kinks. It is recommended to carry negatives corner to corner on a diagonal.

Film Thickness—Graphic Arts film is available in two thicknesses, 4 mil and 7 mil. A 7-mil thickness film is preferred to reduce the possibility of kinks during handling and storage.

Proper Distortion—Film negatives must be properly distorted to allow for elongation in the print direction. The photopolymer thickness and repeat length of the job determines the distortion percentage (see Film Reduction Factors).

Distortion

When a photopolymer printing plate is laying flat the top surface and the bottom surface of the plate are the same length, $X=Y$ (see diagram 1).

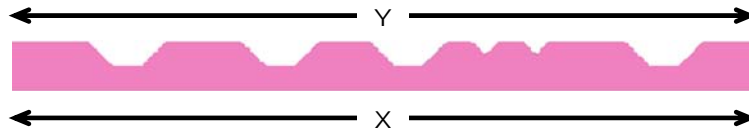


Diagram 1

When the plate is wrapped around a printing cylinder (see diagram 2) the surface of the plate becomes stretched because the distance around the surface is greater than the distance around the back of the plate ($Y_d > X_d$)

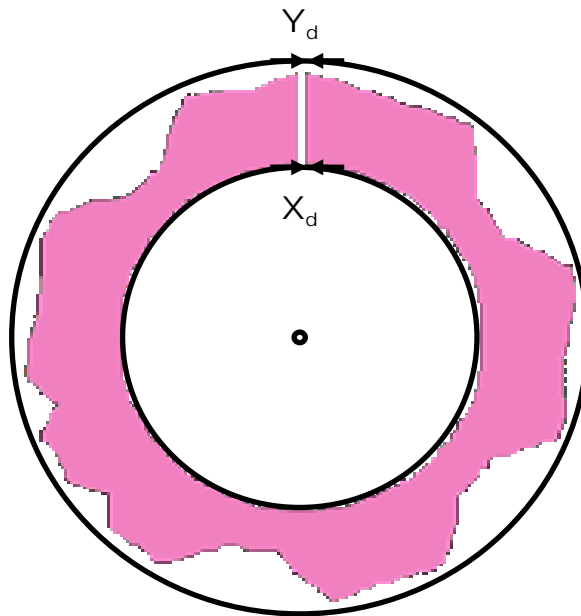


Diagram 2

Since the plate is imaged flat and printed round, the original negative must be reduced (distorted, only in the direction it will be wrapped around the cylinder) so that upon stretching it becomes the proper size.

The plate elongates in the print direction (around the cylinder) because the plate material is elastic. The top of the photopolymer stretches around a larger circumference than the bottom. The % reduction needed to compensate for this elongation can be calculated by the following equation:

$$\% \text{ Reduction} = \left(1 - \frac{K}{R}\right) \times 100\% = \frac{(R - K)}{R} \times 100\%$$

where K = Elongation Length, R = Repeat Length

The value obtained corresponds to the percentage reduction of the original in the printing direction.

K = Elongation Length

K is the extra length that the top of the photopolymer stretches around a cylinder compared to the bottom. Its value depends on the thickness of the photopolymer (t), which is the plate thickness, minus the polyester support thickness (the rigid support does not elongate). For polyester support thickness, see chart on next page. Contact your Cyrel® Sales Representative for any specialty products.

For these calculations, we will approximate the factor π as 3.142.

$$K = 2 \pi t$$

Example: Cyrel® 112UXL

$$\begin{aligned} K &= 2 \pi t \\ &= 2 \pi \times (\text{plate thickness} - \text{polyester thickness}) \\ &= 2 \times 3.142 \times (0.112 - 0.005) \\ &= 2 \times 3.142 \times 0.107 \\ &= 0.672'' \end{aligned}$$

The following table shows the various pre-calculated constant K values for different Cyrel® plate thickness:

Cyrel® Thickness	K (inches)	K (cm)	Base Thickness
.045 in/1.143 mm (FOP/CL4)	0.220	0.559	.010 in/.254 mm
.045 in/1.43 mm (not Coating)	0.239	0.606	.007 in/.178 mm
.067 in/1.70 mm	0.390	0.990	.005 in/.127 mm
.090 in/2.29 mm	0.534	1.357	.005 in/.127 mm
.100 in/2.54 mm	0.597	1.516	.005 in/.127 mm
.107 in/2.71 mm	0.641	1.628	.005 in/.127 mm
.112 in/2.85 mm	0.672	1.708	.005 in/.127 mm
.125 in/3.18 mm	0.754	1.915	.005 in/.127 mm
.155 in/3.93 mm	0.943	2.394	.005 in/.127 mm
.170 in/4.32 mm	1.037	2.634	.005 in/.127 mm
.185 in/4.70 mm	1.131	2.873	.005 in/.127 mm
.250 in/6.35 mm	1.539	3.910	.005 in/.127 mm

R = Repeat Length

The repeat length (R) is normally specified with the print job, in which case it is simple to calculate the reduction factor.

If the repeat length is not known, it is best obtained by measurement from the printed sheet.

Alternatively, knowing the radius of the printing cylinder, the thickness of the double-sided adhesive tape, and the plate thickness, the repeat length can be calculated using the following equation:

$$R = 2 \pi \times (\text{cylinder radius} + \text{adhesive tape thickness} + \text{plate thickness})$$

Example: Cyrel® 112UXL plate mounted on a 4.5" diameter cylinder using 3M 411 tape (.015" thickness).

$$\begin{aligned}
 R &= 2 \pi \times (\text{cylinder radius} + \text{adhesive tape} \\
 &\quad \text{thickness} + \text{plate thickness}) \\
 &= 2 \pi \times (2.250 + .015 + 0.112) \\
 &= 2 \pi \times 2.377 \\
 &= 2 \times 3.142 \times 2.377 \\
 &= 14.937"
 \end{aligned}$$

Examples

Let's complete the following two examples. As needed, the K values and the repeat length R have been calculated in the previous sections.

Example 1: Cyrel® 112UXL plate mounted on a 4.5" diameter cylinder using 3M 411 tape (.015" thickness). What would be the film reduction factor?

$$\begin{aligned}
 \% \text{ Reduction} &= (1 - \frac{K}{R}) \times 100\% \\
 &= (1 - \frac{0.672}{14.937}) \times 100\% \\
 &= (1 - 0.0449) \times 100\% \\
 &= 100\% - 4.49\% \\
 &= 95.51\% \text{ of original}
 \end{aligned}$$

Example 2: Cyrel® 112UXL plate mounted on a cylinder with a 15" repeat. What would be the film reduction factor?

$$\begin{aligned}\% \text{ Reduction} &= (1 - \frac{K}{R}) \times 100\% \\ &= (1 - \frac{0.672}{15}) \times 100\% \\ &= (1 - 0.0448) \times 100\% \\ &= 100\% - 4.48\% \\ &= 95.52\% \text{ of original}\end{aligned}$$

Cyrel® Plate Relief

Each Cyrel® plate is manufactured with a minimum floor thickness above which there is a layer of unpolymerized material. This allows platemakers to select their own relief by varying back exposure time. For the best print quality and performance, however, the recommended relief for **all Cyrel® plates** is listed below.

Plate Thickness		Recommended Relief*	
Inches	mm	Inches	mm
.045	1.14	.018-.022	0.45-0.55**
.067	1.70	.018-.025	0.45-0.65**
.090	2.29	.020-.035	0.50-0.90
.100	2.54	.020-.035	0.50-0.90
.107	2.72	.020-.035	0.50-0.90
.112	2.84	.020-.035	0.50-0.90
.125	3.18	.035-.050	0.90-1.25
.155	3.94	.055-.075	1.40-1.90
.170-.276	4.32-7.01	.060-.100	1.50-2.50

*The minimum relief is recommended for best print quality, performance, tighter registration, and less press bounce.

**For Cyrel®FAST plates, consider that the maximum for .045 in./1.14 mm plate should not exceed .024 inch/ 0.6 mm and for .067 in./1.70 mm you should not exceed .028 inch/0.7 mm .

Measuring Cyrel® Plates

The choice of a digital thickness gauge and method of measurement are important for obtaining correct data. The printing image of a processed plate can be easily compressed, and any heavy pressure exerted by the measuring device will lead to false readings.

Several points should be measured on a plate to determine the average thickness of the plate. When measuring raw plates, the plate should be measured with the polyester coversheet intact. The coversheet is 0.004"/.102 mm thick for most plates. Subtract this number for the absolute plate thickness. It is not possible to accurately measure the thickness of fine type or screen areas with conventional equipment. Stationary digital micrometers, which apply minimum pressure on the printing image, are the most commonly used in the industry. The recommended range of measurement should be (0.039-390 mil) 0.001-10 mm with an accuracy of +/- 0.39 mil (+/- 0.01 mm).



The following general recommendations will help ensure good results when using a digital micrometer.

- Calibration of the micrometer should be checked routinely with accurate machinist's blocks of determined thickness.
- Make sure the measuring foot is flat and not loose.
- The measuring table should be sufficiently large, smooth, and level (polished steel or stone) to allow the plate to lie flat at the gauge foot.
- The micrometer foot should be parallel with the micrometer base.
- The measuring foot should also be flat with a minimum diameter of 0.25 inch/6.350 mm.
- The area to be measured should be at least ½ inch/9 mm square.
- The contact pressure of the measuring foot must not exceed 1.5N.
- The polyester backing and the measuring table must be perfectly clean to obtain accurate thickness data.

Exposure Light Sources

Despite the introduction of new light sources, fluorescent tubes are still predominantly used to expose photopolymer plates. Digital plates should only be imaged with conventional fluorescent tubes. The reason for this is the limitations of newer light sources. Cross-linking of the photopolymer occurs most efficiently at maximum wave length of 350-365 nm. Exposure bulbs (UVA) for back exposure, main exposure, post-exposure should be purchased in this range. To prevent overheating of the equipment, only original tubes with the recommended power should be used. We recommend high output bulbs 10R from Philips.

Light Intensity

UV output of the bulbs influences exposure times. As the exposure bulbs age, light intensity falls off, and exposure times increase. The consistency of the bulbs can also begin to vary within the exposure unit, and this can affect image exposure.

Monitor the UV output of new exposure bulbs on a regular basis for the first 100 hours. If a UV meter is not available, exposure bulbs should be burned in a minimum of 10 hours before plates are made. The strength of new exposure bulbs usually shows an increase in measured intensity for the first 10 or so hours of operation. After approximately 10 hours, there will be a slight decrease in measured intensity. This, in turn, will be followed by a “leveling-off” in measured intensity.

An initial reading of the exposure bulbs should be taken after the burn-in period or when the bulbs level off. The bulbs should also be checked periodically (200, 400, 600 hours) for intensity and consistency of irradiance (output). An hour meter on many exposure units is provided for this purpose. Bulb readings and what would be considered the normal operating range will vary depending on the particular exposure unit and the age of the exposure bulbs.

Changing Exposure Bulbs

As mentioned above, back and main exposure bulbs must be adjusted to compensate for the fall-off of bulb irradiance. The expected useful lamp life for high intensity Philips 10R bulbs is up to 800 hours, depending on the number of times the unit is turned on and off. However, when exposure times become too long, the bulbs should be changed.

For optimum quality, the easiest and most reliable method for checking bulb output is to use a UV output measurement device, such as the Kühnast meter, at regular intervals. It is especially important to track UVA output for digital plates. The minimum UVA bulb output for optimum quality plates (especially digital) is 13 mW/cm², and a variability of +/-10% of the average measurements of the exposure unit.

Change all exposure bulbs at once. Make sure the opaque or reflector side of the lamp is facing the proper direction (away from the exposure bed). For a more uniform UV intensity, alternate bulb placement (when inserting bulbs) in the exposure unit based on the “logo” located on one end of each bulb.

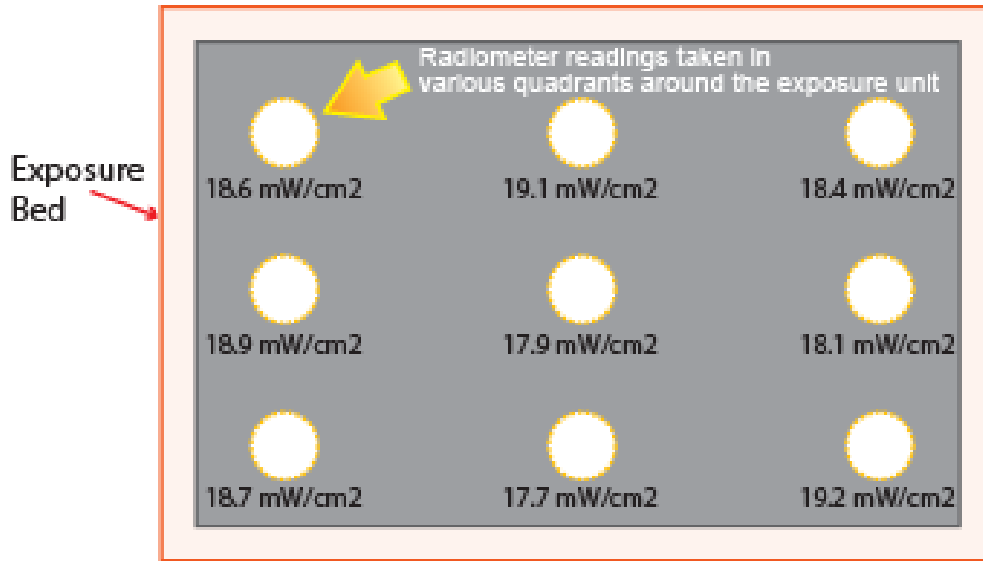
If one exposure bulb goes out, and you do not replace **all** the bulbs at once, the new bulb should be placed in the back of the unit.



Procedure for Testing UV Exposure Bulb Output

1. Inspect main, back, and light finishing exposure bulb intensity at regular intervals (monthly is recommended).
2. Use exposure frame template below for placement of bulb meter 1-9.

**Lamp Reading Locations
Front of Exposure Unit**



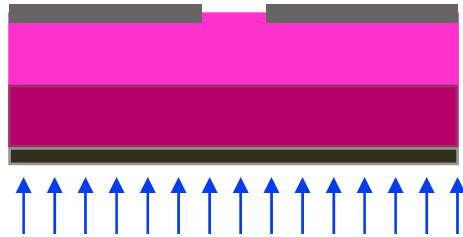
- Pre-heat bulbs at least 3 minutes. Test exposures are dependent on the type of UV meter you are using. We recommend Kühnast UV Meters (available for UVA and UVC), which are best for this application. Information for ordering these meters can be found in the Platemaking Supplies and Equipment List elsewhere in this manual.
- Calculate both the average value and the total variability (high-low) of the nine readings.
- Bulbs should be changed when the maximum variability within the unit is 20% (+/- 10% from the average value).
- Record readings on a log similar to the sample table below.

Tester	Date	Bulb Intensity Reading									Bulb			
		1	2	3	4	5	6	7	8	9	AVG	Status	Notes	

Cyrel® Photopolymer Plate Back Exposure for Cyrel® Plates

Step 1: Back Exposure

Plate is exposed from the back
(through the base)



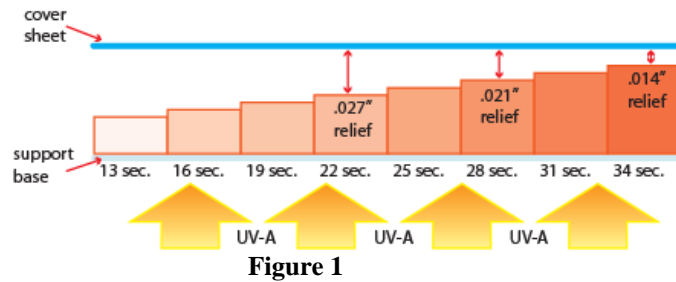
Back Exposure is the first step in printing plate production. A standard back exposure step test is conducted to establish the time required to obtain a desired relief. It occurs through the plate's polyester base prior to main exposure (Step 2). The exact back exposure time is determined by a back exposure step test.

Back exposure also has several important functions:

1. It sensitizes the plate to reduce the main exposure time,
2. It establishes the required relief,
3. It improves the adhesion between the polyester support and the layer of photopolymer,
4. It provides a firm base for fine lines and screens, and
5. Correct back exposure also helps produce a proper dot profile in conjunction with proper main exposure.

The sensitizing process takes place during the first few seconds of back exposure, after which the floor is gradually built up to a pre-selected level. It is recommended to back expose plates immediately before main exposure. Delays can result in significant variation in relief depth and main exposure times.

During the sensitizing phase, most oxygen, which has diffused into the plate during storage, is consumed. Because polymerization has not yet begun, no build up of the floor takes place. When most of the oxygen has been consumed, polymerization begins and the floor starts to build up. The longer the back exposure time, the higher the floor, and the smaller the relief. Polymerization is a complex reaction in which radicals combine to form molecular chains which then crosslink to build a molecular network. The polymerization reaction changes the original properties of the photopolymer that becomes insoluble in an organic solvent or cannot be melted by thermal contact.



More exposure=thicker floor/shallower relief.
 Less exposure=thinner floor/deeper relief.

Example: In the Figure 1 above, a back exposure time of 28 seconds has built the floor up to a thickness of .046 inches, which for a Cyrel® .067 plate corresponds to a relief of .021 inches.

When to Perform a Back Exposure Step Test

Performing back exposure tests regularly saves you time and insures that the best consistent, quality plates are produced.

For consistent results, back exposure step tests should be performed for:

1. Each new batch of Cyrel® plates (See Product Label in Cyrel® Flexo Plate - Packaging Section for location of batch number.)
2. After new exposure bulbs have been installed and burned in
3. For each product type you use

Back Exposure Step Test Procedure

Safety Information

Exposure Units

UV Source Used during Back Exposure
Long Wavelength (UV-A –350-400 nm)

Recommended PPE: Never look directly at the lighted UV bulbs. If necessary, during maintenance, a welding face shield with shade 6 is recommended.

Ultraviolet Light Safety Information:

- Do not defeat or bypass built-in safety features of the equipment.

Single-Bank Exposure Unit (Example – DuPont 2000E Exposure Unit)

1. Preparation of a test plate

Cut a test strip of raw plate material

approximately 5" x 15" (15x40cm) for rotary processing, 12" x 30" (30x75cm) for inline and thermal processing, or an appropriate size for your processor. On the surface of the polyester support, mark off six or more equal segments at least 3 inches/ 8 cm in width with the appropriate exposure time intervals that includes a range of guideline times supplied by DuPont or times based on previous exposure times you established for the product. **For Cyrel®FAST plates**, the marked segments should be at least 6 inches / 15cm in width in order to get smooth and accurate results.

If you have determined that 25 seconds is a good starting estimate, begin with the middle step at 25 seconds (Figure 2) and continue with several additional steps on each side of the starting estimate. Mark off your steps on the back of the plate with a black, permanent marker so that the lines and numbers will be imposed into the plate (Figure 3).

Create a Solid Area

For Cyrel® FAST plates, leave sufficient space at the end of the strip for a solid area. This solid area must be in the same direction as the segments and next to longest backflash time segment. This creates a solid step for checking relief when test is completed.

This solid will also serve to properly clamp the step test plate into the FAST processor. You will back expose the solid strip the same time as your longest step next to it.

For solvent plates, create a solid with one-half of your step test plate (Figure 4).

Next, place a strip of high density stripping tape across the center back of the test plate (Figure 4). This tape blocks the light to prevent polymerization of the plate material under the tape. We can then verify washout performance.

