SWancor®
Green Energy & Environmental Protection & Safety

Epoxy Vinyl Ester Resins
Corrosion Resistance Guide

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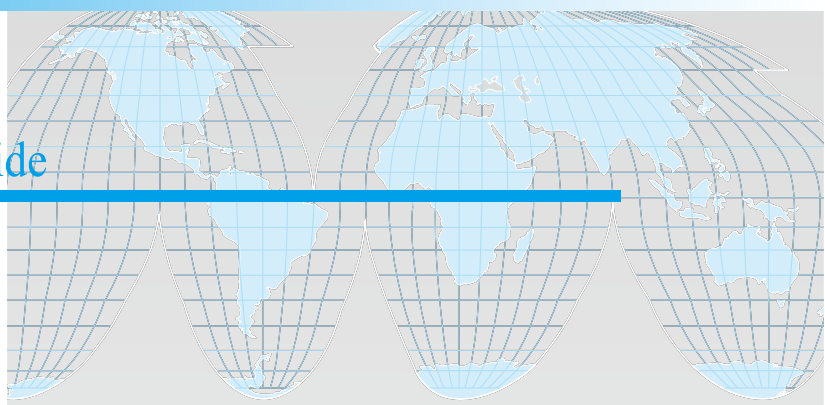
Epoxy Vinyl Ester Resins Corrosion Resistance Guide



FOREWORD

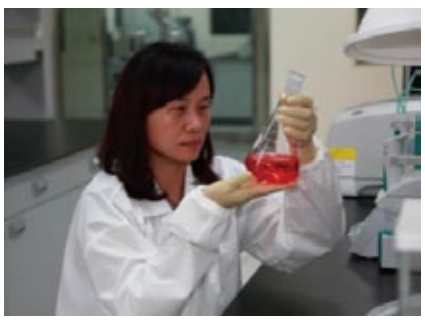
SWANCOR epoxy vinyl ester resins are designed to meet the demands for the Fiber Reinforced Plastic (FRP) industry, particularly for those requiring high performance of corrosion resistance. SWANCOR epoxy vinyl ester resins are manufactured with unique technology and both have been proved of excellent chemical resistance, as well as good physical properties in recommended conditions.

This guide is designed to assist the designers and fabricators in selecting the suitable resins for FRP parts, which will be exposed to highly corrosive environments. It is important to note that the values given in this guide are only for reference because construction of laminates varies from shop to shop and it is beyond SWANCOR's control. That is, SWANCOR does not make any warranty for the information provided in this corrosion guide. It is highly suggested that fabricators begin with small-scale tests before starting full-scale production.

THE PRODUCT SERIES

SWANCOR 901 Series

SWANCOR 901 series is the Bisphenol-A type epoxy vinyl ester resins dissolved in styrene monomer. The resins are widely used in FRP. This series is commonly used in various fabrications, such as hand lay-up, spray-up, pultrusion, filament winding and infusion. The 901 series displays excellent mechanical properties, toughness and fatigue resistance. SWANCOR 901 series also provides excellent chemical resistance against most of alkalis, acids, salt solutions and solvents.



SWANCOR 905 Series

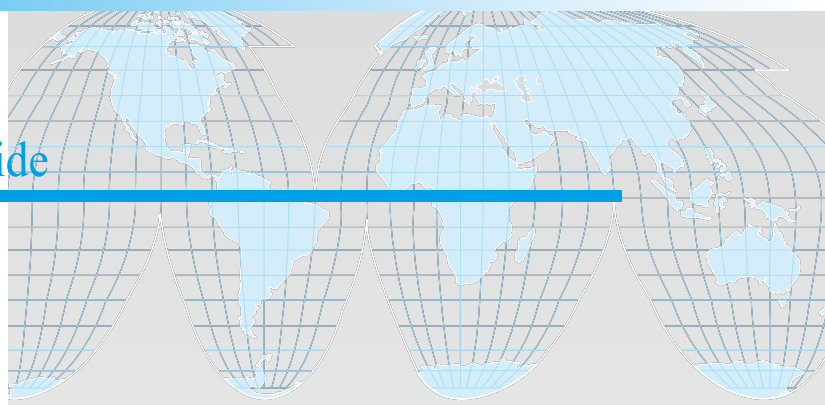
SWANCOR 905 series, Brominated Bisphenol-A type epoxy vinyl ester resins dissolved in styrene monomer, is often used in flame retardant applications. This series displays physical properties and chemical resistance as good as SWANCOR 901 series. The 905 series is also qualified with ASTM E84 flame retardant test and meets the AFPA classification.

SWANCOR 907 Series

SWANCOR 907 series is Novolac type epoxy vinyl ester resins dissolved in styrene monomer. This series of resins can resist against strong acids, oxidants and solvents due to its superior corrosion resistance. Furthermore, the mechanical properties of the resins remain unchanged even at high temperature. Some resins are designed to provide extremely high service temperature for specific application requirement.

SWANCOR 980 Series

SWANCOR 980 series is elastomer-modified epoxy vinyl ester resins dissolved in styrene monomer. The resins present improved tensile elongation and toughness. These resins have increased adhesion strength and superior resistance to abrasion and severe mechanical stress. The excellent performance of their impact resistance makes them the best choice for sport parts (e.g. helmet) or structure applications.



HOW TO USE

In the chemical resistance tables, a blank space simply indicates that no data was available at the time that temperature ratings were assigned.

NR stands for "not recommended" at any temperature.

LS stands for "limited service" (at least 3 days to 1 year at maximum 40℃/100℉). Generally in these cases, the respective resins can be used for FRP that is exposed accidentally, and where cleaning and inspection are possible after no more than 3 days.

This guide is updated on a regular basis in order to take into consideration all the new experiences and data (new products, other temperatures or concentrations, etc.).

Product Series	SWANCOR 901	SWANCOR 905	SWANCOR 905-N	SWANCOR 907	SWANCOR 985	SWANCOR 977S
SWANCOR	901 901-3	905-2 905C	905-N	907	985	977S
CHEMPULSE	901	-		-	-	-

EXSAMPLE

	Maximum Recommended Temperature (°F/°C)						
Chemical	Conc. (%)	SWANCOR 901	SWANCOR 905	SWANCOR 907	SWANCOR 980	SWANCOR 905N	SWANCOR 977-S
Benzene	100	NR	NR	100/38	NR	LS	110/43
	weight - % (unless otherwise stated)	not recommended	not recommended	highest recommended temperature (°C/°F)	not recommended	limited service	highest recommended temperature (°C/°F)

CORROSION TESTING

The listing provides the maximum service temperature at different chemical environments of each SWANCOR epoxy vinyl ester resins according to the ASTM C581 standard, and the criteria are:

- Within the maximum given temperature, the equipment made with SWANCOR or epoxy vinyl ester resins has shown satisfactory service in the field of operation.
- The specimen tests of physical properties based on ASTM standard indicated good conditions in Barcol hardness, flexural strength/modulus and weight change

If resins are applied in building FRP equipments for specific environments/conditions, factors other than maximum service temperature are also important. These factors include:

- Design suitability
- Type of reinforcement
- Curing system and conditions
- Impurities in the environment

If the following situations occur, please contact SWANCOR for assistant. The contact information is shown in the INQUIRIES section. SWANCOR is always ready to provide you solutions and suggestions.

- The product will be exposed at temperature near the maximum values in the corrosion tables.
- Either a combination of chemicals listed in the tables, or chemicals which are not listed in the corrosion tables will be contacted with the product.
- The product will be exposed to unknown or unclear chemicals.

A corrosion test based on ASTM C581 will be performed by SWANCOR, and the report will be sent to customers.

Epoxy Vinyl Ester Resins Corrosion Resistance Guide

LAMINATE CONSTRUCTION

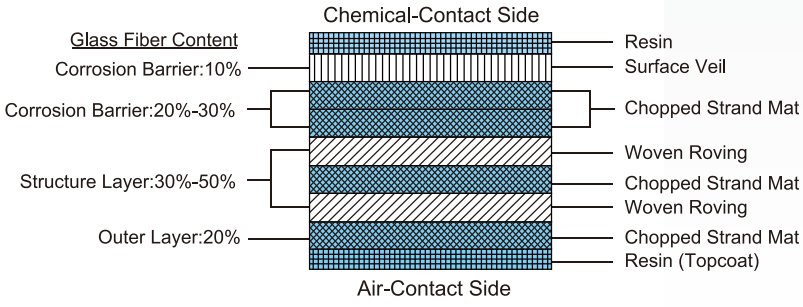
Composite products are designed with high corrosion resistance, typically use as a structural laminate and a corrosion barrier. NBS PS 15-69 " Custom Contact-Molded Reinforced-Polyester Chemical-Resistant" is a good guide for product design. Glass fibers, while providing physical strength, have little to none corrosion resistance in many environments. Resin, unlike glass fibers, provides corrosion resistance and also conveys stress into glass fibers. Consequently, a resin-rich corrosion barrier is necessary in order to protect a high glass content structural laminate.

CORROSION BARRIER

In accordance with general industry practices, corrosion barrier is typically 3.0 mm (100 mils) thick and consists of a surfacing veil saturated with 90% resin content, followed by two layers of 450 g/m^2 (1.5 oz/ft^2) ch opped strand mat impregnated with about 70% resin.

Several types of surfacing veil are available. The ones that are most frequently used are made from "C" glass or from synthetic polyester. The surfacing veil layer should be 0.3 mm (10 mils) thick. Corrosion resistance can be improved with thicker veils but the laminate has more potential to crack.