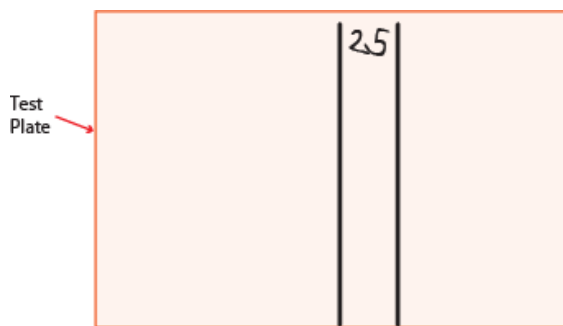


Figure 2

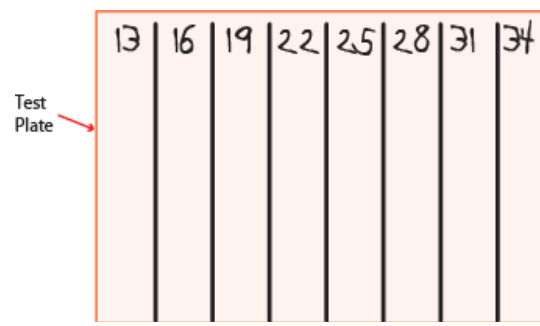


Figure 3

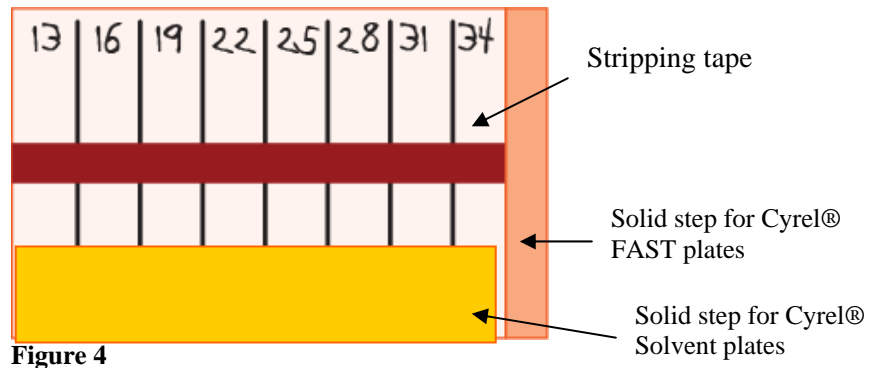


Figure 4

2. Pre-heat the back exposure lamps.

For optimum consistency in plate relief it is important to attain a stable operating bulb irradiance on the exposure bed, especially with the short exposure times for thinner plates. Warm up the UV lamps in the exposure unit if the unit has not been used within ten minutes. You can determine the required length of pre-flashing time on your equipment by measuring how long it takes a particular exposure unit to reach its stable UV energy output. Some units may reach the stable point in 2 minutes, others may take longer. Back exposure step test conditions should simulate production conditions as closely as possible. Once the bulbs are warmed up, begin the step test and each step exposure within 30 seconds.

3. Place the plate on the exposure unit.

Place the marked plate on the exposure unit with the coversheet facing downward. No vacuum is used during back exposure. Obtain two pieces of masking material. All masking material used for the step tests should measure at least 4.0 D-max or greater to prevent light leaks.

4. Expose each segment for the proper time interval

using the “individual” or “cumulative” exposure method described below.

For .090/2.28 mm thickness plates and thinner, with the back exposure segments of shorter than 10 seconds, expose according to the “individual exposure method” listed below.

For other plate thickness, with back exposure segments of 10 seconds or more, expose according to the “cumulative exposure method” listed below.

A. Individual Exposure

To expose the segments individually, lay two pieces of masking material directly on the plate or exposure bed (depending on exposure unit), spacing the two masks apart the exact distance of each stepped interval.

Expose each segment individually for the entire time interval, beginning with the longest individual time exposure. Example time segments are shown below.

Segments: 13, 16, 19, 22, 25, 28, 31

Mask the 13-31 second segments and expose the last segment and the solid segment for 34 seconds (Figure 5).

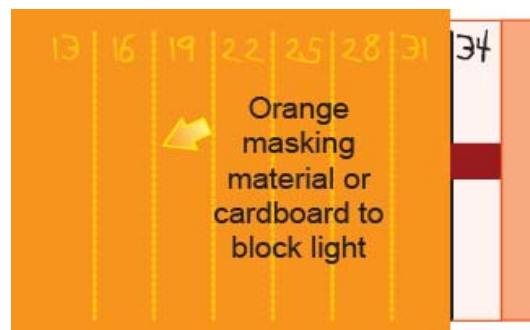


Figure 5

Adjust masking material on plate to cover the 13-28 and 34 second segments and expose the revealed segment for 31 seconds (Figure 6).

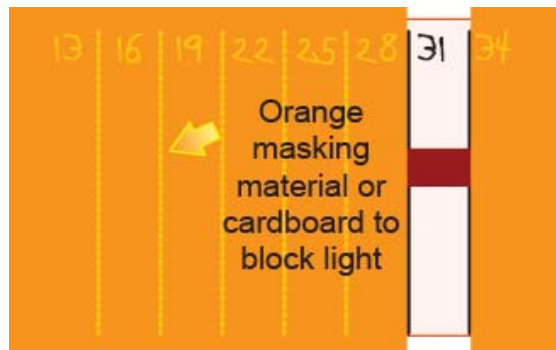


Figure 6

Continue this progression until all segments are exposed.

B. Cumulative Exposures

Example cumulative time segments (Figure 7):

Segments: 40, 50, 60, 70, 80, 90, 100

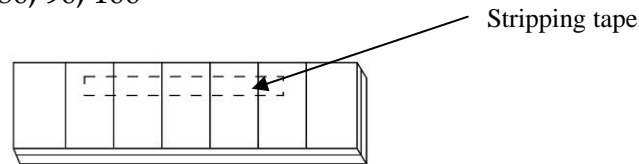


Figure 7

The entire back of the plate is first exposed for the shortest time interval. A mask is placed covering the top of the plate completely.

Then, mask the shortest time interval (40") and expose the remaining time intervals for 10 more seconds (Figure 8).

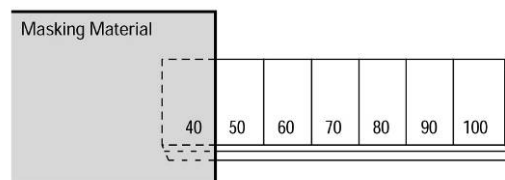


Figure 8

Advance the mask to cover the 40 and 50 second time segments and expose the remaining time intervals for 10 more seconds (Figure 9).

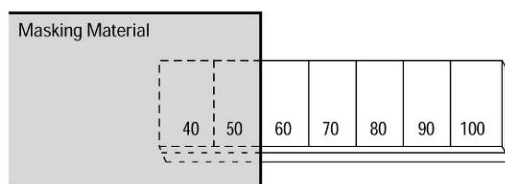


Figure 9

Continue the progression of 10 seconds until each segment has been given the proper time by cumulative time exposure.

C. Specifics for Dual-Bank Exposure Unit (Steps 1-4)

1. Preparation of a test plate

Cut a test strip of raw plate material

approximately 5" x 15" (15x40cm) for rotary processing, 12" x 30" (30x75cm) for inline and thermal processing, or an appropriate size for your processor. On the surface of the polyester support, mark off six or more equal segments at least 3 inches/ 8 cm in width with the appropriate exposure time intervals that includes a range of guideline times supplied by DuPont or times you have previously established for the product. **For Cyrel®FAST plates**, the marked segments should be at least 6 inches / 15cm in width in order to get smooth and accurate results.

Identify the time intervals on the bottom back of each segment with a black permanent marker. Place a strip of high density stripping tape across the center back of the test strip. This tape will block the light so that you can check for complete washout of the polymer.

2. Pre-heating of the back exposure lamps is not needed for dual bank exposure units. Dual bank exposures units are conditioned on a stable temperature.

3. Place the marked plate on exposure unit and mask.

Keep the coversheet intact and place the plate so that the coversheet faces upward. No vacuum is used during this step. Obtain two pieces of masking material. All masking material used for the step tests should measure at least 4.0 D-max or greater to prevent light leaks. This will give you the most accurate floor results.

4. Expose each segment for the proper time interval

using the "individual" or "cumulative" exposure method described above.

End of Specifics for Dual-Bank Procedure – Continuing with main procedure below

5. Main expose a solid area for clamping into the machine and measuring relief.

For solvent analog plates:

When exposure of the step intervals is complete, place masking material on top of the coversheet, leaving the top segment uncovered (Figure 10). This top segment of the plate will be main-exposed to create a solid. This segment will be clamped into the machine for processing and will also provide a solid for measuring relief.

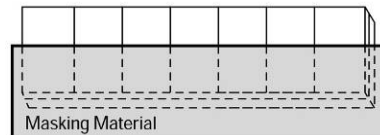


Figure 10

For solvent digital plates:

When exposure of the step intervals is completed, remove cover sheet and place masking material on top of the mask, leaving the top segment uncovered (same as Fig.10). Place sticky tape across the mask on the top section of the test. Then remove the black mask by pulling off the sticky tape creating a clear area on the plate. When imaged, this will create a solid.

6. Before processing coversheet and stripping tape must be removed (Figure 11).

Process according to the required plate type and thickness.

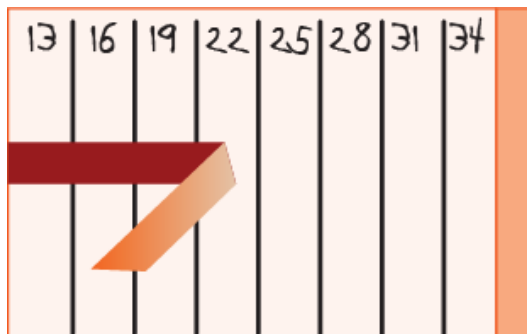


Figure 11

Additional Cyrel®FAST Exposure and Processing Specifics

- A. The back exposure test sample should be minimum of 12x30" (30x75cm). The marked segments should be at least 6 inches / 15cm in width. Refer to analog and digital solvent procedure above for all other back exposure steps.
- B. Be sure to clean off the black marker lines before processing with film cleaner or alcohol. Otherwise, they will transfer off onto the white drum skin of the Cyrel®FAST processor (Figure 12).

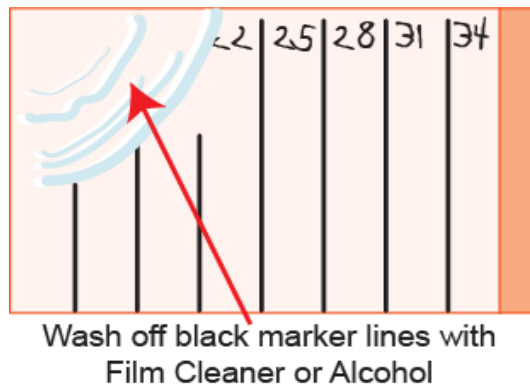


Figure 12

- C. The Cyrel®FAST back exposure step test **plate** must be **processed in the vertical position** through the machine (Figure 13) clamped on the solid segment. This allows the heated roller to engage the plate uniformly across each step. Use the appropriate Cyrel®FAST processor program for the plate thickness of the test.

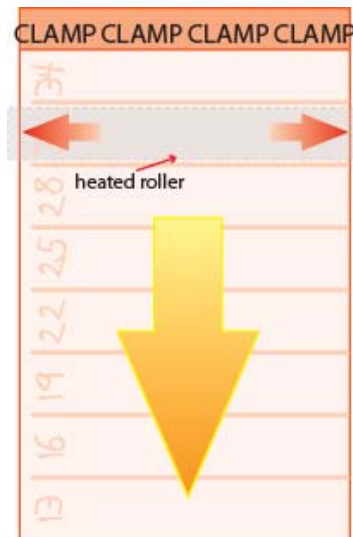


Figure 13

Continuing with main procedure steps

7. For solvent-processed plates, dry the washed out plate for minimum 20 minutes (minimum) at 140° F / 60°C and allow it to cool to room temperature.

8. Measure the relief depth.

Zero out the digital micrometer on the metal base. Take a measurement of the solid area to determine the plate thickness. Measure the corresponding stepped segment below that solid area three times and take the mean value.

Subtract the measurement of the stepped segment from the thickness of the solid area. This value is equal to the relief depth. The relief depth will correlate with the amount of back exposure for each segment. Continue to measure the solid area to the stepped segment (Figure 14 and 15).

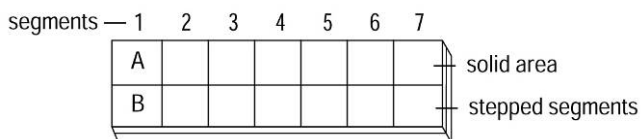


Figure 14 – Solvent Plates

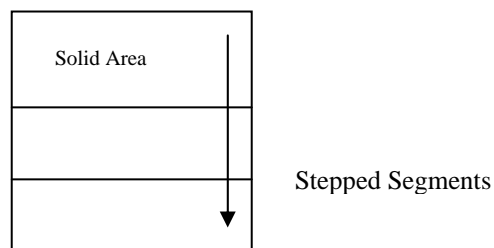


Figure 15 – Cyrel® FAST Plates

9. Select the back exposure time that provides the desired relief or draw a diagram (Figure 16) of times to relief and choose the recommended relief depth with corresponding time.

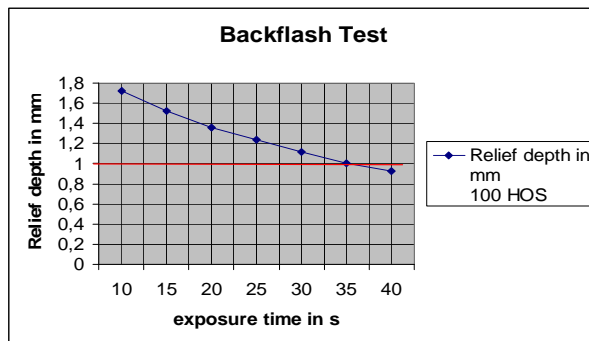


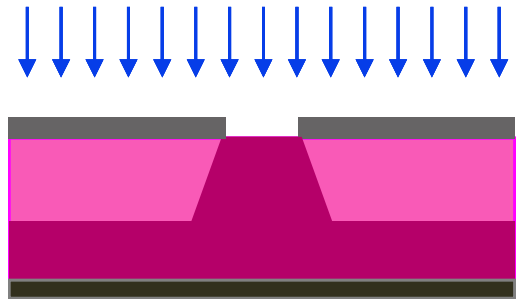
Figure 16

10. **For solvent plates only**, return plate to dryer to complete drying time.
11. After drying is completed, measure the relief depth (step 7) to verify the previously selected back exposure time.
12. Retain the back exposure information for use on this batch of Cyrel® plates, and record the back exposure time on your Cyrel® Production Log. Daily use of the Cyrel® Production Log to record processing data will improve production efficiency. The results of previous jobs will then be available to guide new jobs and information will be available for troubleshooting. The Cyrel® Production Log can be found in the Quality Assurance section of this manual.

Cyrel® Photopolymer Plate Main Exposure

Step 2: Main exposure

The face of the plate is exposed through the film negative or LAMS-layer.



Main exposure is the second step in the production of photopolymer plates and should be performed immediately following back exposure. The purpose of main exposure is to create the relief image for the printing plate and to ensure that the image elements are firmly anchored to the relief base built up during back exposure.

Main exposure is carried out through a film negative or laser-ablated plate and forms the printing image. Ultraviolet light that passes through the clear areas of the negative or mask causes a polymerization reaction. The exposed photopolymer cannot be removed in the processing step, thus creating the relief image. Main exposure time is affected by:

- Polymer Type
- Polymer Thickness
- Condition and type of platemaking system
- Age and type of the exposure bulbs
- Temperature of the exposure bulbs
- Solvent
- Image Detail
- Plate Relief
- Transparency of the vacuum coversheet material (analog only)

For these reasons, we recommend that a *Main Exposure Step Test* be performed:

- After burn-in of new exposure bulbs
- For each product type & thickness you use
- If there is a change in your platemaking system (Exposure unit, Processor, Solvent)
- As exposure bulbs age & bulb output decreases
- Any change in the platemaking process

Main Exposure Step Test Procedure – Solvent Plates

Safety Information - WARNING: Potential Physical Hazard – Radiation

Exposure Units

UV Source Used during Main Exposure
Long Wavelength (UV-A – 350-400 nm)

Recommended PPE: Never look directly at the lighted UV bulbs. If necessary, during maintenance, a welding face shield with shade 6 is recommended.

Ultraviolet Light Safety Information:

- Do not defeat or bypass built-in equipment safety features.
- Do not stare directly at the UV bulbs.
- Do not operate equipment with covers or access panels removed.
- All personnel operating and maintaining the equipment should be thoroughly aware of the hazards and use appropriate personal protective equipment.
- Refer to manufacturer's equipment manual for safety requirements when viewing UV light through viewing slots.

1. Sample Preparation -Cut a test strip of raw plate material

For analog plates, cut a piece of raw polymer to fit the main exposure step test negative. **For digital plates**, you can tack the step test image onto the end of a job if you have space, or if imaging the step test image alone, you need to cut enough raw material to image the file and to go around the drum.

2. **Pre-heat the back exposure lamps.**

For optimum consistency it is important to attain stable operating bulb irradiance on the exposure bed. The UV bulbs should be warmed up for at least three minutes. If you have a UV meter, such as the Kuhnast meter, you can determine the required length of pre-flashing time on your equipment by measuring how long it takes a particular exposure unit to reach its stable UV energy output. Some units may reach the stable point in two minutes, others may take longer. Also, UV lamps in the exposure unit should be warmed up if the unit has not been used within ten minutes. Back exposure step test conditions should simulate production conditions as closely as possible.

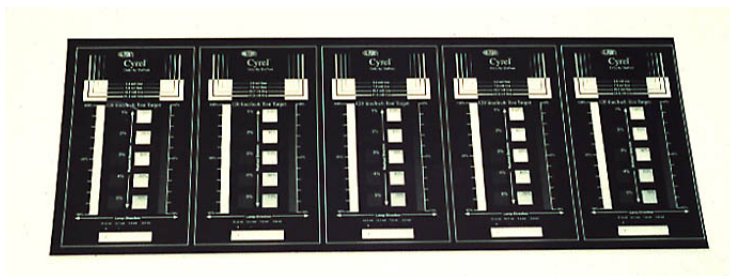
3. **Back expose** the plate for a pre-selected time that will produce the desired relief (determined by the back exposure test).

4. Prepare the plate for exposure.

5. **For single bank exposure units**, place the back exposed, raw plate on the exposure unit bed, with the coversheet intact and facing upward. Remove the coversheet in one smooth motion and discard. You can distinguish the coversheet by flicking the edge of the plate.

For analog plates:

- Place the test negative on the Cyrel® plate, emulsion-side (matte surface) in contact with the plate surface. A test file is available from DuPont. Clean the back of the negative with antistatic film cleaner, roller, or tack cloth.



- Place the masking strips around the edges of the negative and plate down to the exposure bed floor. Masking strips help create contact between the negative and plate surface. Masking strips must have a matte or air-channeled surface to allow air to escape (i.e., DuPont masking strips). Make sure that the masking strips extend to the vacuum channels of the exposure unit surface.

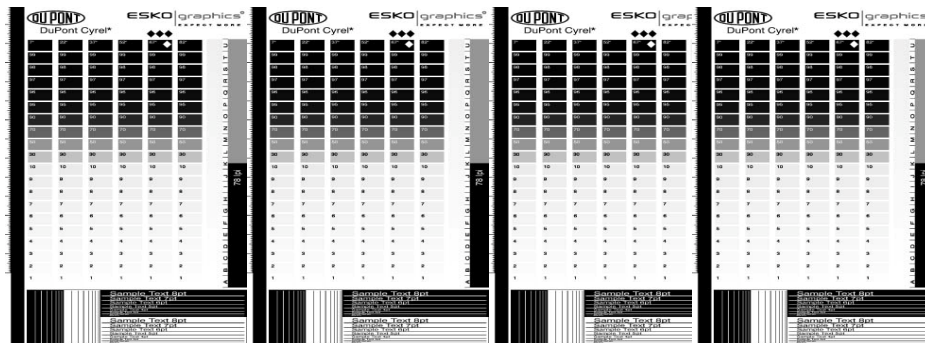


Masking material for
Dual Bank Exposure Bed

- For glass exposure beds (dual bank exposure units), masking material must be placed to cover all exposed glass so that UV light will not be reflected from the upper bulb bed. The lifetime of masking strips is limited. They need to be checked regularly and replaced as soon as the embossing is worn. Draw the vacuum coversheet and pull vacuum (~.8 bar or ~25 in. on gauge, .99 on ECLF).

For digital plates:

- Laser-ablate a unbumped main exposure step test image onto a plate. A test negative file is available from DuPont.
- Place the laser-ablated plate on the exposure unit bed.
- No vacuum coversheet is required for main exposing digital plates.



5. **Main expose** the entire test plate for the smallest amount of time in the range of expected exposure times. Then cover one image copy using opaque material and add exposure intervals of 2 minutes, repeating the procedure until the last copy of the target is exposed. The test plate should result in main exposures that

range from being slightly under-exposed at the first segment to being slightly over-exposed at the last segment.

6. Process the plate.

Area to be clamped				

Recommended processing direction for all systems.

7. **For solvent plates**, dry the plate thoroughly for at least 20 minutes in the dryer. At this point, check the plate for solvent spots, missing images, etc. Return the plate to the dryer to complete the drying time. If solvent spots are apparent, remove plate from the dryer (or shut the dryer off), and wipe the spots with an antistatic film cleaner or a mixture of 50% alcohol and 50% water.
8. **Post expose and light finish** the test plate.
9. **Document** the batch number on the test plate and save this test in the box of plates for reference.

Evaluating Main Exposure Step Test

The correct exposure is the one where you hold your finest detail (fine lines and type) and a consistent minimum dot (with no dot dropouts), and keep your reverses open. The main exposure time should be as long as necessary and as short as possible.

Check the integrity of the plate images for the following qualities when completed. A complete Quality Control Checklist for a finished plate is available in the Quality section of this manual.

1. Positive characters should have a sharp, clean shoulder.
2. There should be no positive dot drop-outs for the targeted % dot you wish to produce.
3. All positive dots on the targeted screen should be well-defined and of the same height. No dots should be falling over, missing, or chipped. Isolated dots should be present and well-anchored to the base.
4. Positive lines should be sharp, clean, and straight. They should not be wavy or chipped.
5. Reverse areas, dots, and lines should be open, clean, and sharp.
6. Check that the relief is correct.

Image Resolution

For digital plates, choose the **shortest** main exposure time that holds your smallest dot at a consistent size and height. There is no advantage to choosing a longer exposure time. Digital plates are usually capable of holding 1-98% dots.

For analog plates, choose the proper main exposure time to hold the finest detail while keeping fine type and reverses open. Analog Cyrel® plate are usually capable of holding 2-95% dots (some exceptions).

Refer to the *Cyrel® Product Data Sheets* for specific imaging capabilities of Cyrel® plates.

Main Exposure of the Cyrel® Plate

As mentioned previously in main exposure step test section, main exposure is carried out immediately following back exposure. As with all exposures, it is important to attain stable operating bulb irradiance on the exposure bed for optimum consistency. The UV bulbs should be warmed up for at least three minutes, especially if the exposure unit has not been used for ten minutes.

Main Exposure for Analog Plates

1. Clean the emulsion or matte side of the negative with antistatic film cleaner, tack roller, tack cloth or magnetic wiping cloth to insure no dust or dirt interferes with the plate image quality. Do not use any cleaner that will leave a residue on the film surface.



2. For single bank exposure units, place the back exposed, raw plate on the exposure unit bed, with the coversheet intact and facing upward. Remove the polyester coversheet in one smooth motion and discard. You can distinguish the coversheet by flicking the edge of the plate.
3. Position the negative with the emulsion side in contact with the plate surface. Clean the back of the negative with antistatic film cleaner, tack roller or tack cloth.
4. Place masking strips over the edges of the negative and the plate, as explained in the #5 of the main exposure step test procedure above.
5. Turn on the vacuum.
6. Unroll the vacuum coversheet over the plate and negative. As you unroll, use a lint-free cloth dampened with antistatic film cleaner or tack cloth to remove dust and dirt from the coversheet. Wipe the vinyl coversheet in one direction as it is unrolled. The vacuum coversheet must be kept static free, clean, and free from mechanical damage (holes, etc.)
8. Rub the vinyl coversheet lightly but firmly with your hands, cardboard or a Toray Stick (see Platemaking Supply List) to eliminate any bubbles or wrinkles. If you see any dirt in the image areas, be sure to roll back the coversheet and remove it before proceeding with your exposure. It is important to keep the

vacuum gauge at .8 bars, 25 inches of Mercury or higher, or .99 on the ECLF without fluctuation during exposure.

7. Proceed with main exposure. For dual bank exposure units, back exposure and main exposure is performed simultaneously.

Main Exposure for Digital Plates :

1. For single bank exposure units, place the raw, laser-ablated plate on the exposure unit facing upward.
2. When using a glass bed exposure unit (dual bank), place masking material to cover all exposed glass so that UV light will not be reflected from the upper bulb bed.
3. Proceed with main exposure. For dual bank exposure units, back exposure and main exposure is performed simultaneously.

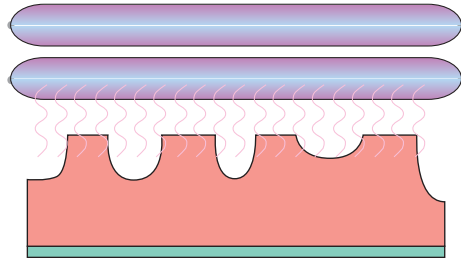
Cyrel®FAST Plate Post Exposure and Light Finishing

Step 4: Post Exposure

The plate surface is exposed with UV-A radiation.

Step 5: Light Finishing

The plate surface is exposed with UV-C radiation.



Post Exposure

Post exposure is necessary to ensure that the plate reaches its final hardness and durability. However, not all plates require this additional UV cure to complete the polymerization process. Over-curing can result in brittle dots and fine lines. Post Exposure uses the same type of UV-A light that is used for back and main exposure. The effectiveness of the post exposure procedure depends on the UV output of the exposure bulbs. Post exposure can be carried out simultaneously with light finishing

Effects of Post Exposure

- Plate achieves its final overall hardness
- Completes polymerization

Safety Information - **WARNING: Potential Physical Hazard—Radiation**

Exposure Units

UV-A Light Source Used during Post Exposure (350-400 nm)

UV-C Light Source Used during Light Finishing (Short Wavelength 254 nm)

Recommended PPE:

Never look directly at the lighted UV bulbs. If necessary, during maintenance, a welding face shield with a shade 6 is recommended.

Wear long- sleeve shirt and leather gloves

Ultraviolet Light Safety Information:

- Do not defeat or bypass built-in equipment safety features.
- Do not operate lamps with covers removed.
- Do not stare directly at the UV bulbs.
- Do not operate equipment with covers or access panels removed.
- All personnel operating and maintaining the equipment should be thoroughly aware of the hazards and use appropriate personal protective equipment.
- Refer to manufacturer's equipment manual for safety requirements when viewing UV light through viewing slots.

Light Finishing

After processing, the surface of a Cyrel® plate is slightly tacky. Light finishing eliminates surface tackiness of Cyrel® photopolymer plates, and the plate's final surface properties are achieved. The light finishing step utilizes short wavelength (UV-C) radiation.

- Removes surface tackiness
- Increases the durability and storability of a plate
- Solvent and ozone resistance is increased

Most light finishers today combine the UVA post exposure and the UVC light finishing exposure in one unit. Both the post exposure and light finishing steps are performed simultaneously. When using two separate exposure units, always perform the post exposure step first. The surface of the plate may still have a few microns of partially cross-linked material on the surface making it tacky. The light finishing step increases the cross-linking density of the surface.

Light Finishing Step Test

Light finishing time depends on

UV Output Temperature Equipment Exhaust Rate Plate Type
--

Because of these variables, a light finishing step test (see procedure below) should be performed to determine the correct finishing time for Cyrel® photopolymer plates. Any imaged, processed (and dry) Cyrel® plate can be used for this test. A back exposure step test plate is ideal for this test, since it has already been divided into sections. If you are not using the a back exposure step test plate, mark off as many equal sections as needed on processed plate to accommodate the range of recommended times (refer to plate processing guidelines) necessary to complete the test. Actual times may vary slightly from these values due to variations in light finishing equipment, design for different size units, and/or different manufacturers (i.e., lamp intensity, lamp spacing, and lamp height).

Allow the plate to cool to room temperature after drying or thermal processing, and then finish each step in two-minute intervals using opaque material to cover the sections you are not exposing. The plate is properly finished when it is no longer tacky. One quick method to determine when a plate is adequately detacked, is to utilize the coversheet material that is removed from the raw material. Place the coversheet on the finished step test plate, pressing it down with your fingers. Slowly lift the coversheet from the plate. Take note at what finishing time the coversheet no longer sticks to the plate.

For maximum printing performance/durability, a minimum light finishing exposure to just remove plate tackiness is recommended. Prolonged exposure (“over-finishing”) can lead to poor ink transfer and/or increased cracking potential immediately or subsequently during use/storage.

Post Exposure and Light Finishing Procedure

1. Make sure there are no spots of any kind, dirt, etc. on the plate surface.
2. For solvent plates, make sure the plate is completely dried and cooled to room temperature.
3. Place the plate on the exposure unit bed face up.
4. Expose the plate. Post exposure and light finishing can be run simultaneously with the appropriate equipment. **If each operation is run separately, the post exposure step should be performed first.**

Cleaning Polyester Support after Finishing

Polymer residue must be removed from the back of the plate so that it does not interfere with plate thickness uniformity or adhesion of the mounting tape in printing applications. Place the plate on a clean surface and wipe the polyester back to remove. An antistatic film cleaner or alcohol can be used; however, large amounts should not come in contact with the surface of the plate.

The DuPont™ Cyrel®FAST Thermal Platemaking System

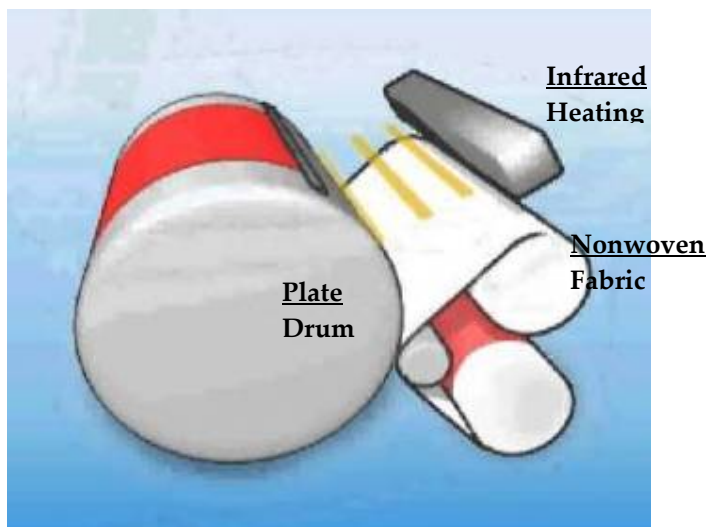
The Cyrel®FAST Platemaking system is the world's first dry, thermal technology that allows the development of analog and digital flexographic plates without using solvent. The thermal developing of the Cyrel®FAST plate accelerates the platemaking process to produce a high-quality plate in one hour or less by eliminating solvent processing and the drying step. This system eliminates the use of solvents or aqueous washout solutions from the plateroom, along with recycling and storage concerns. The unpolymerized polymer collected in the thermal system is accumulated on a nonwoven fabric, making disposal simple and safe.

The Cyrel®FAST Thermal Platemaking Systems includes:

1. DuPont™ Cyrel® EC/LF (Exposure, Light Finisher, Post Exposure)
2. Cyrel®FAST photopolymer plates
3. Cyrel®FAST thermal processor
4. DuPont™ Developer Roll

Cyrel®FAST Platemaking

The Cyrel®FAST plates can be imaged using conventional film negative (analog), or laser-ablated plate (digital). The plates are given a back and main exposure in the same manner as conventional photopolymer plates.



After main exposure the plate is clamped in the Cyrel® FAST processing unit on a drum that passes an infrared heating section as it turns. During the development process, the plate is heated to the melt flow index of the photopolymer. It is then pressed gently against a nonwoven fabric, which absorbs the unexposed, molten photopolymer, leaving a clean printing surface. Standard processing programs are already loaded in the machine when installed. No drying step is required after thermal development.

The Cyrel®*FAST* plate is post-exposed and light finished and ready for press.

Some of the **Cyrel®*FAST* system advantages** and benefits are:

- Easy to operate – quickly making plates
- Simple installation of equipment
- Improved Sustainability – elimination of all organic solvents
- Very short access time to finished plate – higher throughput, no need for back-up plates.
- Superior print quality on all substrates

DuPont™ Cyrel®*FAST* Thermal Platemaking Equipment Portfolio

The DuPont Cyrel®*FAST* System is a revolutionary technology that offers enhanced pressroom productivity. Cyrel®*FAST* uses a dry, thermal technology for plate development, completely eliminating conventional solvents and aqueous washout solutions. In addition to the obvious environmental and health gain, it also reduces the plate processing times significantly (up to 70%).

Additional information and brochures for the Cyrel®*FAST* thermal platemaking equipment can be found by region on the main Cyrel® internet website, www.cyrel.com.

DuPont™ Cyrel®*FAST* Analog and Digital Plate Portfolio

Cyrel®*FAST* is an innovative, highly productive plate processing technology utilizing solvent-free thermal processing. It produces a press-ready, finished plate in an hour or less. Digital Cyrel®*FAST* plates give the ultimate in print quality with wide tonal range from highlights to detailed shadows.

DuPont's portfolio of digital and analog Cyrel®*FAST* plates meets the needs of a broad range of printing applications. Information and brochures for Cyrel® printing plate products can be found by region on the main Cyrel® website, www.cyrel.com.

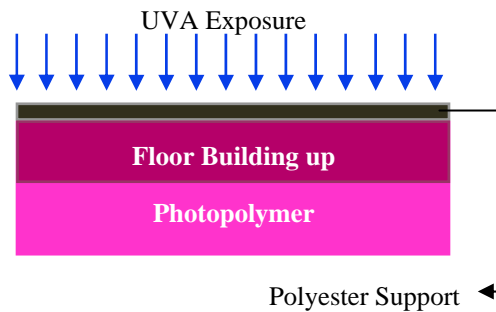
Cyrel®FAST Platemaking Process

Overview

Cyrel®FAST plates are produced in five basic steps:

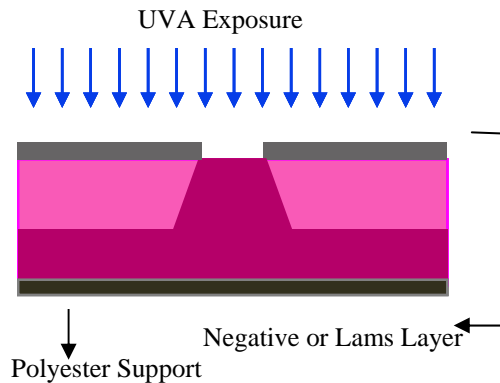
1. *Back Exposure*

Back exposure sensitizes the plate, establishes the plate relief, improves adhesion between the polyester support and the photopolymer, and provides a firm base for fine lines and screens. It is an exposure of the back of the plate through the polyester base. The back exposure time is determined by a back exposure step test.



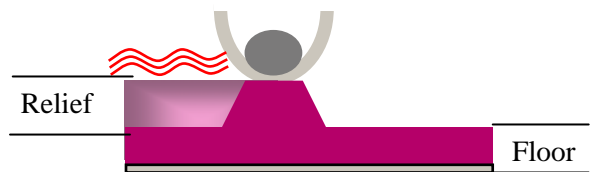
2. *Main Exposure*

Main exposure is carried out through a film negative or laser-ablated plate. The exposed photopolymer cannot be removed in the processing step, thus creating the relief image. Because the image is formed by exposure, the plate can reproduce the finest details of the original film negative or electronic file.



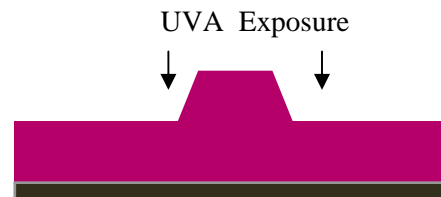
3. *Processing*

Unexposed photopolymer is removed in the thermal processor by heat transfer. The molten polymer is absorbed by a nonwoven fabric. . No solvents are used.



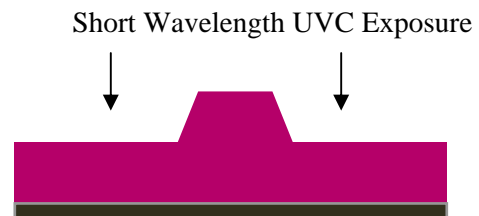
4. *Post Exposure*

Post exposure completes the polymerization process, and the plate achieves its final hardness.



5. *Light Finishing*

Light finishing removes the surface tackiness, increases durability, and resistance to solvents and ozone. Light finishing and post exposure can be performed simultaneously.



The Cyrel® Digital Workflow

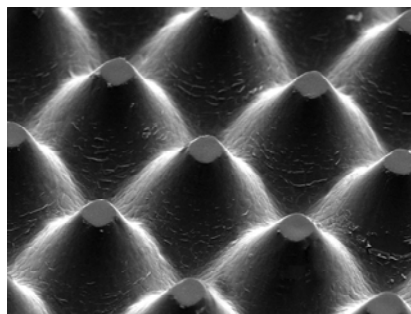
The Cyrel® Digital Workflow System features the Cyrel® Digital Imager (CDI) combined with a choice of several Cyrel® digital plate types, and processed in either Cyrel® solvent or Cyrel®FAST thermal processors. This Cyrel® computer-to-plate process widely known and used in flexo platemaking today utilizes a proprietary black mask layer bonded directly to the photopolymer layer during plate manufacturing. This laser-imaged mask is referred to as the LAMS layer (Laser Ablation Mask System).

Benefits of Cyrel® Digital Imaging

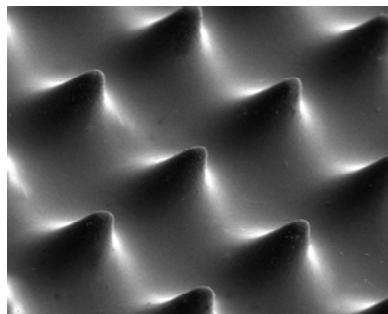
Unsurpassed quality and consistency are achieved with Digital technology. It affords the capability of handling complex or unique packaging jobs with reduced production time.

The Cyrel® Digital Imager creates an accurate, high-resolution image in the thin LAMS layer. Image features created in the LAMS layer are defined by the spot size of the laser, meaning that very fine detail can be resolved.

Cyrel® digital plates require no film layers and no vacuum drawdown. The virtual absence of light scatter means that the high-resolution image in the mask layer is predictable in the photopolymer. Additionally, the possibility of out-of-contact spots or dirt imaging between the negative and the polymer with conventional plates is eliminated. The presence of oxygen during the UV exposure creates sharpened plate features that improve print quality for line work, text, fine highlights, and throughout the tone scale.



Conventional Dots



Digital Dots

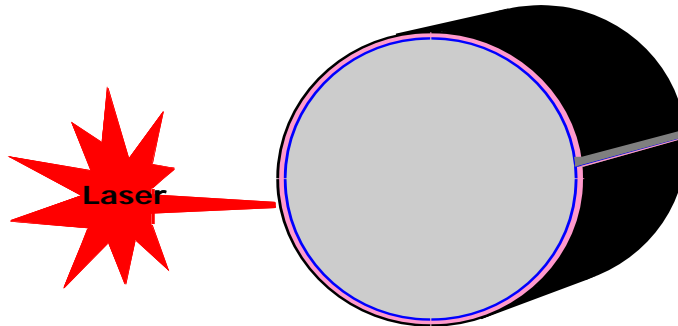
The Cyrel® Digital Workflow

The Cyrel® Digital Workflow employs these key elements.

- Cyrel® digital photopolymer plates
- The Cyrel® Digital Imager (CDI) plate-setter to laser-ablate the mask on the plate
- The Cyrel® FAST UV Exposure Unit or other Cyrel® Exposure Unit to expose the plate with UV light;
- The Cyrel® FAST Thermal Developer or a Cyrel® Solvent Processor to remove the unpolymerized monomer to create the relief plate.

Laser imaging

The Cyrel® Digital Imager (CDI) is manufactured by EskoArtwork. A CDI is an external drum write engine (plate-setter) that uses an infrared laser to write an image into the LAMS layer.



Controlled by the computer, the laser in the CDI burns away (“ablates”) the LAMS layer but has no effect on the photopolymer layer below it, creating a photopolymer plate with an integral mask.

UV Exposure

Back exposure of the plate is completed before laser imaging. Main Exposure is performed after laser imaging. The Cyrel® digital plate is taken off the CDI and placed in a conventional exposure unit for the main UV exposure. The integral mask serves as the platemaking film, but since it is built into the plate, there is no need for vacuum drawdown to ensure good contact. Variability and out-of-contact spots are eliminated, giving a consistent top-quality photopolymer plate.

Process

After UV exposure, the Cyrel® digital plate goes through a Cyrel®*FAST* thermal processor or solvent processor. The LAMS mask layer is removed along with the unexposed monomer. The result is a relief photopolymer printing plate with extraordinarily sharp dots.

Depending on your development system, the digital plate is completed through the remaining conventional platemaking steps (drying for solvent plates), post exposure and light finishing.

See the section on Cyrel® Platemaking – All Systems for more information on the steps for producing Cyrel® photopolymer plates.

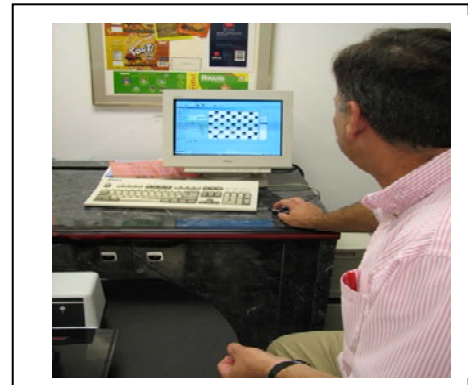
Cyrel® Digital Platemaking Instructions

Pre-Press

All 1 Bit Tiff or .Len files should have bump curves calibrated for the specific digital-imaging device and plate type to be used. This is done in pre-press when the file is ripped. The procedure for determining the correct bump curve can be found in a separate file in the digital section of the manual.