Chopped strand mat reinforcement consists of a felted matrix of chopped strand "E" or "ECR" glass fibers, 0.5 inches (13mm) to 2.0 inches (51mm) long and loosely held together by a styrene-soluble resin binder. Two layers of a 450 g/m^2 (1.5 oz/ft^2) mat are generally used with the surfacing veil to form the corrosion barrier. For highly corrosive environments, the corrosion barrier could be 6 mm (200 mils) or 15mm (500 mils).



STRUCTURAL LAYER

The structural layer is designed to meet the requirement of physical property. Additives, such as thixotropic agents, can be used in the structural layer. Woven roving is commonly used in alternate layers with chopped strand mats in the structural layer of laminates, and forms the primary structure of many large hand-lay- up vessels.

TOPCOAT

Topcoat is often used to protect the exterior of composite product from weathering and the occasional exposure to corrosive agents. 0.4% paraffin wax is often added in order to improve the cure on the air-contacting surface. Caution: Wax topcoats should not be used between laminate layers because they may interfere with adhesion of one layer to the other.

Thixotropic agents may be used to prevent the topcoat from flowing down on an inclined surface or dripping from a vertical surface. UV absorber or pigments with UV light absorption capability may be added to improve weathering-resistant properties. A fast-gelling curing system is recommended.

PROCESS INFORMATION

Based on the experiences, most of failure of FRP is owing to improper operation or incorrect procedures of fabrication techniques. The following information will assist customers in FRP operation and prevent failure of FRP.

CURING SYSTEM

One of the most important factors governing the corrosion resistance of composites is the degree of cure that the resins reach. For general purpose, it is recommended that the laminate reaches a minimum of 90% of the clear cast Barcol hardness value listed by resin manufacturer.

Standard catalysts, such as Methyl Ethyl Ketone Peroxide (MEKP) and Benzol Peroxide (BPO), can be used with SWANCOR vinyl ester resins. Cumene Hydroperoxide (CHP), another type of catalyst, is recommended to use with resins having high peak temperature, such as SWANCOR 907 series. MEKP and CHP are commonly used with promoters, typically Cobalt Octoate (CoOct) or Cobalt Naphthenate (CoNap), and accelerators, typically Dimethyl Aniline (DMA). BPO, on the other hand, is normally combined DMA accelerator, without cobalt promoters.

The optimum usage ratio of MEKP (55% active content) to CoOct or CoNap (6% cobalt content) ranges from 3/1 to 10/1. The ratio of DMA accelerator to catalysts suggested in the previous/following pages can be adjusted by customers in order to achieve the best performance.

CAUTION: The cobalt promoter should never be mixed directly with a peroxide catalyst (such as MEKP). Mixing cobalt with peroxide catalysts could cause violent reaction, fire or explosion.

For optimum result, the ratio of 98% BPO to 100% DMA should range from 10/1 to 15/1. Ratio out of the recommended range could lead to non-gel, or under-cure. In such case, post-cure would be ineffective.

AIR INHIBITION

When processing in an open mold, oxygen in the atmosphere tends to inhibit the complete cure of an exposed FRP surface. If air exposure occurs, the surface may be under-cure, and further results in the reduction of chemical resistance as well as failure of long-term service of FRP vessels and parts. Paraffin wax solution can be added to the resin as topcoat layer so that the exposure of air can be prevented.

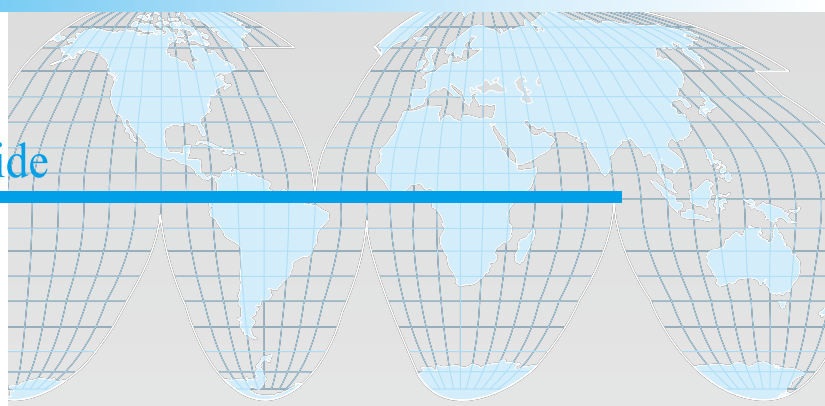
Note: If the wax is applied, the top layer of the wax should be removed under reconstruction, because the wax layer may be the bonding barrier between the laminates. That is, the adhesion between laminates could be significantly reduced.

MOISTURE INFLUENCE

It should be aware that moisture could considerably slow the curing in Cobalt/MEKP systems. In other words, high humidity could affect the curing systems. Sealing the vessels right after use is also required so that moisture can be prohibited from contacting with the resins. Besides, it is important to ensure that no moisture is absorbed by reinforcement and fillers, such as glass fiber mat, surface veils and thixotroped agents, while they are stored.

SECONDARY BONDING

All laminate surfaces, which are no longer tacky, should be wiped off with acetone to remove all the sands and dirt. Then, the laminate surfaces should be ground to rough before continuing on laminate fabrication.



POST-CURE

The performance of composite product in some applications can be enhanced by post-curing the finished workpieces. Post-curing provides benefits in two ways: complete the curing reaction that maximizes the cross-linking density and eliminates un-reacted functional groups.

To maximize the effectiveness, post-curing should be performed soon after the composite is gelled and the exothermic process is accomplished. Ideally, composite should be post-cured at 80oC for 4 hours. Time for post-cure would be longer if the workpeice becomes thicker.

If the laminate is applied to a substrate which has a different thermal expansion coefficient, cracks and/or peel-off may occur at temperature over 60oC. In such case, primer with high flexibility or post-curing at 60oC for a longer period is suggested. Both will prevent failure of adhesion between laminate and substrate.

FOOD CONTACT

Vinyl ester resins, SWANCOR 901 and SWANCOR 907 series, are complied with the U.S. Food and Drug Administration (FDA) 21 CFR 177.2420 if properly formulated and cured.

The following procedures can help to achieve FDA compliance:

1. Use a formulation that low styrene will be residual. For example, CoOct/MEKP or CoOct/CHP curing systems.
2. Thoroughly clean the intended part to remove any dust or dirt prior to post-cure.
3. Post-cure with dry heat for 2 hours at 90 °C/194°F or 4 hours at 80°C/176°F.
4. Treat the part with steam or immerse the part in hot water for 8-16 hours at 70°C or higher temperature.
5. Wash the part with detergent and rinse it thoroughly before placing in service.

It should be noted that steaming is recommended only after post-cure by dry heat because moisture may result in improper cure and/or discoloration of surface.

DATA INTERPRETATION

Whenever fluorine, fluorine compounds and hot alkaline chemicals are encountered, an organic synthetic veil must be used, such as Nexus or Abfab VL. Some products related to SWANCOR epoxy vinyl ester resins are unlisted in the following tables but the given values can be applied to all the related products. In the following tables, a blank indicates that data is not available. "NR" means "Not Recommended" and "All" means the resin is suitable for use under the maximum temperature despite the concentration of specific chemical.

Footnotes used in the following tables are explained below:

1. Double synthetic surfacing veil should be used in corrosion barrier layer.
2. BPO/DMA curing system is more suitable than MEKP and CHP.
3. Double C-veil should be used in corrosion barrier layer.
4. Post-cure is recommended for maximum performance and service life.
5. If service is marginal, use SWANCOR 900.
6. Acid resistant (ECR) glass should be used in the corrosion resistant barrier and may be used in the structural layer.
7. Mildness discoloration could be occurred during first exposure with high purity acid.
8. 200 mils (6mm) corrosion barrier should be used with a double C-veil. All glass has to be acid resistant ECR glass.
9. Check with SWANCOR team for specific recommendations.

INQUIRIES

Please contact SWANCOR for questions about chemicals and/or conditions not listed in this corrosion guide. The contact information is showing as below.

SWANCOR HIGHPOLYMER CO., LTD.
NO.9 INDUSTRY SOUTH 6 ROAD,
NANTOU CITY 54066, TAIWAN
TEL: 886-49-2255420
FAX: 886-49-2251534
nantou@swancor.com.tw
www.swancor.com

Please provide the following information for questions about corrosiveness of chemicals or conditions, which are not listed in this guide.

1. The common name of chemicals and if possible, the chemical name.
2. Concentration of the chemical interested and pH if it is an aqueous system.
3. Operational temperature.
4. Maximum operational temperature.
5. Pressure.
6. Applications in food and/or drug should be brought up in advance.

If the inquiry includes several chemical compounds, the following information is of importance.

- Are these chemicals stored separately, each in an individual tank?
- Are they stored alternately in a single tank?