Digital plates should have a highlight bump curve large enough to reproduce a minimum finished plate mask opening that provides a uniform dot size and uniform thickness throughout the tonal range for the screen ruling in place. A finished plate dot value smaller than the mask opening can lead to poor image transfer, premature plate wear or dirty printing.

Prior to imaging, examine the 1-Bit Tiff or .Len files using an application such as ShowCT, Dot Spy, TIFF viewer, etc. Inspect to ensure correct minimum dot size and correct screen ruling, dot shape and angle, as well as an overall inspection to ensure correct content, color separation, etc.



Add a control target, such as the DFTA CtP (minimum version V1.2) target shown below to the side of each full size digital plate file. This can be used later for checking stain level and dot quality. Contact your Cyrel® Technical Representative



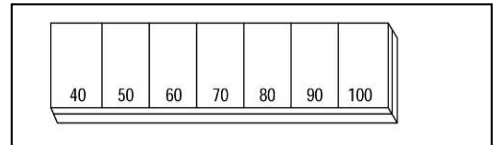
Platemaking

Digital plate processing guidelines can be obtained from your Cyrel® representative and information on procedures for optimum exposure time testing can be found in the “Cyrel® Platemaking – All Systems” section of this manual.

Back expose the plate the required time that you have determined from your Back Exposure Step Test. Recommended relief for Cyrel® plates can be found in the General Platemaking section.

Ablate the plate with image and control target.

After ablating the plate, using tape, pull an unimaged area of the mask from the plate. Zero the densitometer to this clear polymer area. Then read a 100% solid ablated area on the quality control target. It is critical that the 100% reading

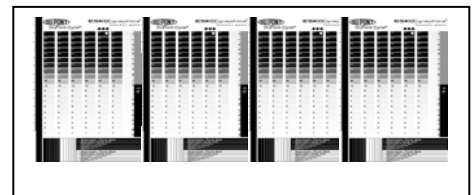


be between 0.02-0.07. This reading is the “stain level.” If the stain level is higher than 0.07, increase the amount of laser energy to the plate until your stain level is below 0.07. If your stain level is too high, check your focus and laser energy.

Next, again zero the densitometer on the 100% solid ablated area on the control strip and read the 50% value on the control strip. The densitometer reading should be between 0.29 and 0.31 (preferred value is .030.). This is the original density for a 50% dot. If reading is below 0.29 or above 0.31, check the laser energy of the CDI. Newer software versions set the energy directly and correct the laser power and speed themselves. For example, if the 50% reads a low density (example .026), increase RPMs or lower laser power (watts).

Based on your Main Exposure Step Test, determine the minimum amount of time to hold a uniform highlight dot.

Main expose the plate. Use only a conventional exposure unit with a bank of UV exposure bulbs. **Do not use point or capillary light sources, as these light exposure units do not reproduce quality plates.**



Solvent or thermally process the plate for the required amount of time for plate thickness.

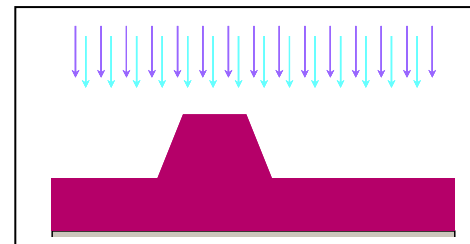
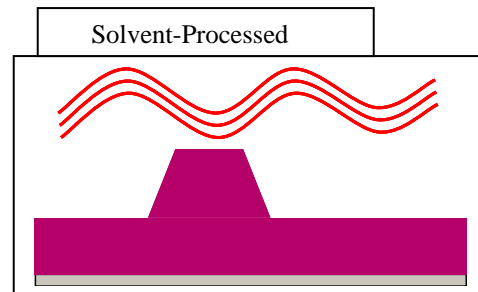
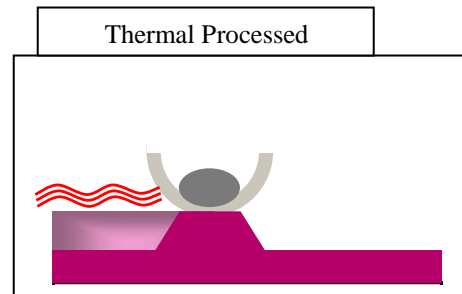
For solvent-processed plates:

Dry the plate for about 20 minutes in a forced air oven at 140 deg. F. After 20 minutes, check each plate for solvent spots. If solvent spots are detected, remove the plate from the dryer or shut the dryer off and wipe the plate with antistatic film cleaner or an alternative compatible solution. If no solvent spots are visible, continue to dry the plate for the required amount of time established by a drydown test. Plates should be dried at 140 degrees F/60°C. until they reach a uniform thickness. Keep in mind that the highlight dots are the last to revert back to their original thickness.

After drying, post expose and light finish the dried plate for the required amount of time. Always post expose two minutes less than the light finishing time. Do not use excessive post exposure times, as prolonged post exposure can lead to fractured dots, premature plate wear, or dirty printing.

A Light Finishing Step Test should be performed for each plate type.

Certain plate types require less or no post exposure.




Establish a procedure to verify the consistency of your finished plate. Refer to the DFTA CtP (minimum version V1.2) target procedure or ask your Cyrel® Technical Representative.

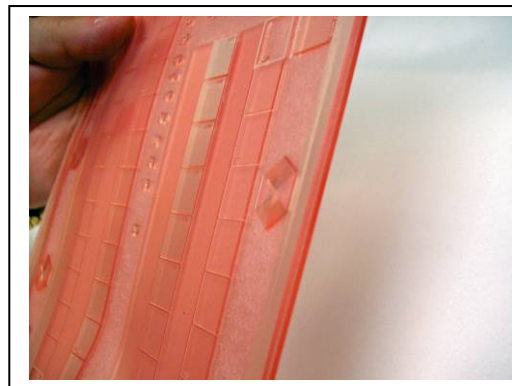


Use the Cyrel® Quality Control Checklist to examine your finished plate (available in the Quality Control Section of this manual).

CYREL® PACKAGING GRAPHICS	
Cyrel® Platemaking Quality Control Checklist	
Image Integrity (Compare plate to negative or digital file)	√
Required dots are held; no dropouts	
Digital Plates: Correct bump curve (dots are consistent size and at full plate height)	
Reverses are clean, sharp, and open; not filled-in	
Lines are sharp, clean and straight; not wavy	
There are no "out of contact" spots (Analog Plates) or "out of focus" (Digital Plates).	
• no fat type, reverses filled-in, shiny areas, missing or unsharp image	
Entire image, registration marks, microdots have transferred to plate	
Surface Defects (No Surface Defects in the Image Area)	
No artifacts, cracks, kinks, pinholes, chipping/broken characters, depressions, dust/dirt/lint, solvent spots, shiny spots, patterns	
Surface Tackiness	
• Plate is not sticky	
• Plate is not hazy (excessive light finishing)	
• Plate does not haze when the corner is bent back (excessive light finishing).	
Uniform Thickness	
Process work and line work are approximately the same height	
No high or low spots	
Relief	
Plates are measured in several areas for required/acceptable relief.	
Clean Floors (Determine if plate has processed down to the true floor)	
No residual monomer on floor or surface	
No cracks in floor	
Trimming	
Plate edges have been cleanly trimmed and beveled.	

/cmc
 Cyrel® Process of Use Manual

The plate should then be trimmed with a beveled edge and packaged appropriately for shipment.



Determining the Bump Curve for Digital Plates

This procedure is to determine the minimum stable highlight dot on a digital plate. It is often used to:

- 1) determine the proper bump-up curve to be used at the RIP in digital platemaking, and
- 2) as a consistency check in the digital plate making process.

All other aspects of platemaking must be controlled for a valid measurement or comparison: plate type, plate thickness, main exposure, back exposure, relief, and processing (solvent or *FAST*),

Target

A highlight dot target is used to find the minimum stable dot. The accuracy to which the minimum stable dot can be established will depend on the gray scale resolution of the target. All steps in the prepress, imaging, and platemaking process can have an affect on the tonal value of the minimum stable dot.

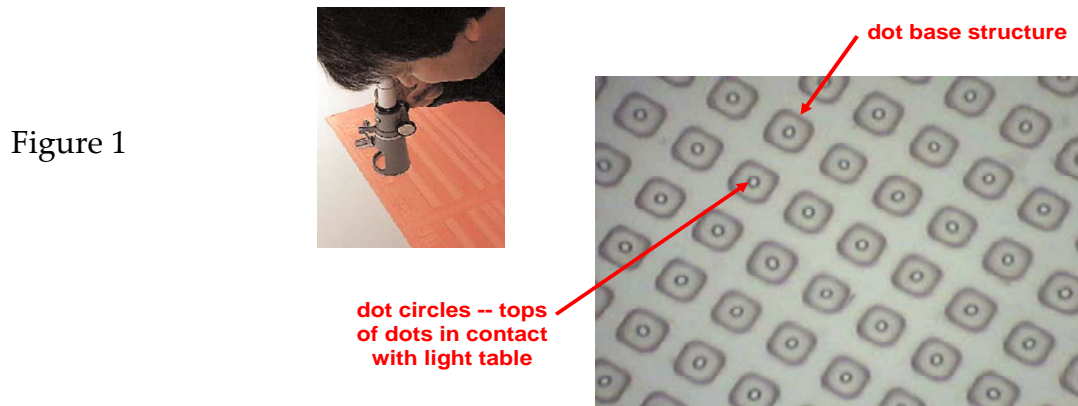
The highlight dot target should contain highlight tone values +/- 3% of the expected minimum stable dot value. Adjacent tone areas should have steps of at least 0.5%, preferably 0.39% (1/256). A good all-purpose scale would cover 0 – 10% in steps of 0.5% or less.

The file is ripped with linear values, and imaged in perfect focus with the proper energy to insure the mask has been cleared to the acceptable range (.03-.07 density). The plate is then processed according to the normal workflow that you would follow.

Processed Plate Measurement

Examine the plate by turning it upside-down on a light table, so that the tops of the dots are touching the surface of the light table. It must be a standard diffuse-illumination graphic arts light table.

Use a 50X – 100X (preferably 100X) microscope to examine the tops of the dots through the base of the plate. The tops of stable dots will contact the surface of the light table and can be observed through the microscope as a bright dot circle, surrounded by the dot base. See Figure 1 below.



The size of the dot circles will increase and decrease with the tonal values in the scale. At small tonal values the dots are unstable. These unstable dots will have poorly formed or inconsistent dot circles, and inconsistent dot bases (see figure 2). The smallest tonal area that has both open and consistent dot circles and consistent dot bases is the minimum stable dot (as shown in Figure 1). Of course, determining the smallest, consistent dot size is a somewhat subjective determination. For press latitude, some customers may require (and choose) a larger minimum stable dot than others.

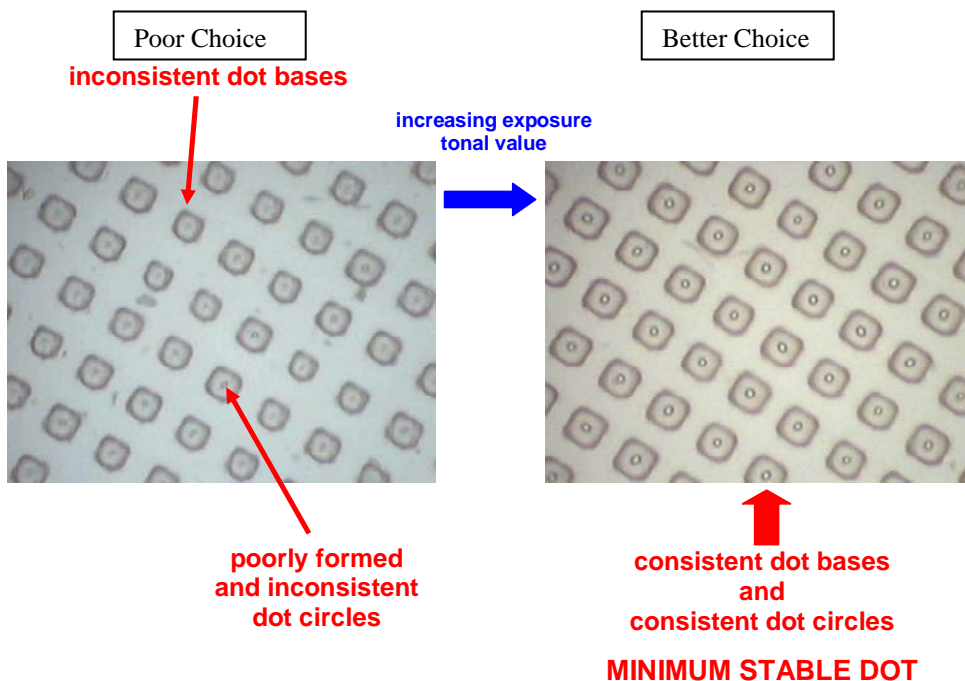


Figure 2

The digital process has the capability to create dots too small for the flexographic process. The smallest imaged dot is usually below the surface of the other features on the plate. This will commonly result in dirty printing. The smallest dot on the plate is not the best dot on the plate. Once again, the smallest, consistent dot is the better choice.

Cyrel® Solvent Platemaking System

DuPont™ Cyrel® solvent platemaking systems serve the broadest range of applications. High resolution dot, excellent line definition, deep reverses and clean floors are achieved to meet the highest flexographic standards.

Cyrel® offers a range of solvent-processed printing plates and platemaking equipment configurations to address customer size requirements. The DuPont™ Cyrel® In-Line Platemaking Systems are high-capacity, fully-enclosed processing units for automatically producing high quality Cyrel® photopolymer printing plates in a safe and clean environment.

The Cyrel® Solvent Platemaking System includes:

1. Cyrel® Exposure Unit
2. Cyrel® Solvent Processor
3. Cyrel® Dryer
4. Cyrel® Post Exposure/Light Finishing Unit
5. Cyrel® Solvent-Processed Photopolymer Plates

Cyrel® Solvent Platemaking Equipment

Cyrel® offers a range of solvent-processed platemaking equipment configurations to address customer size and productivity requirements. The DuPont™ Cyrel® In-Line Platemaking Systems are high-capacity, fully-enclosed processing units for automatically producing high quality Cyrel® photopolymer printing plates in a safe and clean environment.

Additional information and brochures for Cyrel® solvent platemaking equipment can be found by region on the main Cyrel® internet website, www.cyrel.com.

Cyrel® Analog & Digital Solvent Plate Portfolio

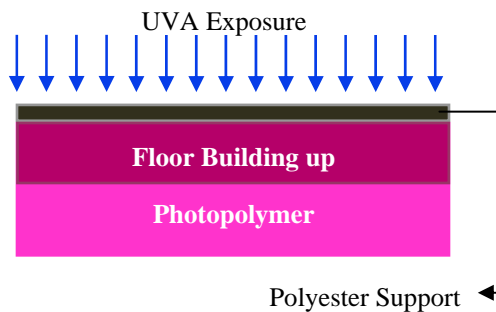
DuPont offers a variety of digital and analog solvent-processed plates that meet the needs of a broad range of printing applications. These applications include: flexible packaging, tag & label, folding carton, beverage carton, corrugated board, offset varnishing and metallic inks. DuPont's portfolio of Cyrel® digital and analog solvent-processed plates meets the needs of a broad range of printing applications. Additional information and brochures for Cyrel® printing plate products can be found by region on the main Cyrel® website, www.cyrel.com.

Cyrel® Platemaking Overview for Solvent-Processed Plates

Cyrel® Solvent plates are produced in six basic steps:

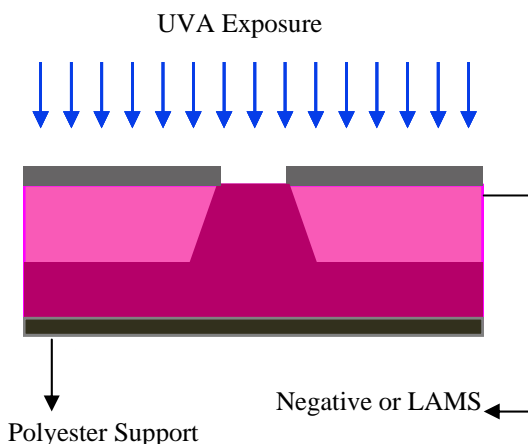
1. Back Exposure

Back exposure sensitizes the plate, establishes the plate relief, improves adhesion between the polyester support and the photopolymer, and provides a firm base for fine lines and screens. BX helps produce a proper dot profile in conjunction with proper main exposure. It is an exposure of the back of the plate through the polyester base. The back exposure time is determined by a back exposure step test.



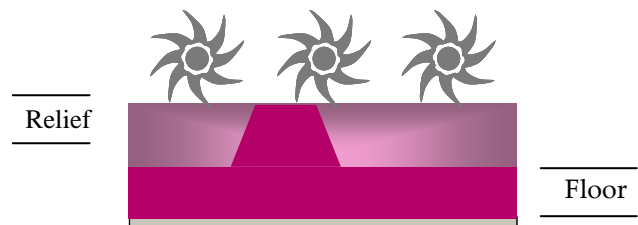
2. Main Exposure

Main exposure is carried out through a film negative or laser-ablated plate. A vacuum coversheet is used during exposure for analog plates to obtain a tight bond between the negative and the plate. With digital plates, no vacuum coversheet is needed during exposure. The physical properties of the exposed photopolymer changes and exposed parts cannot be removed in the processing step, thus creating the relief image.



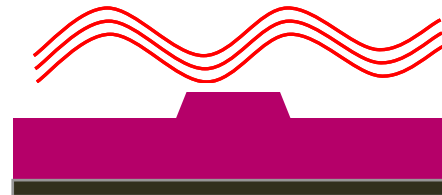
3. Processing

Unexposed photopolymer is removed in the processor to produce a relief printing plate. A processing solution and brushing action are used to dissolve and remove the unexposed photopolymer.



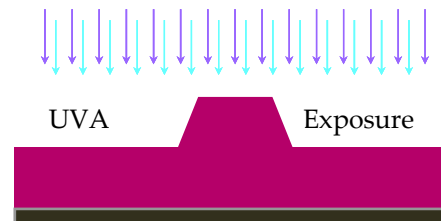
4. Drying

The processed plate swells during washout. The plate is dried in hot air (60°C / 140 F) to remove absorbed processing solution.



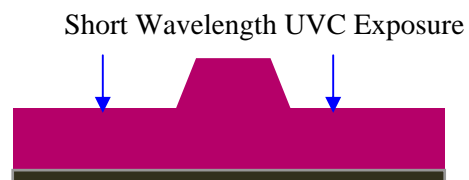
5. Post Exposure

Post exposure completes the polymerization process, and the plate achieves its final hardness.



6. Light Finishing

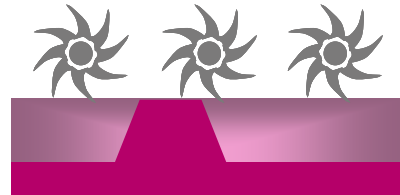
Light finishing removes the surface tackiness, increases durability, and resistance to solvents and ozone. Light finishing and post exposure can be performed simultaneously.



Processing Solvent Cyrel® Solvent Plates

Step 3: Washout

Unexposed polymer is removed by brushes to create a relief printing plate.



During the washout process, the unexposed, non-polymerized photopolymer material is removed to produce a polymerized relief image on the plate. The washout action begins at the surface of the plate and proceeds gradually downward into the plate until full relief depth is achieved. The unexposed polymer is removed by the combined action of brushes and washout solution.

Washout Time

Washout time should be kept to a minimum. The plate swells during the washout step due to solvent absorption. The swelling increases the longer the plate is in contact with the solvent. Therefore, if washout time is excessive, additional solvent is absorbed by the plate requiring longer drying times. Excessive swelling can also cause damage to the image. Washout time depends on the following parameters:

- Plate formulation
- Processor design
- Brush contact pressure
- Composition of washout solution
- Solids concentration in the washout tank
- Relief depth
- Solvent temperature

DuPont recommends the use of Cyrel® Processing Solution; however, Cyrel® printing plates can be processed in most industry washout solutions. It is recommended to optimize washout and drying times when using any washout solution.