TABLE 1.
PROBLEM FOR AMBIENT TEMPERATURE CURE

PROBLEM	PEROXIDE	
	MEKP or CHP	BPO
Resin gels too slowly or does not gel	◢ Check usage rate or ratio MEKP or CHP more than 1.% MEKP/CoNap ratio >3/1 CoOct or CoNap more than 0.15% If temperature <25˚C, DMA is required ◢ Check additive effect Some pigments or additives, e.g. UV absorber, will retard gelling and check effect before use ◢ Review environment condition Water will affect gelling ◢ Others Poor mixing Ambient temperature too low Check active concentration of MEKP, CHP or CoNap	◢ Check usage rate or ratio BPO more than 0.8% BPO/DMA ratio >5/1 ◢ Check active concentration of BPO ◢ Poor agitation: longer mixing time is required for BPO to disperse in resin ◢ Check additive effect: same as in left ◢ Others Temperature too low DMA is not 100% active
Resin does not harden after gelling	◢ Check usage rate or ratio MEKP/CoNap ratio >3/1 If temperature <25˚C, DMA is required. MEKP >1.0% ◢ Check to see if problem is on surface. Add wax at final topcoat for better surface cure ◢ Resin contact with metals can adversely affect the cure	◢ Check usage rate or ratio BPO more than 0.8% BPO/DMA ratio >5/1, preferably 10/1 ◢ Others: same as in left

TABLE 1.(Continued)
PROBLEM FOR AMBIENT TEMPERATURE CURE

PROBLEM	PEROXIDE	
	MEKP or CHP	BPO
Resin gels too fast	- Reduce DMA usagel level - If MEKP >1.0%, reduce MEKP - Add Acetylacetone (2-4-P) - Check resin temperature and choose recommended usage from SWANCOR literature - Check and see if resin is exposed to sunlight. Reduce DMA or MEKP or add Acetylacetone (2-4-P)	- Reduce usage level of BPO or DMA and maintain ratio of BPO/DMA greater than 5/1 - Others: same as in left
Exotherm too high and a whitening laminate or crack occurs	- Reduce or eliminate DMA usage - Use Trigonox 239A - Use CHP with SWANCOR 907 and 900 - Do not build thick laminate, preferably make thinner lay-ups then allow exotherm to subside before continuing lamination - Reduce peroxide usage as low as 1.0%	- Exotherm of BPO/DMA is higher than MEKP - Build thinner lay-ups and allow exotherm to subside before continuing lamination

NOTE: The active content of curing formulation components in this table are specified as follow.

Chemical	Active Content (%)
MEKP	55%
CHP	80%
BPO	98%
DMA	100%
CoNap or CoOct	6%

TABLE 2.
PROBLEMS CAUSED IN LAMINATING

PROBLEM	CAUSE	SOLUTION
Sagging on vertical or ceiling	- Gel time too long - Resin viscosity too low - Too thick laminates at one coat	- Control 15-30 minutes gel time - Add 0.8-1.5% fumed silica - Reduce laminates thickness at one coat
Poor fiber wet-out	- Gel time too short - Improper fiber mat or clothes - Improper lay-up sequence	- Get time longer than 15 minutes - Choose easy-to-wet fiber usually powder type mat has better wetting than emulsion type - Apply some resin on the surface before placing fiber mat
Too many bubbles	- Air entrained in reinforcement after impregnated with resin - Too many bubbles exist in resin	- Hand lay-up with brushes, squeezers or serrated rollers. - Apply a liberal quantity of resin before applying reinforcement. - Add some defoamer - Allow the resin sitting for a few minutes for releasing the air. When MEKP is added, catalyzed resin will generate some bubbles by itself.
Roller picks up fibers when working on mat	- Fabrication start close to limit of gel time - Styrene evaporation - Rolling too fast	- Longer gel time. - Adjust fans, dip rollers in styrene or fresh resin for re-wetting - More deliberate rolling

TABLE 3.
PROBLEM OCCURRED AFTER RESIN HAS CURED

PROBLEM	CAUSE	SOLUTION
Tacky surface	- Air inhibition - Poor curing or low Barcol hardness - High humidity or raindrops on un-cured surface	- Add wax into final topcoat - Refer to table 1. - Prevent fabrication under such condition - Add more DMA
Fiber print-through	- No topcoat and surfacing veil - Coarse woven reinforcement - Resin-poor surface	- Apply 2-layers of surfacing veil and topcoat - Use mat on outer layer - Fabricate a resin-rich surface
De-bonding when laying up on cured surface	- Cured material is not unsaturated polyester or epoxy vinyl ester resins - Resin has cured completely* - Final coat contains wax - The cured resin is SWANCOR 907 or SWANCOR 900	- Grind surface to make it rough - Grind surface to make it rough - Grind surface to make it rough - Grind surface to make it rough
* Rub the surface with styrene monomer. If surface is tacky, then there is no problem for re-layup. - If surface is not tacky, then it is necessary to grind the surface.		
Delamination from concrete substrate	- Laitance exists on the surface - Primer is not suitable or not used - Strength of concrete is inadequate - Concrete is too wet - Dirty concrete surface	- Remove it before applying primer - Use SWANCOR 984 concrete primer - Compression strength of concrete should be higher than 3,000 psi - Moisture content lower than 10% before applying primer - Remove all dirt, oil and contamination
Delamination from metal substrate	- Surface is not sand-blasted - Surface is too wet - Primer is not cured well - Dirty metal surface	- Sand-blasting metal surface to Sa 2 1/2 (white metal) - Dry the surface - Check the suitable usage rate of curing system based on temperature of metal - Remove all dirt, oil and contamination

PRÓLOGO

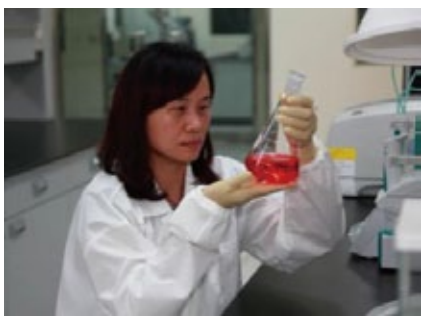
Las resinas epoxi-vinilester de SWANCOR han sido diseñadas para satisfacer los requerimientos de la industria del plástico reforzado con fibra (PRF), particularmente aquellas aplicaciones que requieren de alta resistencia a la corrosión. Las resinas epoxi-vinilester de SWANCOR son fabricadas con una tecnología única que permite lograr excelentes propiedades de resistencia química así como sus buenas propiedades físicas bajo las condiciones recomendadas.

Esta guía está diseñada para ayudar en la selección adecuada de las resinas a los diseñadores y fabricantes de piezas en PRF que estarán expuestas a ambientes altamente corrosivos. Es importante tener presente que los valores indicados en esta guía son sólo para referencia dado que la construcción de los laminados varía de fabrica en fabrica y está fuera del control de SWANCOR. Es decir, SWANCOR no da ninguna garantía por la información contenida en esta guía de corrosión. Es muy recomendable que los fabricantes comiencen con pruebas a pequeña escala antes de iniciar la producción.

SERIE DE PRODUCTOS

Serie SWANCOR 901

La serie SWANCOR 901 es de tipo epoxi-vinilester bisfenol-A, disuelta en estireno monómero. Estas resinas son ampliamente utilizadas en la industria del PRF.



Esta serie es comúnmente aplicada en procesos de laminación manual, spray-up, pultrusion, filament winding e infusión. La serie 901 presenta excelentes propiedades mecánicas, tenacidad y resistencia a la fatiga. Así mismo presenta una excelente resistencia química frente a la mayoría de álcalis, ácidos, soluciones salinas y solventes.

Serie SWANCOR 905

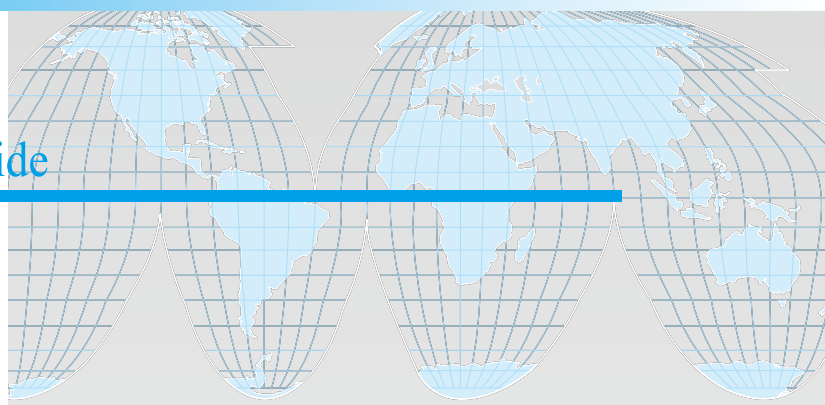
La serie SWANCOR 905 es de tipo epoxi-vinilester bisfenol-A bromada, disuelta en estireno monómero. Este tipo de resina es comúnmente usada en aplicaciones que requieren retardante a la llama. La serie SWANCOR 905 presenta propiedades físicas y de resistencia química tan buenas como la seria SWANCOR 901. La serie 905 está calificada con la norma ASTM E84 correspondiente a la prueba de retardancia a la flama y cumple la clasificación AFPA.

Serie SWANCOR 907

La serie SWANCOR 907 es del tipo Novolac epoxi-vinilester, disuelta en estireno monómero. Esta serie de resinas debido a su alta resistencia a la corrosión, resiste ácidos fuertes, oxidantes y solventes. Además, sus propiedades mecánicas se mantienen incluso a altas temperaturas. Algunas resinas están diseñadas para proporcionar una temperatura de servicio extremadamente alta dependiendo de los requerimientos específicos.

Serie SWANCOR 980

La serie SWANCOR 980 es del tipo epoxi-vinilester modificada con elastómero, disuelta en estireno monómero. Estas resinas presentan elongación a la tensión y dureza mejoradas. Así mismo han aumentado la fuerza de adhesión, superior resistencia a la abrasión y a estrés mecánico severo. Su excelente desempeño de resistencia a los golpes la convierte en la mejor opción para piezas deportivas (ejemplo: cascos) o aplicaciones estructurales.



MODO DE EMPLEO

En las tablas de resistencia química, el espacio en blanco indica simplemente que no había datos disponibles en el momento en que los valores de temperatura fueron asignados.

NR significa “no recomendada” a cualquier temperatura.

LS significa “servicio limitado” (por lo menos 3 días a 1 año como máximo 40°C/100°F). Generalmente, en estos casos, se pueden usar las resinas en PRF que estará expuesto accidentalmente, y en donde la limpieza e inspección se dará en unos pocos días (antes de 3 días).

Esta guía se actualiza de forma regular con el fin de incluir todas las nuevas experiencias con datos de nuevos productos, temperaturas o concentraciones, etc.

Serie de productos	SWANCOR 901	SWANCOR 905	SWANCOR 905-N	SWANCOR 907	SWANCOR 985	SWANCOR 977S
SWANCOR	901 901-3	905-2 905C	905-N	907	985	977S
CHEMPULSE	901	-		-	-	-

EJEMPLO

	Temperatura maxima recomendada (°F/°C)						
Químico	Conc. (%)	SWANCOR 901	SWANCOR 905	SWANCOR 907	SWANCOR 980	SWANCOR 905N	SWANCOR 977-S
Benceno	100	NR	NR	100/38	NR	LS	110/43
	% en peso (a menos que se indique otra cosa)	No recomendada	No recomendada	Temperatura maxima recomendada (°C/°F)	No recomendada	Servicio limitado	Temperatura maxima recomendada (°C/°F)

PRUEBAS DE CORROSIÓN

La lista proporciona el valor de la máxima temperatura de servicio en diversos ambientes químicos para cada resina epoxi-vinilester SWANCOR de acuerdo con la norma ASTM C581, y los criterios son:

- Por debajo de la temperatura dada, los equipos fabricados con las resinas epoxi-vinilester SWANCOR, han demostrado un servicio satisfactorio en el campo de aplicación.
- Las propiedades físicas de las pruebas realizadas con base en la norma ASTM indican buenas condiciones en dureza Barcol, resistencia a la tensión, modulo y cambio de peso.

Si las resinas son usadas en la construcción de equipos en PRF para condiciones y ambientes específicos, otros factores diferentes a la temperatura máxima deben ser considerados, estos factores son:

- Idoneidad del diseño
- Tipo de refuerzo
- Sistema y condiciones de curado
- Impurezas en el ambiente

Si se presenta alguna de las siguientes situaciones, por favor póngase en contacto con el personal técnico de SWANCOR. La información de contacto aparece en la sección de consultas. SWANCOR esta siempre dispuesto para ofrecer soluciones y sugerencias.

- El producto será expuesto a una temperatura muy cercana de la temperatura máxima recomendada en la tabla de corrosión.
- El producto será expuesto a una combinación de sustancias químicas que figuran como sustancias independientes en la tabla de corrosión, o incluso sustancias que no figuran en la lista.
- La pieza estará en contacto con una sustancia química desconocida o poco clara.

Una prueba de corrosión basada en la norma ASTM C581 será realizada por SWANCOR, y el reporte será enviado a los clientes.

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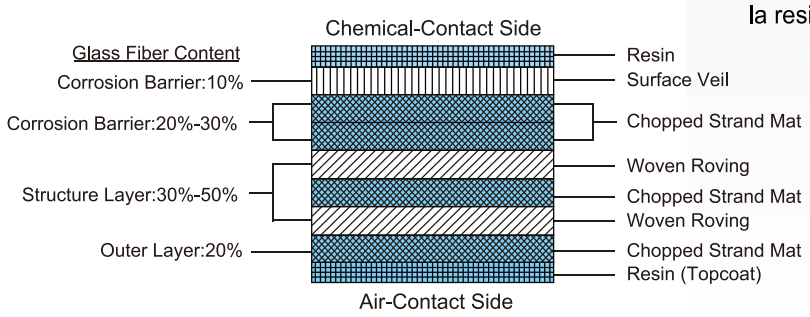
CONSTRUCCIÓN DEL LAMINADO

Los productos que han sido diseñados con alta resistencia a la corrosión, usualmente son construidos con un laminado estructural y una barrera contra la corrosión. NBS PS 15-69 "moldeo por contacto, poliéster reforzado, resistencia química" es una buena guía para el diseño de productos. Mientras las fibras de vidrio proporcionan la fuerza física, poseen poca resistencia a la corrosión en muchos ambientes químicos. La resina en cambio, a diferencia de las fibras de vidrio, proporciona la resistencia a la corrosión y transmite la tensión a las fibras. En consecuencia, es necesario que una barrera contra la corrosión sea rica en resina para proteger el laminado estructural que contiene fibra de vidrio.

BARRERA CONTRA LA CORROSIÓN

De acuerdo con la práctica de la industria en general, la barrera contra la corrosión típicamente tiene un espesor de 3.0 mm (100 milésimas de pulgada), y se compone de un velo de superficie saturado de resina con una proporción de 90% de resina y 10% de velo, seguido de dos capas de MAT 450 gr/m^2 con una proporción de 70% de resina y 30% de fibra de vidrio.

Diversos tipos de velo de superficie están disponibles. Los que son de uso más frecuente se fabrican con vidrio tipo "C" o de poliéster sintético. La capa del velo de superficie debe ser de 0,3 mm de espesor (10 milésimas de pulgada). La resistencia a la corrosión puede mejorarse con una capa de velo más gruesa, sin embargo su resistencia mecánica disminuye en esta parte y tiende más fácilmente a "desquebrajarse".



El refuerzo conocido como tela MAT consiste en una matriz de hilos de fibra de vidrio tipo "E" o "ECR" cortados entre 0,5 pulgadas (13 mm) a 2,0 pulgadas (51 mm) de largo debidamente unidas por un aglutinante soluble en una resina disuelta en estireno. Dos capas de MAT 450 junto con el velo de superficie generalmente conforman la barrera contra la corrosión. Para ambientes altamente corrosivos, la barrera contra la corrosión pudiera ser de 6.0 mm de espesor.

CAPA ESTRUCTURAL

La capa estructural está diseñada para cumplir con los requerimientos de las propiedades físicas. Aditivos como el agente tixotrópico pueden ser usados en la capa estructural. El woven roving es comúnmente usado alternadamente con telas MAT en la capa estructural, formando así la estructura primaria de muchos laminados hechos a mano.

RECUBRIMIENTO DE ACABADO (TOPCOAT)

El topcoat se utiliza a menudo para proteger de la intemperie el exterior de la pieza, y de la exposición ocasional de sustancias corrosivas. Normalmente se adiciona el 0.4% de parafina para mejorar el curado de la superficie en contacto con el aire evitando así la tactosidad. Se debe tener precaución de NO adicionar parafina entre capas de resina o de topcoat, esto genera problemas de adhesión.

Agentes tixotrópicos pueden ser usado para evitar que el topcoat fluya cuando esta aplicado sobre superficies inclinadas. Tambien pueden ser usados protectores contra rayos UV o pigmentos que tengan la capacidad de mejorar la resistencia al ambiente.

PROCESO DE INFORMACIÓN

Con base en la experiencia, la mayoría de los problemas del PRF está asociado al uso incorrecto de las técnicas de fabricación del PRF o incluso a procedimientos errados sobre las técnicas de fabricación del PRF. La siguiente información le ayudará a los clientes a evitar fallos en la fabricación del PRF.

SISTEMA DE CURADO

Uno de los factores más importantes que rigen la resistencia a la corrosión de los materiales compuestos, es el grado de curado que alcanza la resina. Para propósito general, se recomienda que el laminado alcance mínimo el 90% de la dureza Barcol reportada por el fabricante de la resina cuando la resina es curada sin reforzar.

Los catalizadores convencionales como la Metil – Etil – Cetona Peroxido (MEKP) y el Benzoil Peroxido (BPO), pueden ser usados con las resinas vinilester de SWANCOR. Se recomienda usar otro tipo de catalizador como el Cumeno Hidroperoxido (CHP) en resinas que presenten alta temperatura de exotérmia tales como la serie SWANCOR 907. El MEKP y el CHP se usan comúnmente con promotores como el Octoato de Cobalto (CoOct) y aceleradores como la Dimetil Anilina (DMA). Por otro lado, el BPO se usa en combinación con la DMA y sin promotores de cobalto.

La relación optima del uso del MEKP (55% de contenido activo) y el CoOct (6% de contenido de cobalto) varía entre 3/1 a 10/1. La cantidad del acelerador DMA respecto a los sistemas de catalización antes mencionados puede ser ajustado por el cliente con el fin de lograr un mejor rendimiento.

PRECAUCIÓN: Los promotores de cobalto nunca deben ser mezclados directamente con los peróxidos como el MEKP, esta mezcla puede causar una reacción violenta, fuego o incluso una explosión.

Para un optimo resultado, la relación del BPO (del 98% a 100% de concentración) con el DMA debe oscilar entre 10/1 a 15/1. Un valor por fuera de la relación recomendada pudiera dar lugar a la no gelación del sistema o a un subcurado. En tal caso, el postcurado sería ineficaz.