Cyrel® Processing

Washout Temperature

North America

OptiSol® Rotary	Room Temperature
OptiSol® Inline	38-40°C
Cylosol	30°C-32°C for thin plates (<112 mils) 32°C-34°C for thick plates (>112 mils)

EMEA

Flexosol® Inline	30-32°C
Flexosol 2 ® Rotary	30-32°C
Unisol® Inline	Room Temperature

To achieve and maintain all operating temperatures (except room temperature), a cooling/heating unit is required. In order to obtain uniform, consistent washout results, it is crucial to maintain a constant washout solution temperature.

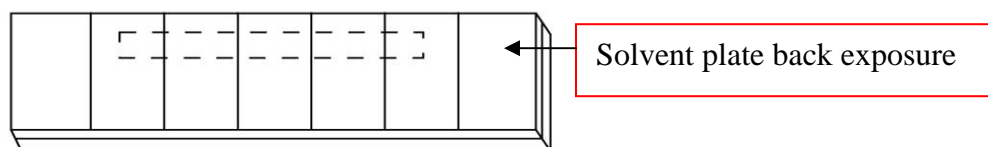
In-Line Processing

The finished plate is punched and placed on the Cyrel® processor pin bar, polyester support side down. The proper washout time, plate thickness, and relief is already pre-set on the control panel as program. The bar is put in place, and the processor takes the bar, with the plate attached, through the processor. The brush pressure for the Cyrel® In-line processor has been pre-set in the programming.

The procedure for determining correct washout time is the same as described in the back exposure step test procedure. Therefore, washout time can be determined at the same time you perform a back exposure step test. Washout time can also be checked with each plate sent through the processor by following the same procedure listed below.

Determining Correct Washout Time

1. During the back exposure step test, a strip of high density stripping tape is placed across the center back of the test strip for solvent plates. This tape blocks the light to prevent polymerization of the plate material under the tape.



2. Before processing, remove the high density tape. Set the processor to wash out the number of seconds previously set up when you installed the machine or the number of seconds you are currently using.
3. After the back exposure step test plate has been processed, measure the over-scrub section (produced by the high density tape).
4. If the plate has not been washed down at least 10 mils past the floor for thin plates (up to 125 mils) or 20 mils for thicker plates, the wash times should be adjusted. Increase washout time to obtain 10 mils of over-scrub or more. Decrease washout time if reverse is deeper than 10 mils for thin plates or 20 mils for thicker plates.

Once the processing and replenishment of the processor is complete, the pin bar or tape bar will continue to feed through the back end of the processor. Once the plate finishes processing, it can be inspected and you can continue on to the next platemaking step. *Safety glasses with side shields and appropriate gloves should be worn when removing plates from the processor.*

Rotary Processing

The plate is clamped on the washout drum. The proper washout time and replenishment rate is set on the control panel. The brush pressure setting should be correct for each plate thickness. Use the manufacturer's operating settings for the plate thickness being processed.

After washout, the plate is rinsed by flooding with clean washout solution (replenishment cycle). *Safety glasses with side shields and appropriate gloves should be worn when removing plates from the processor.*

Blue Towel Procedure (Rotary Processors)

After completion of the washout cycle, while on the washout drum, the surface is blotted with a DuPont blue, lint-free towel to remove residual solvent. The dark side of the blue towel is placed against the plate when blotting. The towel is patted onto the plate and blotted with a glove-protected hand. The towel is then removed and the plate is blotted with a second towel. The plate is removed from the processor with the second blue towel adhered to the image and placed, face down, on a flat surface with the blue towel attached to the face of the plate. Wipe

and dry excess solution from the back of the plate with another blue towel. Remove the blue towel from the face of the plate and place the plate in the dryer.

This process will eliminate cleaning the back of the plates after finishing and post exposure. Blue towels can be purchased from your Cyrel® plate supplier.

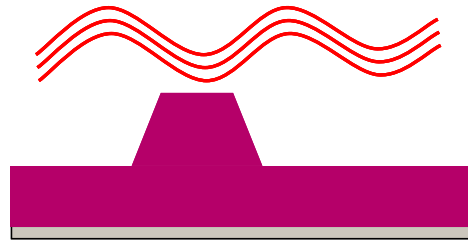
Solvent Replenishment

During the washout process, washout solvent dissolves the unexposed photopolymer. As the solvent becomes more saturated with photopolymer, the washout efficiency decreases. The washout solvent must, therefore, be constantly renewed. The washout unit contains a replenishment system for this purpose. Solvent replenishment is determined by the plate area and relief. Proper replenishment is essential for high quality, consistent platemaking. The replenishment rate is approximately 1 quart/sq. ft of plate material for a relief of .025–.030". The replenishment volumes for thicker plates should be calculated accordingly.

Drying Cyrel® Solvent Plates

Step 4: Drying

Drying is carried out in a forced air oven at a temperature of 140°F/ 60°C.



The Cyrel® photopolymer plate absorbs solvent during the washout process, and the polymerized relief image is soft and swollen. Drying evaporates the solution so that the plate returns to a uniform thickness.

Drying is carried out in a forced air oven at a temperature of 140F (60°C) +/- 5°C. Dryers must comply with the National Fire Protection Association (NFPA) standards for combustible solvents. The actual dryer temperature should be checked periodically in each dryer drawer in nine positions (back, middle, front, left, right, center) with a thermometer. For suggested thermometers, see the Platemaking Supplies and Sources List in the Appendix.

To ensure the dimensional integrity of the polyester support and minimize plate to plate variability, the following procedures should be followed:

1. Do not set the dryer temperature above 140F (60C) or lower than 135F (55°). Higher temperatures can cause shrinkage of the polyester support, and lower temperatures can cause longer drying times.
2. Plates should be dried until their thickness no longer shows any significant changes. A drying test is recommended using your own equipment and workflow to determine optimum drying times for each plate type. Insufficient drying time can cause unacceptable thickness tolerances within the plate. Drying time depends on:
 - Processor Type
 - Processing Conditions (solvent type, temperature, and washout time)
 - Dryer Exhaust
 - Dryer Temperature

Inspect the plates during the drying step. All plates should be carefully removed from the dryer after 20 minutes, i.e., long enough to evaporate solvent on the plate surface, so that they can be inspected for image quality and drydown spots.

Drydown spots are created when droplets of processing solution evaporate on the plate during drying. Drydown spots can be removed by saturating a clean, lint-free cloth with anti-static film cleaner or similar solvent and wiping the area on the plate in a light, smooth, continuous motion. Do not allow the film cleaner to puddle on the plate's surface. Long-term effects of film cleaner may be detrimental to the plate. This preliminary inspection also allows you to decide if a remake is necessary due to any exposure problems, saving production time.

(Note: Read and follow manufacturer's published guidelines for safe handling of anti-static film cleaner.)

Proper drying is especially important for process color work to ensure maximum resolution and tonal reproduction. Process work may take longer to dry than line work due to solvent residue sitting in the wells between dots.

After drying, the surface of the plate is tacky. At this stage, the plates should not be stacked or brought into contact with other materials and surfaces. The printing surface should not be touched before finishing, since marks will appear on the plate surface. The finishing process removes this tackiness.

Plates must be completely dried before the finishing step, or thickness uniformity may be affected. Trapped solution diffuses out of the plate at uneven rates and can lead to variation in plate thickness.

Cyrel® Cylosol Processing Solution-NA

Cyrel® Cylosol is the latest development by DuPont in flexographic plate washout solvent technology for both rotary and inline processors. Cylosol has an especially mild odor and clean scent during processing and drying. It can be efficiently recovered in existing distillation units and requires no re-balancing after distillation.

Cylosol's 55-gallon open-head drum put-up is part of DuPont's efforts for waste minimization. The empty open-head drum can be recycled and used as a container for the distillation stillbottoms. There are two added values to the customer for using the open-head drum. The customer has fewer empty drums to dispose of and fewer drums to buy because he can reuse the drums to package solvent-related wastes.

Safety

DuPont Processing solutions fall under the definition of "hazardous as a chemical hazard" as defined under OSHA's Hazard Communication Standard. DuPont processing solution can be used safely when used as directed, and when applicable safety precautions are followed. Cylosol is classified as a Class IIIA combustible liquid and has a flashpoint of about 144F/62.2C. **Safety considerations can be found in the Material Safety Data Sheet and also in the Safety & Environmental Section of this Manual.**

Storage

Cyrel® processing solutions must be protected from frost during storage. The solution should be brought to room temperature before use.

Cylosol Distillation

The unexposed portion of the photopolymer plate dissolves in the washout solution to produce a relief image. The solution must then be reclaimed by distillation. DuPont washout solution can be distilled without any problems in most commercially available vacuum-based distilling units. If in-house distillation is not available, choose a qualified and reliable solvent reclaimer who will return clean, uncontaminated solution.

Cylosol Distillation Conditions

The distillation of Cylosol is performed in a vacuum at 0.914 bar/27"Hg/13.3 psi. The following data refers to the PRI Distillation unit.

Oil temperature	175°C/345°F
Oil limit temperature*	197°C/244°F
Vapor limit temperature*	154°C/309°F
Boiling Temperature	118-127°C/244°-261°F

*temperature at which the still automatically shuts down

Add-backs

Cylosol washout solution composition varies very little in specific gravity, and no add-back has been needed.

Loss of Washout Solution (Emissions)

Stack monitoring at the customer plant site for actual measurements of VOC emissions can provide the best accuracy for estimating VOC emissions. However, emissions can also be estimated by using "mass balance" over a realistic time frame, such as a year. You must keep supporting records of your solvent purchases and/or use when utilizing this method. Emissions are estimated by difference. This method provides a reasonable degree of accuracy and is an accepted compliance approach in many parts of environmental regulations.

When using "mass balance," you are estimating the emissions that went up the stack by determining the number of gallons of solvent added back to the platemaking system during a year to compensate for what was lost during processing and drying. You must then subtract the number of gallons of solvent that was lost in other ways, such as, pumped out with the stillbottoms or lost from any other disposal method. Contact your Cyrel® Account Representative for more information on estimating VOC's.

OptiSol® Solutions -NA

OptiSol®, developed in 1989, was the first alternative washout solution produced by DuPont for use in rotary and inline processors.

OptiSol® is available in 30 and 55-gallon putups. OptiSol®'s 55-gallon open-head drum put-up is part of DuPont's efforts for waste minimization. The empty open-head drum can be recycled and used as a container for the distillation stillbottoms. There are two added values to the customer for using the open-head drum. The customer has fewer empty drums to dispose of and fewer drums to buy because he can reuse the drums to package solvent-related wastes.

Safety

DuPont Processing solutions fall under the definition of "hazardous as a chemical hazard" as defined under OSHA's Hazard Communication Standard. DuPont processing solution can be used safely when used as directed, and when applicable safety precautions are followed. OptiSol® is classified as a Class IIIA combustible liquid and has a flashpoint of about 154F/68C for inline solution and 194F/90C for rotary. Safety considerations can be found in the Material Safety Data Sheet and also in the Safety & Environmental Section of this Manual.

Storage

Cyrel® processing solutions must be protected from frost during storage. The solution should be brought to room temperature before use.

OptiSol® Solution Maintenance

The unexposed portion of the photopolymer plate dissolves in the washout solution to produce a relief image. The solution must then be reclaimed by distillation. OptiSol® washout solution can be distilled without any problems in most commercially available vacuum-based distilling units. Please consult the manufacturer of your distillation unit for specific instructions on safely operating the equipment. If in-house distillation is not available, choose a qualified and reliable, solvent reclaimer who will return clean, uncontaminated solution.

OptiSol® Inline Distillation Conditions

The distillation of OptiSol® is performed in a vacuum. In general, the following conditions are suggested for distilling OptiSol® inline solution, and this refers to the PRI Distillation unit.

Oil temperature	325F
Oil limit temperature*	385F
Vapor limit temperature*	310F

*temperature at which the still automatically shuts down

OptiSol® Inline Re-Balancing

We recommend that you measure the specific gravity of the distillate on a regular basis to confirm that the blend falls within our recommended range. The hydrometer's measurement range must include the OptiSol® range listed below. Remaining within the limits specified below will ensure that the washout is adequate to remove all unexposed monomer prior to the plate entering the clean-up section of the processor.

Specific gravity must be measured @20°C/68°F. The limits range from 0.8573-0.8554.

Procedure for Checking and Re-Balancing OptiSol® InLine

Reminder: Use proper Safety equipment when working with solvents.

A. Taking Samples

Samples of OptiSol® should be taken after every cook down for testing.

(See your distillation unit manual for how to take a sample. Take sample from clean side of unit after mixing for 1-2 minutes.

- *Make sure OptiSol® is clear with no solid particles.*
- *Make sure graduated cylinder and hydrometer are clean. If not, rinse with virgin OptiSol®.*
- *Hydrometer is fragile. Handle with care.*

B. Determining % Acetate of OptiSol® in System

1. Transfer sample into supplied graduated cylinder.
2. Use hydrometer to take Specific Gravity reading. See attached procedure, "Reading Specific Gravity with a Hydrometer"
3. Record the hydrometer reading to four places after the decimal. This is the Specific Gravity of OptiSol®
 - *The fourth decimal place should be a zero or five.*
4. Take temperature of OptiSol® immediately following the hydrometer reading and record.
5. Find the % Acetate on Chart #1 by using the Specific Gravity and Temperature information.
6. After determining % Acetate, you need to determine if you need to add back OptiClean (acetate).
7. If you are at 70% or higher, do not add any OptiClean.
8. If you are lower than 70%, use Chart #2 to determine add-back of OptiClean. Follow direction below for adding OptiClean to your system

C. Adding OptiClean to System

- *Do not add more OptiClean than you need.*

If your % Acetate is 66% or higher then follow the Maintenance Mode. If your % Acetate is 65% or lower, then follow the Rebalancing Mode.

D. Maintenance Mode

9. Determine the amount of OptiSol® in gallons that is in the Clean Tank.
10. Using Chart #2, determine how many gallons of OptiClean are needed to get the Clean Side Tank back to 70% acetate.

11. Add OptiClean to Clean Side Tank before adding virgin OptiSol® to top off system, if needed.

E. Rebalancing Mode

12. Determine the amount of OptiSol® in gallons that is in the Clean Tank.

13. Using Chart #2, determine how many gallons of OptiClean are needed to get the Clean Side Tank back to 70%.

14. Add OptiClean to Clean Side Tank and mix.

15. Drain the plate processor tank and replenish with the balanced OptiSol® from the Clean Side Tank.

16. Distill over OptiSol® from Dirty Side Tank and measure OptiSol® for % Acetate using hydrometer.

17. Determine the amount of OptiSol® in gallons that is in the Clean Tank.

18. Using Chart #2, determine how many gallons of OptiClean are needed to get the Clean Side Tank back to 70% acetate.

19. Add OptiClean to Clean Side Tank. Wait for next cook down and measure % Acetate to determine which Mode to follow.

Addback Charts Re-Balancing OptiSol® Inline

Charts for determining the % acetate in distilled solvent and the amount of addback needed for rebalancing can be found in the following section of this manual.

OptiSol® Rotary

Always be sure to check the specific gravity of your recovered solution prior to use in the processor. The recommended specific gravity range is 0.922–0.928. The use of washout solution with a specific gravity outside of this range will affect the washout rate and plate quality. Check the specific gravity by measuring with a hydro-meter that has a specific gravity range of 0.9–1.0.

1. Make sure the distillate drum solution is as close as possible to the calibration temperature of the hydrometer. (Specific gravity varies with temperature.)
2. Measure the height of the distillate in the drum with a meter stick.
3. Collect a sample into a tall glass container, or graduated cylinder.
4. Measure the specific gravity by suspending the hydrometer in the solution. (Be sure that the hydro-meter floats in the solution and is not resting on the bottom or against the side of the container. Once the hydrometer is motionless, a reading can

- be taken.)
5. Determine the appropriate formula to use, if the specific gravity is outside the acceptable range of 0.922–0.928.
 6. Determine the quantity (in gallons) of OptiSol® make-up solution or Benzyl Alcohol needed.
 7. Add the calculated quantity to the drum.

If the distillate specific gravity is greater than 0.928, OptiSol® Rotary Make-up Solution must be added. The number of gallons needed is calculated by:

$$\begin{array}{l} \text{Gals. of OptiSol®} \\ \text{Rotary Make Up} \\ \text{Solution} \end{array} = \begin{array}{l} \# \text{ Gals.} \\ \text{Distillate} \end{array} \times \begin{array}{l} \text{Distillate} \\ \text{Specific Gravity--} \end{array} \begin{array}{l} 0.928 \\ \text{divided by} \end{array} \begin{array}{l} 0.058 \\ 0.058 \end{array}$$

Sample:

Distillate in 55-gallon drum

Distillate height in drum = 20 inches

Specific gravity of distillate = 0.938

Using the table* for a 55-gallon drum, a liquid height of 20 inches = 34.4 gallons.

Calculation:

$$\text{Make-up solution needed} = 34.4 \times \frac{(0.938 - 0.928)}{0.058}$$

$$\text{Make-up solution needed} = 34.4 \times 0.01 / 0.058$$

Make-up solution needed = 5.9 gals.

If the distillate specific gravity is less than 0.922, Benzyl Alcohol must be added. The number of gallons needed is calculated by:

$$\text{Gallons of Benzyl Alcohol} = \# \text{ Gallons Distillate} \times \frac{0.922 - \text{Distillate Specific Gravity}}{\text{divided by } 0.120}$$

Sample:

Distillate in 55-gallon drum

Distillate height in drum = 30 inches

Specific gravity of distillate = 0.915

Using the table* for a 55-gallon drum, a liquid height of 30 inches = 51.6 gallons

*The table for height/volume calculations can be found in another file in this section.

Calculation:

$$\text{Make-up solution needed} = 51.6 \times \frac{(0.922 - 0.915)}{0.0120}$$

$$\text{Make-up solution needed} = 51.6 \times 0.007 / 0.120$$

Make-up solution needed = 3.01 gals.

Loss of Washout Solution (Emissions)

Stack monitoring at the customer plant site for actual measurements of VOC emissions can provide the best accuracy for estimating VOC emissions. However, emissions can also be estimated by using "mass balance" over a realistic time frame, such as a year. You must keep supporting records of your solvent purchases and/or use when utilizing this method. Emissions are estimated by difference. This method provides a reasonable degree of accuracy and is an accepted compliance approach in many parts of environmental regulations.

When using "mass balance", you are estimating the emissions that went up the stack by determining the number of gallons of solvent added back to the platemaking system during a year to compensate for what was lost during processing and drying. You must then subtract the number of gallons of solvent that was lost in other ways, such as, pumped out with the stillbottoms or lost from any other disposal method.

The "mass balance" formula below is provided by DuPont to assist Cyrel® customers in the analysis of their site compliance with national, state or local regulations and laws for VOC emissions of our processing solvents.

Total VOC emissions (lbs. /yr.) =
(Gallons of OptiSol® added to system - gallons OptiSol® lost
in the stillbottoms - other OptiSol® losses) X
7.1 lbs. /gal. (OptiSol® Inline)
7.7 lbs. /gal. (OptiSol® Rotary)

Alternative Processing Solutions – EMEA

EMEA offers 3 alternative solvents – FlexoSol[®], FlexoSol-2[®] and UniSol[®].

The **FlexoSol[®]** basic concept was developed in in 1993. FlexoSol has an especially mild odor and can be used in all Cyrel[®] inline processors.

Advantages to FlexoSol[®]

- flash point of 56°C
- lower smell
- more stabile during distillation because of tighter boiling range

It is an alternative solvent to OptiSol[®] with low solvent smell.

FlexoSol[®] can be used in all inline processors.

It is available in 200 liter drums.

Processing temperature is 30-34°C. A corresponding heating/cooling unit is needed.

FlexoSol-2[®] is a revised formulation of FlexoSol[®], developed in 2004.

The optimized composition eliminates the wrinkle swelling during the washout process and prevents orange peel. FlexoSol-2[®] is convenient for In the Round (ITR)-processors. Intermediate drying and rewash of the plates is not necessary. FlexoSol-2[®] of course is applicable for all flat processors too.

UniSol[®] is an alternative solvent for non-heated processors with short processing times, but slightly longer drying time. It can be used at room temperature for inline and rotary equipments without heating units.

Safety

DuPont Processing solutions fall under the definition of “hazardous as a chemical hazard” as defined under OSHA’s Hazard Communication Standard. DuPont processing solution can be used safely when used as directed, and when applicable safety precautions are followed. FlexoSol[®] and FlexoSol-2[®] and UniSol[®] are classified as a Class IIIA combustible liquid. Safety considerations can be found in the Material Safety Data Sheet and also in the Safety & Environmental Section of this Manual.