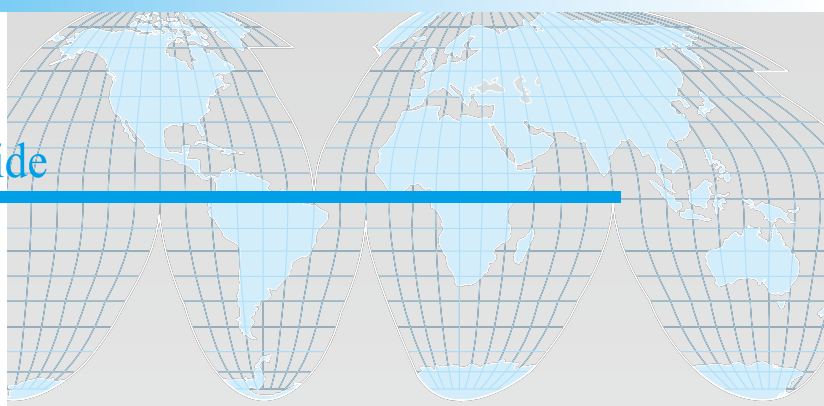
INHIBICIÓN POR AIRE

Cuando la fabricación de una pieza en PRF es por moldeo abierto, el oxigeno de la atmosfera tiende a inhibir el curado completo de la superficie expuesta. Si la exposición al aire ocurre, la superficie pudiera estar subcurada, causando una reducción de ña Resistencia a la corrosión así como la reducción del servicio a largo plazo de las piezas fabricadas en PRF. Se puede adicionar a la resina una solución de parafina solo en la capa de revestimiento superior de manera que la exposición al aire se pueda prevenir.

Nota: Si la parafina es aplicada, ésta se debe remover una vez curado el compuesto y de esta forma continuar con el proceso de fabricación, pues la cera es una barrera de unión entre laminados, es decir, la adhesión se reduce significativamente con el uso de parafina.

INFLUENCIA DE LA HUMEDAD

Se debe tener en cuenta que la humedad puede retrasar significativamente el curado en un sistema Cobalto/MEKP. En otras palabras, la presencia de alta humedad puede afectar los sistemas de curado. Cerrar los recipientes de resina después de su uso, es una buena práctica para evitar la presencia de humedad. Así mismo, es muy importante que los refuerzos, velos, cargas, y aditivos estén almacenados correctamente para que no absorban humedad.



ENLACE SECUNDARIO

Toda la superficie del laminado que no esta pegajosa, debe ser limpiada con acetona para remover la suciedad. Posteriormente, la superficie se debe lijar hasta ponerla completamente áspera y rugosa antes de continuar con el laminado.

POSTCURADO

En algunas aplicaciones, el desempeño de una pieza en PRF puede mejorarse con la ayuda del postcurado. El postcurado proporciona básicamente dos beneficios: completa la reacción del curado maximizando la densidad de reticulación, y elimina grupos funcionales que no reaccionaron.

Para maximizar la eficacia del postcurado, el proceso debe realizarse poco después de gelada la pieza y terminado el proceso exotérmico. Idealmente, la pieza debe ser postcurada a 80°C durante 4 horas. El tiempo de postcurado se hace más largo conforme el tamaño y grosor de la pieza.

Si el laminado se aplica a un sustrato con un coeficiente de expansión térmica diferente, se pudieran presentar grietas o desprendimiento a una temperatura superior a 60°C. En tal caso, un primer flexible o un postcurado a 60°C por mayor tiempo es lo recomendado. Ambos evitan el fallo de adhesión entre el laminado y el sustrato.

CONTACTO CON ALIMENTOS

Las resinas vinilester de las series SWANCOR 901 y SWANCOR 907, han cumplido con la U.S. Food and Drug Administration (FDA) 21 CFR 177.2420 si se formula y se cura adecuadamente.

El siguiente procedimiento puede ayudar a lograr lo descrito por la FDA:

1. Uso de una fórmula para que el contenido de estireno residual sea bajo. Por ejemplo: use como sistema de curado CoOct/MEKP o CoOct/CHP.
2. Limpie la zona expuesta antes de postcurar.
3. Postcure con calor seco durante 2 horas a 90 °C/194°F o 4 horas a 80°C /176 °F.
4. Trate la superficie de contacto con vapor de agua o sumergir la pieza en agua caliente durante 8-16 horas a 70°C o mayor temperatura.
5. Lave la pieza con detergente y enjuague a fondo antes de su puesta en servicio.

Cabe señalar que el vapor de agua se recomienda después de un postcurado con calor seco pues la humedad puede producir un curado inadecuado y/o decoloración de la superficie.

INTERPRETACIÓN DE DATOS

Siempre que se encuentren sustancias como el flúor, compuestos de flúor y químicos alcalinos calientes, se hace necesario el uso de un velo sintético orgánico tal como el Nexus o VL Abfab. Algunos productos relacionados con las resinas epoxi-vinilester de SWANCOR están listados en las siguientes tablas, donde los valores dados se pueden aplicar a todos los productos relacionados. En las siguientes tablas, un espacio en blanco indica que no hay datos disponibles. “NR” significa “no recomendada” y “All” significa que es adecuada para su uso bajo la temperatura máxima a pesar de la concentración de la sustancia química específica.

Los pie de página relacionados en las tablas son explicados a continuación:

1. Se debe usar doble capa de velo de superficie sintético en la Barrera contra la corrosión.
2. Es más adecuado el sistema de curado BPO/DMA que el sistema de curado con MEKP y CHP.
3. Doble velo de superficie tipo “C” debe ser usado en la Barrera contra la corrosión.
4. Se recomienda postcurado para un máximo desempeño y vida útil.
5. Si el Servicio es marginal, utilice SWANCOR 900.
6. El vidrio resistente a los ácidos (ECR) se debe utilizar en la barrera de corrosión y puede ser usada en la capa estructural.
7. Pudiera presentarse una ligera decoloración en la primera exposición al acido de alta pureza.
8. Se debe usar una Barrera contra la corrosión de 200 milésimas de pulgada (6mm) con un velo de superficie tipo “C”. Así mismo toda la fibra de vidrio debe ser resistente a los ácidos como la tipo “ECR”.
9. Consulte al equipo técnico de SWANCOR para recomendaciones específicas.

CONSULTAS

Póngase en contacto con SWANCOR para preguntas sobre productos químicos o condiciones que no figuran en esta guía de corrosión. La información de contacto es la siguiente:

SWANCOR HIGHPOLYMER CO., LTD.
NO.9 INDUSTRY SOUTH 6 ROAD,
NANTOU CITY 54066, TAIWAN
TEL: 886-49-2255420
FAX: 886-49-2251534
nantou@swancor.com.tw
www.swancor.com

Por favor, complete el siguiente formulario par alas preguntas que tenga sobre corrosión de los productos químicos o condiciones que no figuran en esta guía:

1. Nombre común de la sustancia química, y si es posible su nombre químico.
2. Concentración de la sustancia química, y su pH si se encuentra en un sistema acuoso.
3. Temperatura de operación.
4. Temperatura máxima de operación.
5. Presión.
6. Applications in food and/or drug should be brought up in advance.

Si la consulta incluye varias sustancias químicas, es necesaria la siguiente información:

- Estas sustancias químicas están almacenadas por separado en un tanque individual?
- Están almacenadas alternativamente en un solo tanque?

TABLA 1.
PROBELMAS DE CURADO A TEMPERATURA AMBIENTE

PROBLEMA	PEROXIDO	
	MEKP o CHP	BPO
La resina no gela o de proceso de gelación lento	◢ Verifique las cantidades de MEKP o CHP mayor a 1.0% MEKP/CoNap relación mayor a 3/1 CoOct o CoNap mayor a 0.15% Si la temperatura es menor a 25˚C, se requiere el uso de DMA. ◢ Verifique el efecto de los aditivos. Algunos pigmentos o aditivos observadores de rayos UV pudieran retardar el tiempo de gel. Compruebe el efecto antes de su uso. ◢ Revise las condiciones ambientales, la presencia de agua afecta el gelado. ◢ Otros Mezclado deficiente Temperatura ambiente muy baja Verifique la concentración del ingrediente activo del MEKP, CHP o CoNap	◢ Verifique las cantidades de BPO mayor a 0.8% BPO/DMA relación mayor a 5/1 ◢ Verifique la concentración del ingredient active del BPO ◢ Agitación deficiente: se requiere mayor tiempo de mezcla para que el BPO se disperse en la resina. ◢ Verifique el efecto de los aditivos. Algunos pigmentos o aditivos observadores de rayos UV pudieran retardar el tiempo de gel. Compruebe el efecto antes de su uso. ◢ Otros Temperatura muy baja DMA no es de 100% active.
La resina no alcanza dureza después del gelado	◢ Verifique las cantidades de MEKP/CoNap relación mayor a 3/1 Si la temperatura es menor a 25˚C, DMA es requerido. MEKP mayor a 1.0%. ◢ Verifique que el problema no está de la superficie. Adicionce parafina a la capa final para mejorar el curado de la superficie ◢ La resina en contacto con metales puede afectar negativamente el curado.	◢ Verifique las cantidades de BPO mayor a 0.8% BPO/DMA relación mayor a 5/1, preferiblemente 10/1 ◢ Otros: Igual que el punto anterior.

TABLA 1.(Continuación)
PROBELMAS DE CURADO A TEMPERATURA AMBIENTE

PROBLEMA	PEROXIDO	
	MEKP o CHP	BPO
Tiempo de gelado muy rápido	- Reducir el nivel de uso del DMA - Si el MEKP es mayor a 1.0%, reducir MEKP - Adicionar Acetilacetona (2-4-P) - Verificar la temperatura de la resina y elegir el uso recomendado en la literatura SWANCOR - Verificar si la resina está expuesta a la luz solar directa. Reducir el DMA o el MEKP o adicionar Acetilacetona (2-4-P)	- Reducir el nivel de uso del BPO o DMA y mantener la relación BPO/DMA mayor a 5/1 - Otros: Igual que el punto anterior
Exotérmia muy alta produciendo blanqueamiento en el laminado o con grietas	- Reducir o eliminar el uso de DMA - Use Trigonox 239A - Use CHP con SWANCOR 907 y 900 - No construya laminados muy gruesos, preferiblemente haga capas más delgadas y permita que la exotérmia disminuya antes de continuar con la laminación - Reducir el peroxido hasta el 1.0%	- La exotérmia del sistema BPO/DMA es más alto que el MEKP - No construya laminados muy gruesos, preferiblemente haga capas más delgadas y permita que la exotérmia disminuya antes de continuar con la laminación

NOTA: El contenido activo de los componentes de formulación del curado están especificados en la siguiente tabla.

Sustancia química	Contenido activo (%)
MEKP	55%
CHP	80%
BPO	98%
DMA	100%
CoNap or CoOct	6%

TABLA 2.
PROBLEMAS CAUSADOS EN LAMINACIÓN

PROBLEMA	CAUSA	SOLUCIÓN
Flacidez horizontal o vertical	- Tiempo de gel muy largo - Viscosidad de la resina muy baja - Laminado muy grueso en una capa	- Controlar el tiempo de gel en 15-30 minutos - Adicionar 0.8 a 1.5% silica (fumed) - Reduzca el espesor del laminado por capa
Pobre humectación de la fibra	- Tiempo de gel muy corto - Manta de fibra inadecuada - Secuencia inadecuada del lay-up	- Obtener un tiempo de gel mayor a 15 minutos - Elegir una manta de fibra de vidrio con mejor humectación - Aplicar un poco de resina antes de poner la fibra sobre la superficie
Demasiadas burbujas	- Aire atrapado en el refuerzo una vez aplicada la resina - Muchas burbujas en la resina	- Usar brochas, cepillos o rodillos dentados en los procesos manuales - Aplicar un poco de resina antes de poner la fibra sobre la superficie - Adicionar un poco de antiespumante - Permitir que la resina repose para liberar las burbujas. Cuando se adiciona el MEKP se generan burbujas naturalmente.
El rodillo recoge fibras cuando se trabaja con mantas tipo MAT	- Cuando se comienza el trabajo muy cerca del tiempo de gel - Evaporación de estireno - Aplicación del rodillo demasiado rápido	- Mayor tiempo de gel - Humedecer los rodillos en estireno o resina fresca - Aplicar más rodillo deliberadamente

TABLA 3.
PROBLEMAS OCURRIDOS DESPUES DE CURADA LA RESINA

PROBLEMA	CAUSA	SOLUCION
Superficie pegajosa	- Inhibición por aire - Curado deficient o baja dureza Barcol - Alta humedad o gotas de agua en la superficie sin curar	- Adicionar parafina en el topcoat final - Consultar la tabla 1 - Prevenir la fabricación en estas condiciones - Añadir más DMA
Marcación de fibra	- No uso de topcoat ni velo de superficie - Tejido del refuerzo muy grueso - Superficie pobre en resina	- Aplicar dos capas de velo de superficie y de topcoat - Usar MAT en la capa exterior - Fabricar una superficie rica en resina
Desunion en la superficie de curado	- El material curado no es de poliester ni epoxi-vinilester - La resina ha curado completamente* - La capa final contiene cera desmoldante - La resina curada es SWANCOR 907 o SWANCOR 900	- Lijar la superficie para que sea rugosa - Lijar la superficie para que sea rugosa - Lijar la superficie para que sea rugosa - Lijar la superficie para que sea rugosa
* Humedezca la superficie con estireno monomer. Si la superficie está pegajosa entonces no hay problema en laminar. - Si la superficie no es pegajosa, entonces hay que lijar la superficie para que sea rugosa		
Delaminación del sustrato en concreto	- Existe lechada en la superficie - El primer no es adecuado o no usado - La fuerza del concreto es insuficiente - El concreto es demasiado húmedo - La superficie del concreto esta sucia	- Remover la lechada antes de aplicar el primer - Impregnar el concreto con SWANCOR 984 - La resistencia a la compresión del concreto debe ser superior a 3,000 psi - El contenido de humedad debe ser inferior al 10% antes de aplciar el primer - Eliminar toda suciedad, aceite o contaminación
Delaminación del sustrato metálico	- En la superficie no se aplicó el sand-blasted - La superficie demasiado húmeda - El primer no cura bien - La superficie metálica sucia	- Aplicar sand-blasting a la superficie metálica con Sa 2 1/2 (metal blanco) - Secar la superficie - Controlar la relación del sistema de curado de acuerdo a la temperatura del metal - Eliminar toda suciedad, aceite o contaminación

Chemical

Maximum Recommended Temperature, (˚F/˚C)

Chemical	Conc. (%)	SWANCOR 901	SWANCOR 905	SWANCOR 905-N	SWANCOR 907	SWANCOR 985	SWANCOR 977-S
A							
Acetaldehyde	20	100/40	100/40	100/40	100/40	100/40	
	100	NR	NR		LS	NR	
Acetic Acid	0.5-25	210/100	210/100	210/100	210/100	150/65	
	26-50	180/80	180/80	180/80	180/80		
	51-75	150/65	150/65	150/65	150/65		
	76-85	110/45	110/45	110/45	110/45		
	100	NR	NR	NR	100/40		
Acetic Acid/Sulfuric Acid	20/10	210/100	210/100	210/100	210/100	150/65	
Acetic Acid/Nitric Acid/Chromic Oxide	3/5/3	150/65	150/65	180/80	180/80	150/65	
Acetic Anhydride	100	NR	NR	NR	100/40	NR	110/45
Acetone	10		180/80	180/80	180/80		190/90
	100	NR	NR	NR	LS	NR	LS
Acetone, Fumes	Fumes		180/80	180/80	180/80		
Acetonitrile	20	100/40	100/40	100/40	100/40		
	100	NR	NR	NR	LS	NR	
Acetonitrile, Fumes	Fumes		180/80	180/80	180/80		
Acetyl Acetone	20	100/40	100/40	122/50	122/50	100/40	
	100	NR	NR	NR	LS	NR	
Acid Cleaner- 31%hydrochloric acid [3,4,6,8]	31	150/65	150/65	180/80	180/80	150/65	
Acrolein (Acrylaldehyde)	20	100/40	100/40	100/40	100/40		
	100	NR	NR	NR	LS	NR	
Acrylamide	50	100/40	100/40	100/40	100/40	100/40	
Acrylic Acid	25	100/40	100/40	100/40	100/40	100/40	110/45
	100	NR	NR	NR	100/40	NR	
Acrylic Latex	All	180/80	180/80	180/80	180/80		122/50
Acrylonitrile	20	100/40	100/40	100/40	100/40		
	All	NR	NR	NR	LS	NR	LS
Acrylonitrile Latex Dispersion	2	80/25	80/25	80/25	80/25	80/25	
Activated Carbon Beds Water Treatment		180/80	180/80	210/100	210/100	150/65	
Adipic Acid	23	180/80	180/80	180/80	180/80		190/90
Air		360/180	380/195	410/210	450/230		
Alcohol, Amyl	100	122/50	122/50	140/60	150/65	122/50	
Alcohol, Butyl	100	122/50	122/50	122/50	150/65	NR	130/55
Alcohol, Ethyl (Ethanol)	10	122/50	122/50	122/50	150/65	122/50	165/74
	50	100/40	100/40	100/40	150/65	NR	
	90-95	80/25	80/25	80/25	100/40	NR	110/45
	100	NR	NR	80/25	100/40	NR	
Alcohol, Isodecyl	100	122/50	122/50	150/65	180/80	122/50	
Alcohol, Isopropyl (Isopropanol) [5]	100	122/50	122/50	122/50	122/50	NR	130/55
Alcohol, Propyl	100	122/50	122/50	122/50	122/50	NR	
Alkyl (C8-C10) Dimethyl Amine	100	180/80	180/80	200/95	210/100		
Alkyl (C8-C18) Chloride	> 0.5	180/80	200/95	210/100	210/100		
Alkyl Benzene Sulfonic Acid [9]	> 0.5	180/80	200/95	210/100	210/100		
Alkyl Tolyl Trimethyl Ammonium Chloride		100/40	100/40	122/50	122/50		
Allyl Alcohol	100	NR	NR	NR	80/25	NR	
Allyl Chloride	100	80/25	80/25	80/25	80/25	NR	
Alpha-Oleum Sulfates	100	122/50	122/50	122/50	122/50		
Alpha-Methylstyrene	100	80/25	80/25	100/40	122/50	NR	

* "NR" represents Not Recommended, "All" represents 100%, "LS" represents Limited Service, in general 3 days to 1 year lifetime at room temp. (Max 40˚C), usually sufficient for secondary containment .