Safety and product specific data:

	FLEXOSOL®	FlexoSol-2®	UNISOL®
BOILING POINT (°C)	180-215	175-220	175-215
FLASH POINT (°C)	56	61	63
VbF	A III	A III	A III
AUTO IGN. TEMP. (°C)	230		445
FLAMMABLE LIMITS IN AIR (VOL %)	1,0-6,1		1,1-6,5
GRAVITY (g/cm ³)	0,85	0,83	0,91
TA-LUFT (CATEG.)	III	III	III
MASS STREAM (LIMIT)	3 Kg/h	3 Kg/h	3 Kg/h
EXHAUSTED AIR CONCENTRATION (LIMITS)	< 3 Kg/h No LIMIT	< 3 Kg/h No LIMIT	< 3 Kg/h No LIMIT
SMELL	low	moderate	moderate
PROCESSING TEMPERATURE	30	30	20-25
WATER POLLUTION GROUP	1		2
REGULATORY INFO SYMBOL	X _n		o

** At 34°C solvent temperature

*** At 22°C solvent temperature

○ not required

Storage

Cyrel® processing solutions and its distillates must be protected from frost during storage. The solution should be brought to room temperature before use. For transporting special safety guidelines have to be considered.

Use collecting trays according sized made from steel plate.

FlexoSol® and UniSol® Solutions Maintenance

The unexposed portion of the photopolymer plate dissolves in the washout solution to produce a relief image. The loaded solution must then be reclaimed by distillation. FlexoSol® and UniSol® washout solutions can be distilled without any problems in most commercially available vacuum-based distilling units, e.g. Renzmann. Please consult the manufacturer of your distillation unit for specific instructions on safely operating the equipment. If in-house distillation is not available, DuPont offers also finished solvents for delivery.

For more detailed information for FlexoSol®, FlexoSol-2®, UniSol® alternative solutions please refer to the solvent manual EMEA.

Handling, Storing, and Cutting of Cyrel® Raw Plates

Storage Life

If stored properly, Cyrel® raw material has a storage life of up to 36 months. Exposure and processing of plates over 36 months should be avoided; however, customers often use them for longer periods of time when recommended storage and handling practices are followed. Ideally, plates should not be exposed until the “use after” date on the plate box label. If plates are used before the “use after” date, back exposure and main exposure step tests must be performed. See Packaging Section to determine location of “use after” date on the plate box label.

Storage and Stacking



Boxes of plates should remain unopened until use and be stored flat, on a firm surface, never on end. All boxes in a stack must be the same size. Do not stack smaller boxes on top of larger boxes. No more than 10 boxes of large size raw plates (42x80/1067x2032 mm and above) should be stacked on top of each other. Smaller sizes of plates should not be stacked more than 12 boxes high. Do not allow boxes to overhang pallets or shelves or be unsupported for greater than 12 inches between

sides or ends. Opened boxes should not be stacked. They should be stored separately in a flat position, separated by foam sheeting and protected from light. Do not stack smaller pieces of product on top of larger pieces without protective dividers, such as cardboard. Do not stack anything on top of an opened box.

Temperature/Humidity

Plates should be stored in a cool, dry area. Recommended storage temperature is between 40-90 deg. F (4-32 deg. C). Recommended relative humidity is 55% or less. Rapid changes in temperature and humidity should be avoided. If the workroom temperature differs significantly from that of the plate storage room, the plates should be allowed to adapt to the workroom temperature before use.

Lighting

Opened boxes and unprocessed photopolymer plates should be handled and stored in an area protected from light. Exposure to ultraviolet, white incandescent or fluorescent light, window light, and sunlight can cause pre-polymerization after prolonged exposure. For white light illumination, UV filter material can be used in these areas and also to cover windows and skylights.

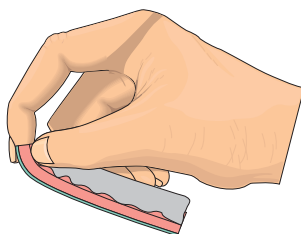
Handling Cyrel® Plates

Handle boxes of plates with care. Boxes are properly constructed for handling and transport, but dropping boxes may damage the structure of the box and its contents.

Raw material should be carried with the coversheet up. Improper handling can flex the plate, e.g., bending of the plate, and cause delamination of the coversheet or wrinkling of the release layer. Once an area of the coversheet is delaminated from the raw plate, it is unusable. Wrinkles can transfer to the plate after imaging. Small sheets of plate material should be supported evenly with the hand under the sheet. For large sheets, hold the plate at the edge and transport it in an upright position.

Do not remove the protective polyester coversheet until immediately prior to exposure. Air bubbles trapped between the raw material and the protective sheets may affect the raw material. They can cause plate defects that will persist even after processing. Once the protective sheet is removed from the raw material, it cannot be brought back into perfect contact with the polymer layer. These plates should be processed immediately.

To determine which side of the plate contains the strippable polyester coversheet, bend one corner of the plate upward with your finger. The coversheet will release, the support will not.



Cutting Cyrel® Raw Plates

A sharp cutting tool, such as a paper trimmer, or safety knife and a smooth, flat surface are essential when cutting raw photopolymer. The blades should be sharp and nick-free. Do not press down on the material with your hand or fingers. This could create a depression in the photopolymer. Cut the plate with the coversheet down. The cutting stroke should be rapid and continuous with the blade held against the cutting board. A plate should be cut at least ½ inch (12.7mm) larger than the image in both directions. This will provide a ¼ inch (6.4 mm) border around the image.

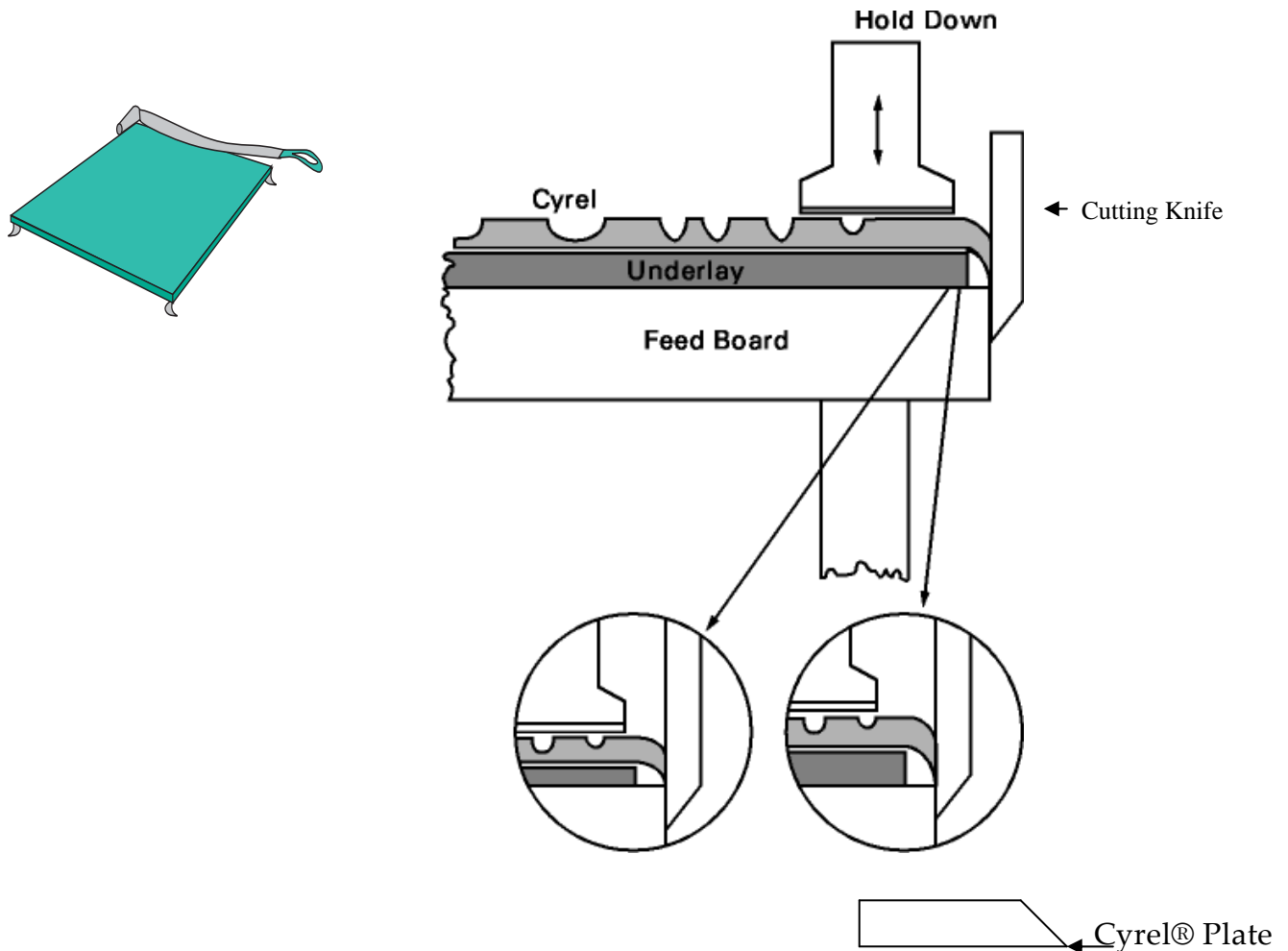
Cutting tables with rotating, self-sharpening knives are available for cutting large-sized plates. We recommend the special Cyrel® Cutting Table.



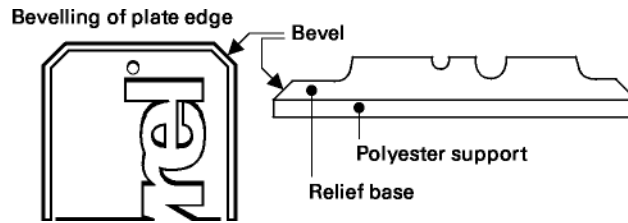
Handling, Cleaning, Cutting, Storing Cyrel® Finished Plates

Cutting and Trimming Cyrel® Finished Plates

Cyrel® plates should be trimmed to size, polyester down, using a standard heavy-duty paper cutter, *sharp* razor blade, scissors, or foot shear. When cutting plates, use a smooth, confident cutting action. The edges of the polyester backing must be cut cleanly with no nicks or feathered edges. Trim off sharp corners. Bevel the edges of the plate at an angle of 35°-45° by placing a cardboard or similar support on the bed of the paper cutter. The position and height of the support determines the bevel angle.



To aid plate removal during repositioning and demounting, cut the plate's four corners at 45° angles when possible



The Cyrel® Cutting Table is also designed and constructed to provide exact and systematic cutting/bevelling of finished Cyrel® photopolymer plates.



Plate/Solvent Compatibility

Once the plate is properly made, carefully mounted and ready for printing, printing inks, additives, and plate cleaners must be carefully selected to achieve the best results. Inks, additives and cleaners may contain only limited concentrations of active solvents, such as acetates, heptane or naphtha. These solvents, and several others, are incompatible with photopolymer printing plates above certain levels. They may cause swelling, or in some cases, shrinking, cracking or softening of the plate. Also, UV inks may contain aggressive monomers that attack the plate, much like aggressive solvents. A Guide for Cyrel® Plate/Solvent Compatibility is available in the Printing Section of this manual.

Plate Cleaning

One of the tremendous economic advantages of Cyrel® printing plates is their reusability. This requires proper cleaning and correct storage. Careful cleaning of Cyrel® printing plates ensures a longer service life of the plates.

After printing, Cyrel® plates should be cleaned immediately and thoroughly of ink. A soft, natural bristle brush or recommended sponge and compatible cleaner should be used. Plates should be allowed to dry before storage. Inks should not be allowed to dry on the surface of the plate, since they become difficult to remove and may require hard scrubbing. This could lead to surface damage. Dried ink can also crack on the plate, possibly damaging it. The following can be used to properly clean Cyrel® plates.

Solvent Inks

- Undiluted alcohol
- Solvent blends compatible with the plate
(See Compatibility Guide).

Water-Based Inks

- Alkaline water with a small amount of mild, liquid detergent/handsoap.
- Cyrel® Flexo Super Cleaner
- Other compatible blends

Ultraviolet Inks

- Undiluted alcohol
- Solvent blends compatible with the plate
(See Compatibility Guide).

As mentioned before, make certain that cleanup solvents are compatible with the plate. Check the cleaner's Material Safety Data Sheet for incompatible components based on our Plate/Solvent Compatibility Guide found in the Printing Section of this manual. If necessary, you can also test a small sample of the plate material by first measuring the thickness of the plate, then immersing it in the solvent for up to 24 hours. Remove the plate from the solution and re-measure the plate thickness and examine the surface. If the plate swells, the plate cleaner is not compatible with the plate.

Aggressive solvents, such as acetates, heptane, or naphtha should not be used for cleaning plates. Above certain levels, these can cause damage to the plate surface and

swell the plate, thus affecting its durability. When cleaning the plate, wet the plate thoroughly with the cleaner solution and allow the plate to soak briefly prior to brushing.

After cleaning the plates, blot or blow them dry. Use a lint-free towel or cloth. Do not rub. Rubbing can cause damage to the plate surface. Plates should always be thoroughly dried before storage.

Plate Staging and Storage

Plates should be protected from the environment at all times. When mounted and staged for a press run, cleaning, or storage, wrap plates in a black poly with the edges sealed to protect against whitelight and ozone. Saran™ wrap is an excellent option for ozone protection; however, if whitelight is present, the plates should also be wrapped or covered with untreated black poly. When storing flat, protect the plates by storing them in black poly bags and sealing them.

The procedures listed below should be followed to properly store the *carefully cleaned and dried* Cyrel® finished plates.

- *Storage temperature* may range between 40-95°F (4-35°C).
- Do not store near heat sources, heating vents, etc
- *Humidity* does not usually affect finished plate life, and no special precautions are necessary in the storage area.
- Plates must always be protected from UV light, white incandescent or fluorescent light, window light, and sunlight. Alternately for white light illumination, a UV filter material can be used.
- When storing flat, protect the plates by storing them in black poly bags and sealing them.
- Plates stored on cylinders or sleeves should be wrapped with an opaque medium, such as untreated black poly, with the edges sealed.
- Plates stored in stacks should be interleaved with paper or foam from raw material packing. Do not stack one plate directly on top of another. Do not stack over 6 high.

Ozone Protection

Ozone is a gas that forms in the atmosphere. At ground level it is formed when motor vehicle and industrial exhaust and other chemicals commonly used in the industry mix in intense heat and sunlight. Corona treaters, extruders, press drives, and other electrical devices can produce ozone in your printing plant. Photopolymer printing

plates are susceptible to ozone attack. Exposure to ozone can cause cracking on the plate surface and sometimes on the floor. Ozone attack is most pronounced when the plate is under stress, such as when mounted, inked, and/or improperly made. The following steps can minimize ozone damage to Cyrel® plates. All of them may be required when ozone levels are very high.

Minimizing Ozone

- Use optimum platemaking parameters, i.e. optimum exposure times, especially light finishing times and drying procedures.
- Use compatible inks/solvents/plate cleaners.
- Protect the plates from the environment at all times.
- Clean plates thoroughly; do not leave residual ink on the plate surface.
- Follow recommended storage practices, especially for plates stored in a curved manner.
- Store plates in a controlled area, away from sunlight.
- Use ozone-resistant material.

Plate Mounting

Correct mounting ensures true color-to-color registration of the printing plates, proper repeat, and no lifting of plates for a problem-free press run. In the area of plate mounting for flexible packaging, in particular, there are four principle methods:

1. Microdot Video Mounting,
2. Pin Registration Mounting,
3. Optical, Reflective Mirror Mounting, and
4. Digital Automated Mounting

Microdot Video Mounting

Video mounting, offered by DuPont, has become very popular, primarily in flexible packaging, as well as narrow and midweb-type presses. The Cyrel® Microflex® mounting and proofing system has set a new quality standard in the mounting area. This mounting system is the fastest method for mounting of Cyrel® plates with high accuracy in register. Integrated proofing is offered as an option. Information on the Cyrel® Microflex Mounting Systems are available on our website

Microdots replace traditional registration marks on the plate. The microdot should be approximately .010"/.25 mm in diameter and normally remains on the plate without interfering with the production copy. Direct display of the imaged dot on the monitors ensures a high degree of mounting accuracy and print registration. Job data can also be stored so that repeat jobs can quickly be set up, and exact camera position is assured.

Mounting Tapes

A compatible cushion (stickyback) should be selected for optimum image transfer. Denser cushions help image transfer. The softest stickybacks do not tend to work as well on digital plates due to the shoulder and dot structure. A firmer cushion provides better support for digital dots, and is also preferred for high speed gearless presses. Mounting tapes should be of uniform thickness to obtain maximum advantage of the consistent and exceptionally uniform Cyrel® plate. Unevenness in the tape will be seen in the printed results. It is not recommended to re-use cushion due to the collapsing nature of the cells.

High Quality Process	Medium Soft Density Tape Memory colors with either neutral gray or critical highlights (fleshtones)
Standard Process	Medium Soft Density Tape Tones with a full range of color; no critical highlights
Combination	Medium Density Tape Areas of line or solid printing with some process or screen
Line and Solid	Hard Density Tape Majority of print is solids or type

Plate Demounting

The proper demounting procedure is important to ensure the plates are in good condition for future use. A Cyrel® plate demounting tool, or other blunt instrument (such as a stainless steel spatula/spreader), can be used to demount the plate. No sharp objects or knives should be used. Avoid kinking the polyester base.

Demounting Procedure

1. Hold the tool at a 45 degree angle upward from the horizontal. Starting at the edge of the mounted plate, insert the corner of the tool to a 1/8 to 1/4 inch depth (3.1- 6.3 mm) between the stickyback and the polyester support of the plate.
2. Draw the tool smoothly across. This will give a free flap of the plate to grasp and peel the plate from the stickybacked cylinder.
3. It is important not to use the tool as a pry bar to remove the plate from the cylinder. If this happens, the edge of the plate will have a wrinkled, wavy appearance and will be impossible to hold down to the cylinder when the plate is remounted.



If the plate was properly prepared when mounted, by wiping the back with a varnish solution, demounting should not be a problem. However, if stickyback is still aggressive, a small amount of alcohol, applied at the contact point between the stickyback and mounting tape, will assist in removal.

Quality Assurance for Cyrel® Platemaking

Quality Assurance (QA) for Cyrel® platemaking includes those planned and systematic procedures necessary to provide confidence that you will consistently produce high quality, reliable printing plates. QA also includes quality control, which relates to checking and reviewing work that has been performed to meet a required standard.

Developing a quality assurance program for your Cyrel® plateroom is essential to producing consistent quality printing plates. A brief overview of suggested quality tools to assist you in establishing an in-house Quality Assurance Program is listed below.

Quality Tools

1. Documented procedures (step tests) for optimizing platemaking parameters.
2. Densitometer for checking line screen, dot values, and ensuring complete clearing of digital plates and film specifications.
3. Digital Micrometer with readout for measuring thickness of raw and finished plates.
4. The *Cyrel® Production Log* to document and track finished plate parameters supplied to the plateroom or your customer.
5. Dryer thermometer to check consistency of dryer drawers (for solvent plates).
6. UV measuring devices to profile and monitor bulb performance and consistency in your exposure units.
7. Control Targets to monitor and troubleshoot variations within the platemaking process and press run.
8. Flexo Dot Analyzer for finished plate inspection of halftone dot size, % dot and dot shape.
9. Solvent Analysis and rebalancing tools and procedures to monitor and maintain consistent quality washout solvent (for solvent plates).
10. *Cyrel® Quality Control Checklist* to assess the quality of each plate before printing. By systematically evaluating each area listed before the plate is sent to press, the printing plate variable can be eliminated.

To assist you with your quality assurance Program, the *Cyrel® Production Log* and *Cyrel® Quality Control Checklist* can be found in another file in the “Quality Assurance” folder.