Chemical

Chemical	Conc. (%)	Maximum Recommended Temperature, (˚F/˚C) SWANCOR 901	SWANCOR 905	SWANCOR 905-N	SWANCOR 907	SWANCOR 985	SWANCOR 977-S
Alum	Sat'd	210/100	210/100	250/120	250/120	180/80	
Alumina Hydrate	All	180/80	180/80	180/80	180/80	180/80	
Aluminum Chloride	Sat'd	210/100	210/100	250/120	250/120	180/80	
Aluminum Chlorohydrate	> 0.5	210/100	210/100	210/100	210/100	180/80	
Aluminum Chlorohydrate /Hydrochloric Acid [3,6]	> 0.5/<15	180/80	180/80	210/100	210/100	150/65	
Aluminum Chlorohydroxide	50	210/100	210/100	210/100	210/100	180/80	
Aluminum Fluoride	All	80/25	80/25	80/25	80/25	80/25	
Aluminum Hydroxide	100	180/80	180/80	180/80	200/95	180/80	
Aluminum Nitrate	> 0.5	210/100	210/100	210/100	210/100	180/80	
Aluminum Potassium Sulfate	Sat'd	210/100	210/100	250/120	250/120	180/80	
Aluminum Sulfate	Sat'd	210/100	210/100	250/120	250/120	180/80	
Aluminum Sulfate Reactor	> 0.5	210/100	210/100				
Amine Salts	All	122/50	122/50	150/65	150/65		
Amino Acids	All	100/40	100/40	100/40	100/40		
Ammonia Liquified Gas		NR	NR	NR	NR	NR	
Ammonia Gas	100	100/40	100/40	100/40	100/40	100/40	
Ammonia Vapors (Wet)	40 vol %	180/80	180/80	180/80	180/80		
Ammonium Acetate	> 0.5	80/25	80/25	80/25	100/40	NR	
Ammonium Bicarbonate	0.5 - 50	160/70	160/70	160/70	160/70	160/70	
Ammonium Bifluoride [1]	> 0.5	150/65			150/65	150/65	
Ammonium Bisulfite Black Liquor		180/80	180/80	180/80	180/80		
Ammonium Bisulfite Cooking Liquor		150/65	150/65	150/65	150/65		
Ammonium Bromate	0.5 - 43	160/70	160/70	160/70	160/70	160/70	
Ammonium Bromide	0.5 - 43	160/70	160/70	160/70	160/70	160/70	
Ammonium Carbonate	> 0.5	150/65	150/65	150/65	150/65	150/65	
Ammonium Chloride	> 0.5	210/100	210/100	210/100	210/100	180/80	
Ammonium Citrate	> 0.5	150/65	150/65	150/65	150/65	150/65	
Ammonium Fluoride [1]	> 0.5	150/65	150/65	150/65	150/65	150/65	
Ammonium Hydroxide [1]	0.5 - 5 6 - 20 30 (as NH_3)	180/80 150/65 100/40	180/80 150/65 100/40	150/65 100/40 100/40	150/65 100/40 100/40	180/80 150/65 100/40	
Ammonium Hydroxide/ Ammonium Chloride/ Ammonium Carbonate [1]	30 (as NH_3) /35/5	100/40	100/40	100/40		100/40	
Ammonium Lauryl Sulfate	0.5-30	122/50	122/50	122/50	122/50	122/50	
Ammonium Ligno Sulfonate	0.5-50	180/80	180/80	180/80	180/80	150/65	
Ammonium Molybdate	>0.5	150/65				150/65	
Ammonium Nitrate	Sat'd	210/100	220/105	250/120	150/65	180/80	
Ammonium Oxalate	> 0.5	150/65					
Ammonium Pentaborate	0.5-12	122/50				122/50	
Ammonium Perchlorate	0.5-15	170/75					
Ammonium Persulfate	> 0.5	210/100	210/100	210/100	210/100	180/80	
Ammonium Phosphate, dibasic	> 0.5	210/100	210/100	210/100	210/100	180/80	
Ammonium Phosphate, monobasic	> 0.5	210/100	210/100	210/100	210/100	180/80	
Ammonium Polysulfide	> 0.5	122/50			150/65	122/50	
Ammonium Sulfate	Sat'd	210/100	220/105	250/120	250/120	180/80	
Ammonium Sulfate/Ethyl Alcohol/Ethoxylate	60/15/3	100/40	100/40	122/50	150/65	100/40	
Ammonium Sulfide (Bisulfide)	Sat'd	122/50			122/50	122/50	

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Chemical

Chemical	Conc. (%)	Maximum Recommended Temperature, (˚F/˚C) SWANCOR 901	SWANCOR 905	SWANCOR 905-N	SWANCOR 907	SWANCOR 985	SWANCOR 977-S
Ammonium Sulfite	Sat'd	150/65	150/65		150/65	150/65	
Ammonium Thiocyanate	0.5 - 20 Sat'd	210/100 122/50	210/100 122/50	210/100 122/50	210/100 122/50	180/80	
Ammonium Thioglycolate	All	100/40	100/40	100/40	100/40		
Ammonium Thiosulfate	All	140/60	140/60	140/60	140/60		
Amyl Acetate	> 0.5	70/20			122/50		
Amyl Alcohol	100	122/50	122/50	140/60	150/65	122/50	
Amyl Alcohol, Vapor	100	122/50	122/50	210/100	210/100		
Amyl Chloride	100	122/50	122/50	122/50	122/50		
Aniline	20	100/40	100/40	100/40	100/40		
Aniline	All	NR	NR	NR	70/20	NR	80/25
Aniline Hydrochloride	> 0.5	180/80	180/80	180/80	180/80		
Aniline Sulfate	> 0.5	210/100	210/100	210/100	210/100		
Animal Fat	100	180/80					
Anionic Surfactant	All	100/40	100/40	122/50	122/50		
Anionic/Cationic Polymer Emulsions in Kerosene or Petroleum Distillates/Water	0 - 50	100/40			122/50		
Anodize (15% Sulfuric Acid)		210/100	210/100	210/100	210/100		
Aromatic Naphtha/Naphthalene/Isopropanol	60/5/10			122/50	122/50		
Arsenic Acid	> 0.5	180/80	180/80	180/80	180/80		
Arsenic Acid/Copper Sulfate/Sodium Dichromate	17/37/20	180/80	180/80	180/80	180/80		
Arsenic Pentoxide/Copper Oxide/ Chromic	17/9/24	100/40	100/40	100/40	100/40	100/40	
Arsenious Acid	19°Be	180/80	180/80	180/80	180/80	150/65	
B							
Barium Acetate	> 0.5	180/80		180/80	180/80		
Barium Bromide	> 0.5	210/100	210/100	210/100	210/100	180/80	
Barium Carbonate (slurry)	All	180/80	180/80	180/80	180/80	180/80	
Barium Chloride	> 0.5	210/100	210/100	210/100	210/100	180/80	
Barium Cyanide	> 0.5	150/65	150/65	150/65	150/65	150/65	
Barium Hydroxide	> 0.5	150/65	150/65	150/65	150/65	150/65	
Barium Sulfate	Sat'd	210/100	210/100	250/120	250/120	180/80	
Barium Sulfide	> 0.5	180/80	180/80	180/80	180/80		
Barley Solution	> 0.5	170/75	NR	NR	NR	NR	
Beer	> 0.5	122/50	NR	NR	NR	NR	
Beet Sugar Liquor	> 0.5	180/80	NR	NR	NR	NR	
o-Benzoyl Benzoic Acid	All	210/100	210/100	210/100	210/100	150/65	
Benzaldehyde	100	NR	NR	NR	70/20	NR	
Benzalkonium Chloride	Dilute	100/40				100/40	
Benzene [5]	100	NR	NR	LS	100/40	NR	110/45
Benzene, 120°F	100	NR	NR	LS	LS	NR	NR
Benzene Sulfonic Acid [9]	>0.5	150/65	150/65	150/65	150/65	150/65	150/65
Benzene, Vapor		80/25	NR	80/25	122/50	NR	
Benzene/Methyl Tertiary Butyl Ether	80/20	NR	NR	LS	100/40	NR	
Benzene/Ethylbenzene/Toluene/ Trimethylbenzene/Xylene	All	NR	NR	LS	100/40	NR	
Benzene:Ethylbenzene	33/67	NR	NR	80/25	100/40	NR	
Benzoic Acid	Sat'd	210/100	210/100	210/100	210/100	180/80	