CYREL® PACKAGING GRAPHICS	
Cyrel® Platemaking Quality Control Checklist	
Image Integrity (Compare plate to negative or digital file)	<input checked="" type="checkbox"/>
Required dots are held; no droplets	<input type="checkbox"/>
Digital Plates: Correct bump curve (dots are consistent size and at full plate height)	<input type="checkbox"/>
Reverses are clean, sharp, and open; not filled-in	<input type="checkbox"/>
Lines are sharp, clean and straight; not wavy	<input type="checkbox"/>
There are no “out of contact” spots (Analog Plates) or “out of focus” (Digital Plates).	<input type="checkbox"/>
• no fat tips, excess filled-in, blurry areas, missing or smudged image	<input type="checkbox"/>
Entire image, registration marks, microdots have transferred to plate.	<input type="checkbox"/>
Surface Defects (No Surface Defects in the Image Area)	<input type="checkbox"/>
No artifacts, cracks, kinks, pinholes, chipping/broken characters, depressions, dust/dirt/film, solvent spots, oily spots, patterns	<input type="checkbox"/>
Surface Tackiness	<input type="checkbox"/>
• Plate is not sticky	<input type="checkbox"/>
• Plate is not bare (excessive light finishing)	<input type="checkbox"/>
• Plate does not haze when the corner is bent back (excessive light finishing)	<input type="checkbox"/>
Uniform Thickness	<input type="checkbox"/>
Process work and line work are approximately the same height	<input type="checkbox"/>
No high or low spots	<input type="checkbox"/>
Relief	<input type="checkbox"/>

Cyrel® Platemaking Quality Control Checklist

Image Integrity (Compare plate to negative or digital file)	√
Required dots are held; no dropouts	
Positive characters have a sharp, clean shoulder.	
All dots are well-defined, consistent size, and at full plate height. No missing, fallen, or chipped dots.	
Reverse dots and lines are clean, sharp, and open; not filled-in	
Positive lines are sharp, clean and straight; not wavy	
There are no “out of contact” spots (<i>Analog Plates</i>) or “out of focus” (<i>Digital Plates</i>). <ul style="list-style-type: none"> no fat type, reverses filled-in, shiny areas, missing or unsharp image 	
Entire image, registration marks, microdots have transferred to plate.	
Surface Defects (No Surface Defects in the Image Area)	
No artifacts, cracks, kinks, pinholes, chipping/broken characters, depressions, dust/dirt/lint, solvent spots, shiny spots, patterns)	
Surface Tackiness <ul style="list-style-type: none"> Plate is not sticky Plate is not hazy (excessive light finishing) Plate does not haze when the corner is bent back (excessive light finishing). 	
Uniform Thickness	
Process work and line work are approximately the same height	
No high or low spots	
Relief	
Plates are measured in several areas for required/acceptable relief.	
Clean Floors (Determine if plate has processed down to the true floor)	
No residual monomer on floor or surface	
No cracks in floor (could indicate residual monomer)	
Trimming	
Plate edges have been cleanly trimmed and beveled.	

Cyrel® Photopolymer Platemaking Production Log

Solvent Plates

DuPont Packaging Graphics

Date	Job #	Raw Plate Thickness Gauge	Description	Plate Type/Size	Batch /Box No.	Exposure (minutes)		Washout (minutes)	Drying (hours)	Post Exposure/Finish (minutes)		Thickness Gauge Total/Relief		Notes
						Back	Face			Back	Face	Total	Relief	

Daily Check:

- ❖ Vacuum gauge reading
- ❖ Solvent Temperature
- ❖ Dryer Temperature
- ❖ Vacuum coversheet
- ❖ Cleanlines of exposure bed
- ❖ Proper solvent replenishment rate

Weekly Check:

- ❖ Exposure light intensity
- ❖ Cleanliness of exposure—bulbs, fans, filters
- ❖ Bleeder strip wear
- ❖ Processor solvent tank cleanliness

Establish Optimum Exposure Times:

- ❖ When batch number changes
- ❖ After new lamps are burned in
- ❖ For each new product type



The miracles of science™

Cyrel® Photopolymer Platemaking Production Log

Cyrel®FAST Plates

DuPont Packaging Graphics

Date	Job #	Raw Plate Thickness Gauge	Description	Plate Type/Size	Batch #	Box #	Exposure (minutes)		Processor Set-up#	Post Exposure & Finishing (minutes)		Thickness Gauge Total/Relief		Notes
							Back	Face		Back	Face	Total	Relief	

- Daily Check:**
- ❖ Vacuum gauge reading
 - ❖ Vacuum coversheet
 - ❖ Cleanlines of exposure bed

- Weekly Check:**
- ❖ Exposure light intensity
 - ❖ Cleanliness of exposure—bulbs, fans, filters
 - ❖ Bleeder strip wear
 - ❖ Drum cleaning

- Establish Optimum Exposure Times:**
- ❖ When batch number changes (BX)
 - ❖ After new lamps are burned in
 - ❖ For each new product type



Printing Inks

Printing inks must be carefully selected and formulated for optimal image transfer. Therefore, for best results, the ink supplier is key to obtaining proper and accurate ink information.

Flexographic printing inks consist of dyes or pigments, which are dissolved or dispersed, in an ink vehicle. The ink vehicle consists of synthetic or natural resins dissolved in suitable ink solvents, which determine the physical properties of the printing ink. Two important functions of the ink solvent are to control both the viscosity and drying rate of the printing ink. Flexographic inks are sometimes classified according to the type of solvent used to dissolve the resin, for example, alcohol, water, cosolvent inks, etc.

Flexographic printing inks could be based on a single solvent, but in order to achieve the desired physical and chemical properties, it is more usual to employ mixtures of solvents. Printing inks may, therefore, contain limited concentrations of active solvents, such as esters or hydrocarbons, to retain resins in solution. The composition of a printing ink depends, to a strong extent, on the type of substrate being printed and on the end-use requirements of the ink (such as adhesion, heat resistance, abrasion, deep-freeze properties, etc.).

Based on extensive laboratory studies, it has been determined that of the major ingredients contained in an ink (colorant, resin, additives, liquids), it is the liquid materials that could potentially and adversely influence the plate.

The information in the following section is based on the combination of historical experience along with static and dynamic testing.

Ink Compatibility

Cyrel® Photopolymer Printing Plates are fully compatible with most alcohol-based and water-based flexographic inks, as well as, solvent mixtures (as shown in the compatibility section). Inks, which are oil-based, high in esters, ketones or other aggressive hydrocarbons, cannot be used since they cause premature swelling and/or softening of photopolymer plates.

Slower evaporating solvents are often added in higher concentrations because of the finer anilox rollers and faster running presses. Care should be taken because these slow solvents, in any amount, can build up on dots creating an oil barrier that results in dirty printing in addition to premature swelling and softening of the plate.

Certain incompatible water-based antifoams, less than 1% of formula, have been found to cause plate swell and deterioration after prolonged and repeated exposure.

UV Ink Compatibility

UV inks contain photo reactive monomers, which cure when exposed to ultraviolet light. Some of these monomers are known to swell and/or soften photopolymer plates, even at low concentrations.

Since UV Flexographic printing inks vary widely in formulation, it is recommended to perform a soak test to ensure compatibility prior to printing.

Solvent Compatibility

The Solvent Compatibility List contains mixtures of aggressive solvents with neutral ones. As neutral solvents n-Propanol was used for alcohol-based inks. Pure solvents which are classified as compatible can, of course, be used in any diluted concentration. Concentration of aggressive solvents should be lower whenever possible.

Higher concentrations will destroy the plates within a short time and should never be used. When different non-compatible solvents are used in the same ink or plate cleaner, the individual percentages need to be added before comparing to the list. Please refer to the Solvent Compatibility Guide in this Appendix.

DuPont Packaging Graphics

Global Solvent Compatibility Guide Cyrel®

The **summary chart 1** shows **consolidated data** for **resistant** (swelling ≤ 80µm **and/or** hardness loss of ≤ 7°ShA) or **not resistant** (swelling > 80µm **and/or** hardness loss of >7° ShA)

Chart 1: Summary – Solvent compatibility guide

Plate type according family

Solvent	HIQS HOS DPR		NOW DPN	DS2		UXL SEP EXL DPU DPL	TDR DPC	TCP	FD1 FD2 FOP DFH DFM		DFS DFQ
	DPI DPH	NEOS									
Ethanol	R	R	R	R	R	R	R	R*	R	R	
Isopropanol	R	R	R	R	R	R	R*	R*	R	R	
n-Propanol	R	R	R	R	R	R	R*	R*	R	R	
n-Butanol	R	R	R	R	R	R	R*	R*	R	R	
n-Pentanol	R	NR	R	R	R	R	R*	R*	R	R	
o 4h run n-Pentanol	R	R	R	R	R	R	R*	R*	R	R	
Methoxybutanol 20% ⁽¹⁾	R	R	R	R	R	R	R*	R*	R	R	
Ethoxypropanol 20%	R	R	R	R	R	R	R*	R*	R	R	
Methoxypropanol 20%	R	NR	R	R	R	R	R*	R*	R	R	
Ethylacetat 15%	NR	NR	NR	R	NR	NR	R*	R*	NR	NR	
o 4h run Ethylacetat	R	R	R	R	R	R	R	R	R	R	
Isopropylacetat 15%	NR	NR	NR	NR	NR	NR	R*	R*	NR	NR	
o 4h run Isopropylacetat	R	R	R	R	R	R	R	R	R	R	
n-Propylacetat 15%	NR	NR	NR	NR	NR	NR	NR	R*	NR	NR	
o 4h run n-Propylacetat	R	R	R	R	R	R	R	R	R	R	
i-Butylacetat 15%	NR	NR	NR	R	R	NR	R	R*	NR	R	
o 4h run i-Butylacetat	R	R	R	R	R	R	R	R	R	R	
n-Butylacetat 15%	NR	NR	NR	R	R	NR	R	R*	NR	NR	
o 4h run n-Butylacetat	R	R	R	R	R	R	R	R	R	R	
Methylethylketon 5%	R	R	R	R	R	R	R*	R*	R	R	
Hexan (=n-Hexan) 5%	R	NR	R	R	R	R	R*	R*	R	R	
Benzol/Ethylbenzol	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	
Toluol	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	
Xylol	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	
White spirit 40/60	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	
2-Butoxyethanol 5%	R	R	R	R	R	R	R*	R*	R	R	
Ethanolamin	R	R	R	R	R	R	R	R	R	R	



The miracles of science™

(1) **volume % mixture with n-Propanol** * Leach out > 3,5% / standard condition for soak test: 24h into solvent
(e.g.20% means: 100ml = 20ml solvent + 80ml n-Propanol)

Executive Summary:

For the test all common ink and cleaning solvents were tested in the usual percentage.

NEOS, TDR and TCP are the best analog solvent resistant plates. DS2, DPC and DFS are the best digital solvent resistant plates. DPI and DPH are the most sensitive plates. TDR and TCP are sensitive for leach out. Over time it can lead to changing the surface properties.

All technical information set out herein is provided free of charge and is based on technical data, which DuPont believes to be reliable. It is intended for use by persons having skill, at their own discretion and risk. The handling precaution information contained herein is given with the understanding that those using it will satisfy themselves that their particular conditions of use present no health or safety hazards. Since conditions of product use are outside of our control we make no warranties express or implied in relation thereto and therefore cannot accept any liability in connection with any use of this information. Nothing herein is to be taken as a licence to operate under, or a recommendation to infringe any patents.



DuPont Packaging Graphics

Cyrel® Platemaking Troubleshooting Guide



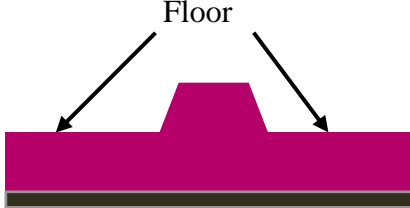
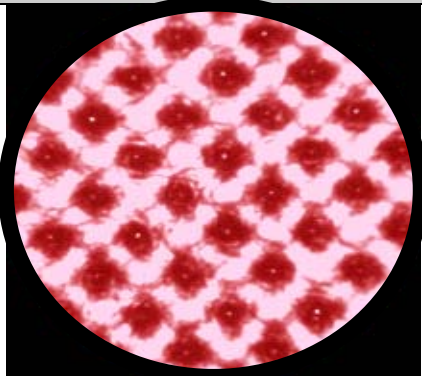
Platemaking Issues that affect printing can occur in all stages of platemaking process.

This Troubleshooting Guide should help you identify and address workflow-related issues.

Sometimes it is difficult to clearly identify the precise origin of an issue because a defect has one or more possible causes. Each cause should be analyzed separately to identify the proper steps to take to resolve the problem.

Cyrel® Photopolymer Printing Plate Troubleshooting Guide

Key to Defects =	All Plates - Green	Digital Plates – Blue	Analog Plates - Purple
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Problem*	Probable Cause	Problem Identification	
Relief out of Specification Floor too shallow Floor too deep	Back exposure too long Insufficient washout Base pre-exposed during storage Insufficient back exposure No back exposure Cold lamps Weak lamps		
<u>Dot Variation</u> - <u>Poorly formed</u> - <u>Sub-Surface</u> - <u>Fallen over</u> - <u>Missing Highlight</u> <u>Dots</u>	Improper Bump Curve Wrong focus adjustment Laser power too low Incorrect dot value in computer file or on mask Main exposure too short Varying bulb output Defective exposure ballasts All bulbs not working		


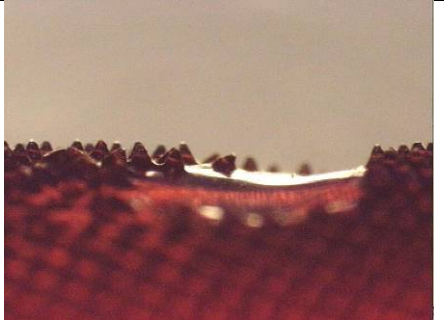
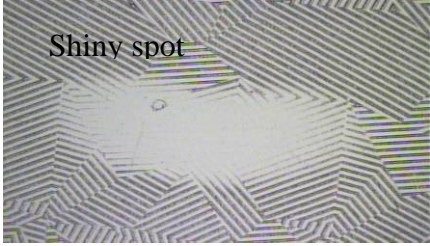
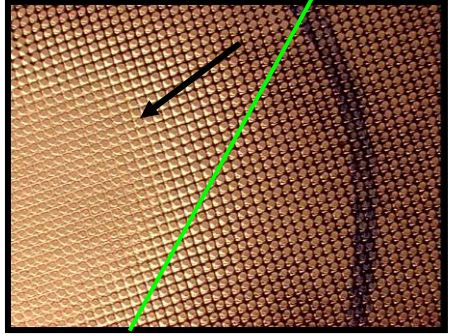
Incorrect bump curve



*Photos are included for “Problems” that are underlined.

Cyrel® Photopolymer Printing Plate Troubleshooting Guide

Key to Defects =	All Plates - Green	Digital Plates – Blue	Analog Plates - Purple
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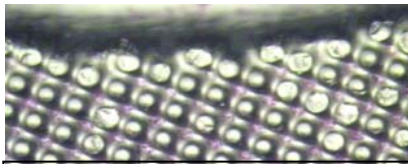
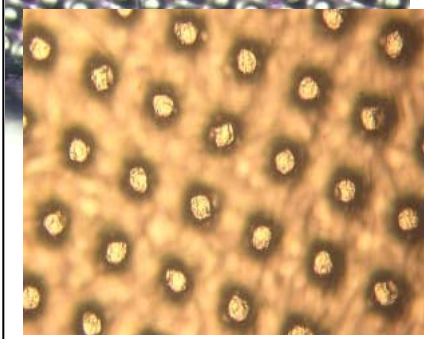
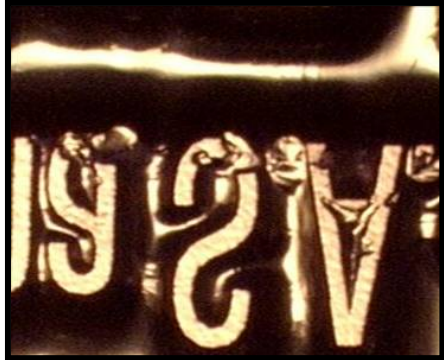
Problem*	Probable Cause	Problem Identification	
(More on next page)	Poor vacuum		
<u>Dot Variation (Cont'd)</u> - <u>Poorly formed</u> - <u>Sub-Surface</u> - <u>Fallen over</u> - <u>Missing Highlight Dots</u>	Incorrect dot value on film Insufficient back exposure (high relief) Low Matte Negative Dirt on Negative Blocked out on negative with opaque liquid		
<u>Out of Contact (Hot Spot)</u> <u>Missing image</u> <u>Loss of Resolution</u> Fat type & line <u>Edge of image not sharp</u> Reverses filled-In <u>Shiny spot</u> Plate mottle	Low/No Matte Film Poor vacuum Vacuum Masking Strips used Improperly or not at all Poor platemaking technique	Shiny spot 	



*Photos are included for “Problems” that are underlined.

Cyrel® Photopolymer Printing Plate Troubleshooting Guide

Key to Defects =	All Plates - Green	Digital Plates - Blue	Analog Plates - Purple
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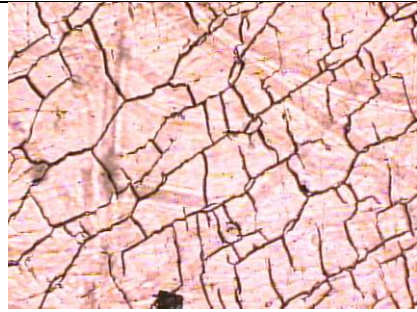
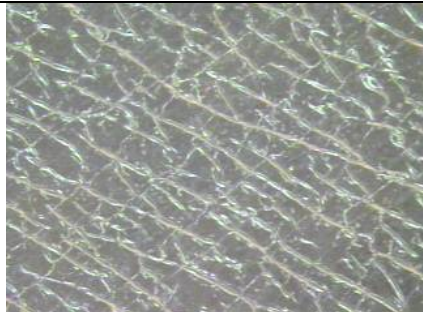
Problem*	Probable Cause	Problem Identification	
			
<u>Chipped Dots/type</u> Platemaking	Too much main, post, or light finishing exposure Improper bump curve (highlight dots) Insufficient back exposure Insufficient main exposure Excessive light finishing <u>Solvent Plates Only</u> Excessive washout Hard, dirty brushes Excessive brush pressure	<div style="display: flex; flex-direction: column; align-items: center;">   </div>	



*Photos are included for “Problems” that are underlined.

Cyrel® Photopolymer Printing Plate Troubleshooting Guide

Key to Defects =	All Plates - Green	Digital Plates – Blue	Analog Plates - Purple
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Problem*	Probable Cause	Problem Identification	
Printing	Harsh cleaning tool Over-Impression		
Cracked Plates - <u>Over-Light Finishing</u> -Slick Surface -Hazes when bent	<u>Excessive light finishing</u>		





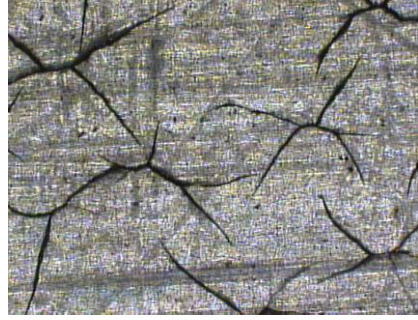
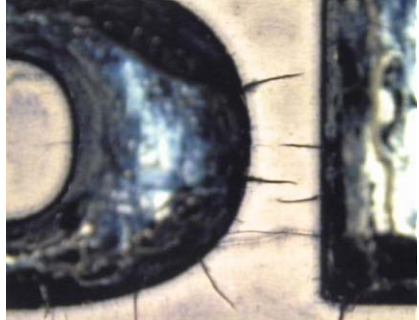
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Cyrel[®] Photopolymer Printing Plate Troubleshooting Guide

Key to Defects =	All Plates - Green	Digital Plates – Blue	Analog Plates - Purple
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Problem*	Probable Cause	Problem Identification	
<u>Solvent Cracks</u>	Aggressive inks, additives, plate cleaners, antifoams		
<u>Ozone Cracks</u>	Internal Ozone (extruders, motors, corona discharge, air from outside) External Ozone (hot, humid days, the environment) Aggressive inks contribute		



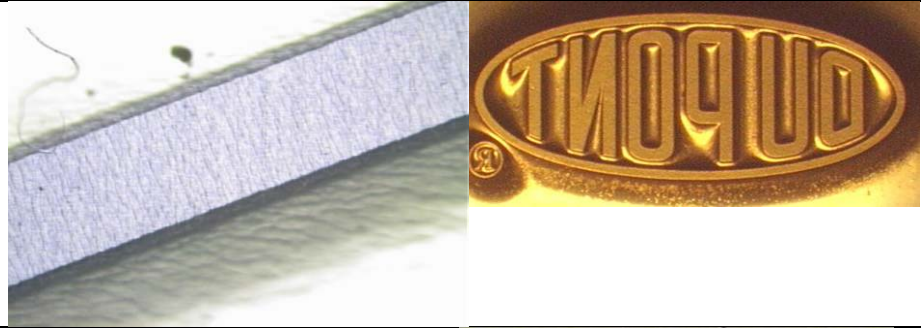
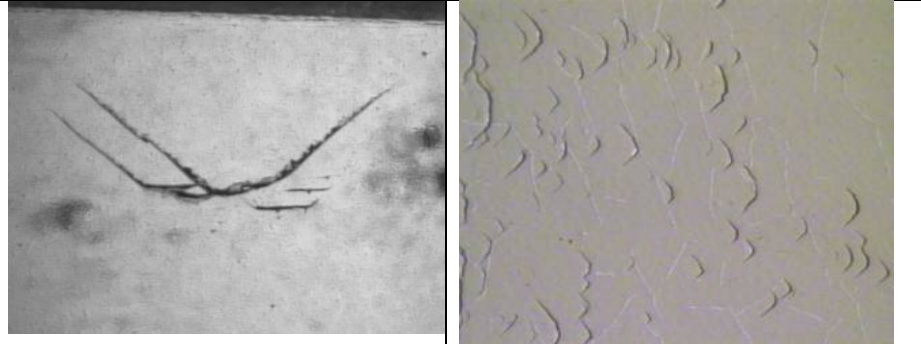
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Cyrel[®] Photopolymer Printing Plate Troubleshooting Guide

Key to Defects =	All Plates - Green	Digital Plates - Blue	Analog Plates - Purple
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Problem*	Probable Cause	Problem Identification	
<u>Light Cracking</u> <u>Yellow Plates</u>	Excessive exposure to: whitelight, incandescent, UV or any type of light		
<u>Over-impression</u> <u>Cracking</u>	V-shaped cracks usually coming out of reverses		



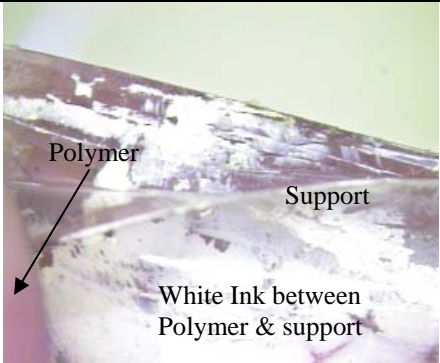
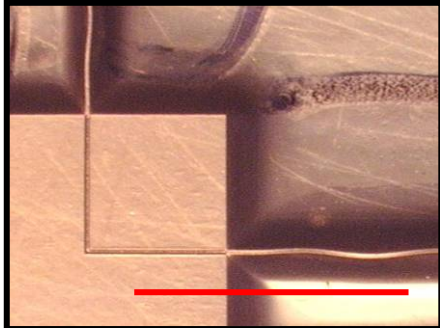
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Cyrel® Photopolymer Printing Plate Troubleshooting Guide

Key to Defects =	All Plates - Green	Digital Plates – Blue	Analog Plates - Purple
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Problem*	Probable Cause	Problem Identification	
<u>Support Delamination</u> - Base separates from polymer	Insufficient back exposure Poor plate trimming Aggressive solvents Rough handling/mounting	 <p style="font-size: small;">Polymer Support White Ink between Polymer & support</p>	
<u>Wavy Lines in Image</u>	Line size out of spec Weak lamps Insufficient back exposure Insufficient main exposure Excessive washout		



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Cyrel® Photopolymer Printing Plate Troubleshooting Guide

Key to Defects =	All Plates - Green	Digital Plates – Blue	Analog Plates - Purple
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Problem*	Probable Cause	Problem Identification	
After Printing - Plate Swell - Dot gain on press - Bold Type - Plate Shrinkage	Dryer ventilation incorrect (too high, too low) Aggressive ink, additives, defoamers, plate cleaners Excessive press temperature Abrasion/chipped dots		
Release Layer Not Washing Off - <u>Shiny area on image</u>	<u>Analog Solvent Only</u> Incorrect washout solution temperature Washout solvent out of spec Insufficient washout time Insufficient solvent replenishment Dirty solvent tank Processor brushes too soft <u>Analog FAST Only</u> Running wrong processor		



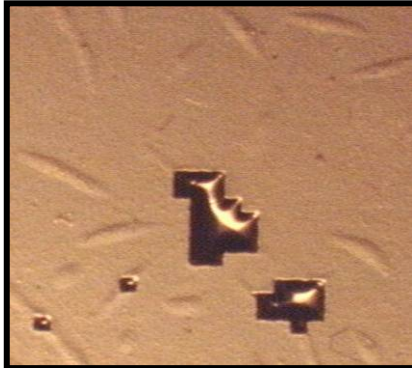
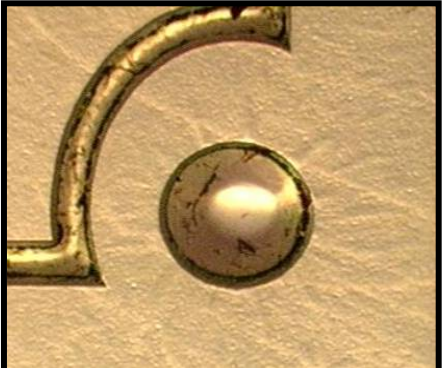
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Cyrel[®] Photopolymer Printing Plate Troubleshooting Guide

Key to Defects =	All Plates - Green	Digital Plates – Blue	Analog Plates - Purple
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Problem*	Probable Cause	Problem Identification	
	program		
<u>Orange Peel</u>	Insufficient back exposure Insufficient main exposure Excessive solvent processing Low alcohol concentration in the solvent Solvent dirty Solvent composition out of balance		



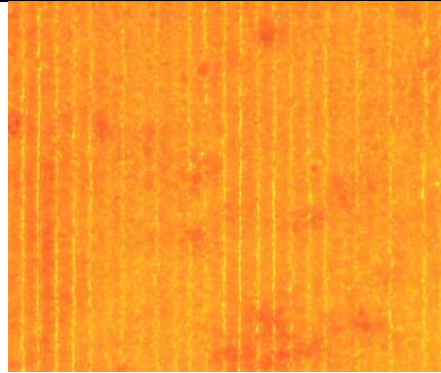

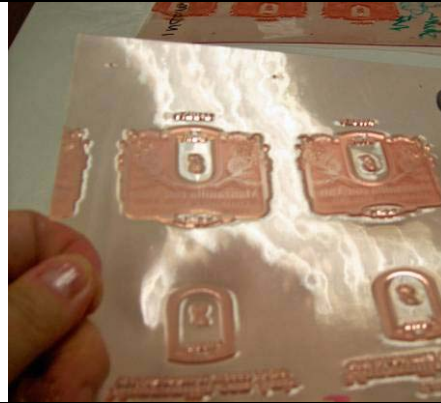
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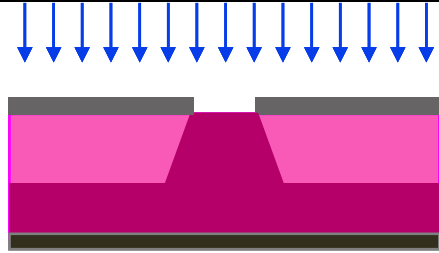
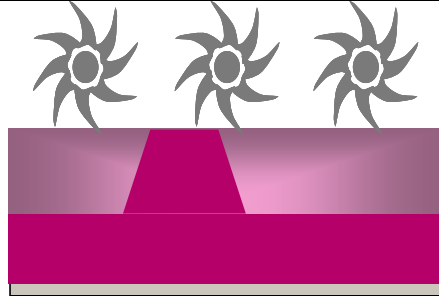
Problem*	Probable Cause	Problem Identification	
<p>Out of Focus</p> <ul style="list-style-type: none"> - <u>Shadow around dots on mask</u> - Loss of resolution - <u>Laser Lines</u> 	<p>Laser Energy too low</p>		 <p>On Mask</p>
<p>Plate floor not clean</p> <ul style="list-style-type: none"> - Uneven floor - <u>Shiny floor</u> - Puddling at base of images - Monomer deposits on image surface & floor - Reverses filled in 	<p><u>Solvent Plates Only</u></p> <p>Insufficient back exposure Insufficient washout time Dirty washout solution Inadequate replenishment Weak Exposure bulbs</p>		



*Photos are included for “Problems” that are underlined.

Cyrel® Photopolymer Printing Plate Troubleshooting Guide

Key to Defects =	All Plates - Green	Digital Plates – Blue	Analog Plates - Purple
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Problem*	Probable Cause	Problem Identification	
Long Exposure Times	<p style="color: purple;">Incorrect film specifications</p> <p style="color: purple;">Vacuum film/sheet out of spec. (MX)</p> <p style="color: green;">Time not optimized for product or batch number</p> <p style="color: green;">UV Lamp age</p>		
<p style="color: green;">Long Washout Times</p> <p style="color: green;">- Washout times longer than normal</p>	<p style="color: green;"><u>Solvent Plates</u></p> <p style="color: green;">Solution out of balance</p> <p style="color: green;">Dirty solution</p> <p style="color: green;">Under replenished solution</p> <p style="color: green;">Wrong brush setting</p> <p style="color: green;">Low drum speed (rotary)</p> <p style="color: green;">Incorrect solution temp.</p>		




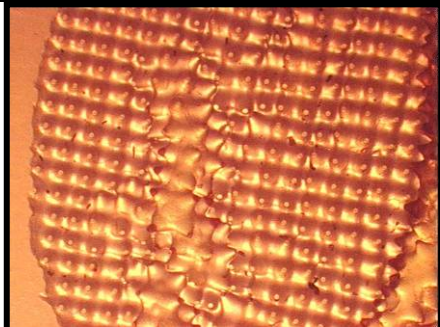
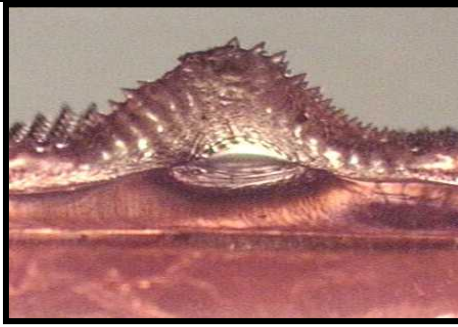
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Cyrel® Photopolymer Printing Plate Troubleshooting Guide

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Problem*	Probable Cause	Problem Identification	
<p>Plate Curl</p> <ul style="list-style-type: none"> - Plate edge lifts on press - <u>Plate edges curl upward</u> 	<p>Relief too high Incompatible inks, additives, plate cleaners, antifoams <u>Solvent Plates</u> Excessive washout time Excessive drying time and/or high temperature in dryer</p>		
<p>Ridges in Screens</p> <ul style="list-style-type: none"> - <u>Dot area deformation</u> - <u>Area higher than other areas</u> 	<p><u>Solvent Plates</u> No back exposure Insufficient back exposure Insufficient main exposure</p>		



*Photos are included for “Problems” that are underlined.

Cyrel® Photopolymer Printing Plate Troubleshooting Guide

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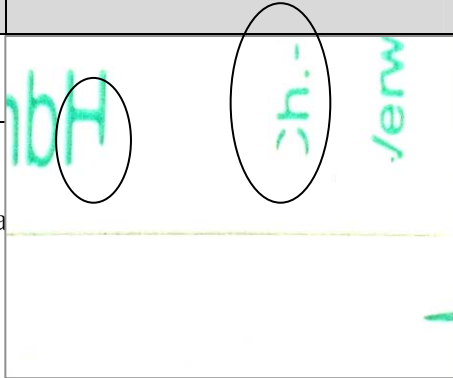
Problem*	Probable Cause	Problem Identification	
<u>Reverses Filled-In</u>	Incorrect film density Low/ no matte film Blocked vacuum system Masking strips not used or used improperly Over-Exposed Reverse too small		
Pinholing on Plate - Tiny Pits in processed plate	Dust/dirt/lint under negative or vinyl coversheet Low humidity Poor ventilation Poor housekeeping		
Poor Registration - Images do not fit	Check file for design accuracy Improper loading of plate to imager (plate sag) All plates not made in the same direction on raw mat'l. All plates not made in the		



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Cyrel® Photopolymer Printing Plate Troubleshooting Guide

Key to Defects =	All Plates - Green	Digital Plates – Blue	Analog Plates - Purple
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Problem*	Probable Cause	Problem Identification	
	same platemaking system Different conditions used to make each plate Cyrel®FAST Equipment Issues <u>Solvent Plates Only</u> Excessive drying temperature Excessive drying time		
<u>Coversheet Delamination</u>	Poor Handling Raw Material has been bent		
<u>Deformation of register marks, micro dots, fine</u>	<u>Cyrel®FAST Plates</u> Image elements out of spec		



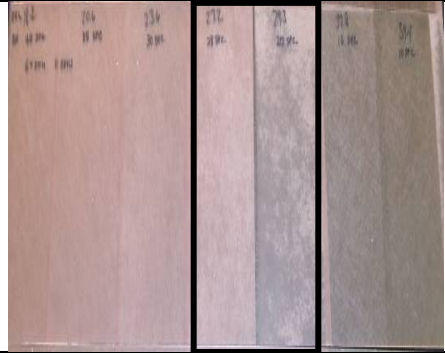
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Cyrel® Photopolymer Printing Plate Troubleshooting Guide

Key to Defects =	All Plates - Green	Digital Plates – Blue	Analog Plates - Purple
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Problem*	Probable Cause	Problem Identification	
<u>lines on print</u> - Characters or small single dots don't print or don't print completely	Insufficient Back Exposure Insufficient Main Exposure Mixing plate format sizes Stain level too high in image areas UV Lamp age		
<u>Rough Floor Texture</u>	Cyrel®FAST Plates Relief too deep Improper back exposure time (not cleaning to true floor)		



Section C-1
/CMC

*Photos are included for “Problems” that are underlined.

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Cyrel® Photopolymer Printing Plate Troubleshooting Guide

Key to Defects =	All Plates - Green	Digital Plates – Blue	Analog Plates - Purple
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Problem*	Probable Cause	Problem Identification	
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<u>Wrinkles on Image</u>	Handling (Release layer is disturbed before imaging)		
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*Photos are included for “Problems” that are underlined.

Cyrel® Process of Use Manual 2008

Cyrel® Platemaking Supplies and Sources

<u>Item</u>	<u>Source</u>	<u>Contact Information</u>
<u>Pre-Press</u>		
High Matte Film for Cyrel® Platemaking	Local Graphic Arts Dealer	
3M™ Temflex™ General Use 1700 Vinyl Electrical Tape (for some older digital imagers)	3M Electrical Division	Part # 054007-49571 www.3M.com (to search for distributors)
<u>Plate Processing Solutions</u>		
Cylosol/OptiSol®	DuPont Co./Cyrel® Distributor	DuPont # 1-800-345-9999
FlexoSol®/ Unisol® / Antistat	DuPont Co./Cyrel® Distributor	
<u>Equipment Support Parts</u>		
Exposure Lamps	DuPont Co./Cyrel® Distributor	DuPont # 1-800-345-9999
Vinyl Cover Sheets	DuPont Co./Cyrel® Distributor	DuPont # 1-800-345-9999
Embossed Mylar®	Local Graphic Arts Dealer	www.SDIonline.com (for distributor search) or call 1-888-734-7734
DuPont In-line Transport Tape	DuPont Co./Cyrel® Distributor	DuPont # 1-800-345-9999
<u>Plateroom Support</u>		
<u>Platemaking Supplies</u>		
Temperature Tape Labels	www.omega.com or Comparable Source	Non-Reversible Temperature Labels, Part Number TL-10-105, Temperature Range: 105-180 deg. F. (Other ranges available)
DuPont Blue Towels (for wiping)	DuPont Co./Cyrel® Distributor	DuPont # 1-800-345-9999

This listing **IS NOT** all inclusive of all types of supplies and peripheral equipment available, or all the sources and manufacturers which provide such products. DuPont does not recommend these suppliers over any other source, and is not responsible for availability, pricing, improper use/handling, or performance of these supplies and peripheral equipment. Each customer should evaluate the suitability of all supplies and equipment in its operations.

Cyrel® Platemaking Supplies & Sources

<u>Plateroom Support</u>		
<u>Platemaking Supplies</u>		
Film Cleaner	VWR Scientific or Comparable Source	Part # 21899-490 www.vwr.com 1-800-932-5000
SDI Dust Removal System Roller	Local Graphic Arts Dealer	www.SDionline.com (for distributor search) or call 1-888-734-7734
Magnetic Wiping Cloths	Local Graphic Arts Dealer	
Room Lighting UV Filters	Local Graphic Arts Dealer	
Screen Angle Finder	Local Graphic Arts Dealer	
Orangeplast (for masking)	Local Graphic Arts Dealer	
<u>Plate Cutters</u>		
Dupont Cutting Table (raw & finished)	DuPont Co./Cyrel® Distributor	Item # M81668A 1-800-345-9999
Kuttrimmer (finished plates)	MBM Corporation	Call for dealer in your area 1-800-223-2508 www.mbmcorp.com
Thermocutter Hot Knife (for raw plates)	Abbeon-Cal, Inc.	ZETZ-24 – Industrial Model ZETZ-9 – 8" Hand Held 123 Gray Avenue. Santa Barbara, CA 93101 1-805-966-7659/1-800-922-0977

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		www.abbeon1.com
<u>Vacuum Drawdown</u>		
Vacuum Masking Strips (vacuum)	DuPont Co./Cyrel® Distributor	DuPont # 1-800-345-9999
Flexowand Antistatic Film Drawdown Wand	Local Graphic Arts Dealer	
Toraystick	Local Graphic Arts Dealer Pitman Co.	Item # 152-00001
<u>Quality Control Equipment</u>		
Dryer Temperature Control	VWR Scientific or Comparable Source	Item #23609-230 www.vwr.com
Thermometer Dial (-50-150C/58-302F)	VWR Scientific or Comparable Source	Item #61161-310 www.vwr.com
Loupes (magnifiers)	Local Graphic Arts Dealer	
Plate Thickness Gauge	Cyrel® Distributor or Local Graphic Arts Dealer	London Model FPI (.0001" increments)
Exposure Lamp Meters UVA - #D11760703 UVC - #D11760710	Kühnast Strahlungstechnik GmbH	Contact: Ms. Grein, Export Dept. Poststrasse 56, D-63607 Wächtersbach, Germany, Tel. +49 (0) 6053 / 9650, E-Mail: info@uv-technology.de
Measuring Films & LAMS Layer Tabletop Transmission Densitometer Techkon densitometer T 20 and illumination plate LP 20 or LP 40	X-Rite Incorporated TECHKON GmbH	Model # 361T www.xrite.com (to locate Dealers) 1-800-248-9748 Wiesbadener Straße 27 D-61462 Königstein phone: +49(0) 6174-924450 www.techkon.com

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Spectroeye (spectrophotometer for measuring print samples)	X-Rite Incorporated	www.xrite.com (to locate Dealers) 1-800-248-9748
Flexo Dot Analyzers Betaflex 334	Beta Industries, Inc.	1-800-272-7336 1-201-939-2400 http://www.betascreen.com
Flexo IAS-II	Quality Engineering Associates, Inc.	99 South Bedford Street, Unit 4 Burlington, MA 01803 1-781-221-0080 http://www.qea.com
<u>Safety Supplies</u>		
Absorbent for Spills	Local Safety Supply Distributor	
Protective Gloves (for handling solvents)	Local Safety Supply Distributor	Ansell Sol-Vex®, Style 37-155 (11 mils thick; 13" length) or equivalent
Safety Glasses, Chemical Splash Goggles	Local Safety Supply Distributor	
Welding Helmet (Shade 6)	Local Safety Supply Distributor	
Respirators with organic vapor cartridges	Local Safety Supply Distributor	Important Note: See OSHA 29 CFR 1910.134, Respiratory Protection
<u>Solvent Rebalancing</u>		
Hydrometers	VWR Scientific or Comparable Source	OptiSol® Rotary Item # 34670-161 OptiSol® InLine Item #34627-130 Cylosol Item #34627-130 www.vwr.com
Graduated Cylinders	VWR Scientific or	Item # 89001-232 (340 ml) 38x375 mm

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	Comparable Source	www.vwr.com
Thermometer for measuring specific gravity	VWR Scientific or Comparable Source	Item # 61161-310 www.vwr.com
<u>Solvent Recovery</u>		
Solvent Recovery Units (PRI)	DuPont Co./Cyrel® Distributor	
Parts and Supplies for PRI Units	PRI (Progressive Recovery, Inc.)	700 Industrial Drive Dupo, IL 62239 1-618-286-5000/1-800-732-3793 www.progressive-recovery.com
<u>Pressroom Supplies</u>		
Hydra-Sponge™	Local Hardware Store or U.S. Wholesale Supply, Inc. (large quantities)	Item # SPHs0800 (#2M) 2125 Ponticello Dr. Henderson, NV 89052 1-800-472-8453
Natural Bristle Plate Brush #89540	Advance Product Co. or Comparable Source	1015 Spring Garden Street Philadelphia, PA 19123 1-215-232-5926
Cyrel® Flexo Super Cleaner	DuPont Company/Cyrel® Distributor	Item # M70959 (5 gal), M70940 (55 gal)

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H-54635-1 (Revised 10/08)



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