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Chemical

Chemical	Conc. (%)	Maximum Recommended Temperature, (˚F/˚C) SWANCOR 901	SWANCOR 905	SWANCOR 905-N	SWANCOR 907	SWANCOR 985	SWANCOR 977-S
Benzyl Alcohol	20 100	100/40 NR	100/40 NR	122/50 80/25	122/50 100/40	100/40 NR	122/50
Benzyl Chioride	100	NR	NR	NR	100/40	NR	90/30
Benzyltrimethylammonium Chloride	60	100/40	100/40	100/40	100/40		
Black Liquor (Pulp & Kraft Mill) [1,4]	Thin	180/80	180/80	180/80	180/80		
Black Liquor (Pulp & Kraft Mill) Thick, Heavy [1,4]	Thick	200/95	220/105	220/105	220/105		
Black Liquor Recovery, Furnace Gases [9]		325/165	325/165	350/175	400/205		
Blow Down (Non-Condensable Gases from Pulp Digester, i.e., Dimethyl Sulfide and Mercaptanes) [8]		250/120	250/120	250/120	250/120		
Borax	> 0.5	210/100	210/100	210/100	210/100	180/80	
Boric Acid	> 0.5	210/100	210/100	210/100	210/100	180/80	
Boron Trichloride Scrubbing	> 0.5	150/65	150/65	150/65	150/65		
Brake Fluids	100	122/50	122/50	122/50	122/50	122/50	
Brass Plating Solution: 3% Copper, 1% Zinc, 5.6% Sodium Cyanides, 3.0% Sodium Carbonate [1]		180/80	180/80	180/80	180/80	180/80	
Brine Mixture: 0.4% $MgSO_4$, 9.5% NaCl, 5.0% Na_2SO_4, 2.0% K_2SO_4, 7% $CaSO_4$ /$2H_2O$, 3% Na_2SO_3 /$9H_2O$, pH= 7		210/100	210/100	210/100	210/100	180/80	
Brine, Chlorinated (see Chlorinated Brine)							
Brine, Salt	> 0.5 Sat'd	210/100 210/100	210/100 230/110	210/100 250/120	210/100 250/120	180/80 180/80	
Brominated Phosphate Ester	> 0.5				122/50		
Bromine, Dry Gas	100	100/40	100/40	100/40	100/40	100/40	
Bromine, Liquid	100	NR	NR	NR	NR	NR	NR
Bromine, Wet Gas	100	100/40	100/40	100/40	100/40	100/40	
Brown Stock		200/95	200/95	180/80	180/80		
Bunker C Fuel Oil (heavy fraction)	100	210/100	210/100	220/105	220/105	150/65	
Butadiene (Gas) [4]	100	110/45	110/45	110/45	110/45	110/45	
Butane	100	140/60	140/60	140/60	140/60	140/60	
Butanol	100	122/50	122/50	122/50	150/65	NR	
2,2-Butoxyethoxyethanol	100	100/40	100/40	100/40	100/40	NR	
2-Butoxyethanol	20 100	100/40 100/40	100/40 100/40	122/50 100/40	122/50 100/40	100/40 NR	
Butyl Acetate [5]	100	NR	NR	80/25	90/30	NR	90/30
Butyl Acrylate	100	NR	NR	NR	80/25	NR	
Butyl Alcohol (see Alcohol, Butyl)							
Butyl Alcohol/Benzene	93/4	NR	NR	100/40	122/50	NR	
Butyl Amine	100	NR	NR	NR	LS	NR	
Butyl Benzoate	70				100/40		
Butyl Benzyl Phthalate	100	180/80	180/80	210/100	210/100		
Butyl Carbitol, Diethylene Glycol Butyl Ether	100	100/40	100/40	100/40	100/40		

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Chemical

Chemical	Conc. (%)	Maximum Recommended Temperature, (˚F/˚C) SWANCOR 901	SWANCOR 905	SWANCOR 905-N	SWANCOR 907	SWANCOR 985	SWANCOR 977-S
Butyl Chloride	0.1 - 100	NR	NR	LS	80/25	NR	
Butyl Hypochlorite	98	NR	NR	NR	NR	NR	
Butyl Stearate (5% in Mineral Spirits)		100/40					
Butylene Glycol, BG	100	160/70	160/70	180/80	180/80		190/90
Butylene Oxide	100	NR	NR	NR	LS	NR	
Butyraldehyde	100	NR	NR	NR	100/40	NR	
Butyric Acid	0.5-50 100	210/100 80/25	210/100 80/25	210/100 122/50	210/100 122/50		210/100 120/50

C

Cadmium Chloride	> 0.5	210/100	210/100	210/100	210/100	180/80	
Cadmium Cyanide Plating Bath: (3% Cadmium Oxide, 10% Sodium Cyanide, 1.2% Sodium Hydroxide) [1]		180/80	180/80	180/80	180/80	180/80	
Calcium Bisulfite	> 0.5	210/100	210/100	210/100	210/100	180/80	
Calcium Bromide	> 0.5	210/100	210/100	210/100	210/100	180/80	
Calcium Carbonate (slurry)	All	180/80	180/80	180/80	180/80	180/80	
Calcium Chlorate	> 0.5	210/100	210/100	210/100	210/100	180/80	
Calcium Chloride	> 0.5 Sat'd	210/100 210/100	210/100 220/105	210/100 250/120	210/100 250/120	180/80 180/80	
Calcium Hydroxide [1]	100	210/100	210/100	210/100	210/100	180/80	
Calcium Hydroxide Slurry [1]	0.5 - 25	180/80	180/80	150/65	100/40	150/65	
Calcium Hypochlorite [1,2,4]	All	180/80	180/80	180/80	100/40	180/80	
Calcium Nitrate	> 0.5	210/100	210/100	210/100	210/100	180/80	
Calcium Sulfate Slurry	All	210/100	210/100	210/100	210/100	180/80	
Calcium Sulfite	> 0.5	210/100	210/100	210/100	210/100	180/80	
Cane Sugar Liquor & Sweetwater	All	180/80					
Capric Acid (Decanoic Acid)	> 0.5	180/80	180/80	180/80	180/80	180/80	
Capric Acid/Lauric Acid/Fatty Acids (C10-C18)	70/15/15	180/80	180/80	180/80	200/95	180/80	
Caproic Acid (Hexanoic Acid)	100	80/25	80/25	122/50	122/50	80/25	
Caprolactam	0 - 50 100	100/40 NR	100/40 NR	100/40 NR	100/40 LS	100/40 NR	
Caprolactone	100	NR	NR	NR	LS	NR	
Caprylic Acid (Octanoic Acid)	100	180/80	180/80	210/100	210/100		
Caramel	All	122/50					
Carbon Dioxide Gas	All	325/165	325/165	350/175	400/205	180/80	
Carbon Disulfide	100	NR	NR	NR	LS	NR	LS
Carbon Disulfide Fumes, no condensation or coalesence	All	100/40	100/40	150/65	150/65	NR	
Carbon Monoxide Gas	All	325/165	325/165	350/175	400/205	180/80	370/190
Carbon Tetrachloride	100	150/65	150/65	180/80	180/80		180/80
Carbon Tetrachloride, Vapor	All	180/80	180/80	200/95	200/95		
Carboxyethyl Cellulose	10	150/65	150/65	150/65	150/65	150/65	
Cashew Nut Oil	100	150/65					
Castor Oil (Ricinus Oil)	100	160/70	160/70	160/70	160/70	160/70	
Anionic/Cationic Polymer Emulsions in Kerosene or Petroleum Distillates/Water	0 - 50	100/40			122/50		

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Chemical

Chemical	Conc. (%)	Maximum Recommended Temperature, (˚F/˚C) SWANCOR 901	SWANCOR 905	SWANCOR 905-N	SWANCOR 907	SWANCOR 985	SWANCOR 977-S
Caustic (see Sodium Hydroxide)							
Cetyl Alcohol (Hexadecanol)	100	150/65	150/65	180/80	180/80	122/50	
Chlordimeform	100	80/25	80/25	122/50	122/50		
Chloric Acid	All	80/25	80/25	80/25	80/25	80/25	
Chlorinated Brine, pH < 2.5	Sat'd Cl_2	180/80	180/80	200/95	200/95		
Chlorinated Brine, pH>9 (Hypochlorite) [1,2,4]	Sat'd Cl_2	180/80	180/80	150/65	150/65		
Chlorinated Brine, pH 2.5-9 [9]	Sat'd Cl_2	LS	LS	LS	LS	LS	
Chlorinated Pulp [9]	All	180/80	195/90	200/95	200/95		
Chlorinated Solvent Recovery (see Specific Solvents)							
Chlorinated Wax	All	180/80	180/80	180/80	180/80		
Chlorination Washer (Hoods & Vent Systems)	Vapors,All	180/80	180/80	200/95	200/95	150/65	
Chlorine Dioxide Generator Effluent, R2 System		150/65	150/65	180/80	180/80	150/65	
Chlorine Dioxide Scrubber [1,2,4]		170/75	170/75				
Chlorine Dioxide, Chlorine (Bleaching Solution, with or without Pulp) [9]	All	180/80	195/90	200/95	200/95		
Chlorine Dioxide, No Chlorine (Bleaching Solution, with or without Pulp) [9]	All	180/80	195/90	200/95	200/95		
Chlorine Dioxide, Solution Storage	Sat'd	70/20	70/20	70/20	70/20		
Chlorine Water, pH < 2.5	Sat'd Cl_2	180/80	180/80	200/95	200/95		
Chlorine Water, pH >9 (Hypochlorite) [1,2,4]	Sat'd Cl_2	180/80	180/80	150/65	150/65		
Chlorine Water, pH 2.5-9 [9]	Sat'd Cl_2	LS	LS	LS	LS	LS	
Chlorine, Dry Gas [4,8]	100	180/80	180/80	210/100	210/100	150/65	
Chlorine, Wet Gas [4,8]	100	180/80	180/80	210/100	210/100	150/65	
Chlorine/Chlorine Dioxide/Sulfur Dioxide Chlorine-Hydrogen	0.8/2/0.7	200/95	200/95	200/95	200/95	180/80	
Chlorine-Hydrogen Chloride, with Aqueous Condensate [3,6,8]	8-10%HCl	180/80	180/80	210/100	210/100	180/80	
Chloroacetic Acid	0 - 25 26 - 50 51 - 79 80 - 85 86 - 100	122/50 100/40 80/25 80/25 NR	122/50 100/40 80/25 80/25 NR	122/50 100/40 90/30 80/25 NR	122/50 100/40 90/30 80/25 LS	 NR	
Chlorobenzene	100	NR	NR	80/25	100/40	NR	110/45
Chloroform [5]	100	NR	NR	NR	LS	NR	LS
Chloroform, Fumes (No Condensation or Coalescence)	Fumes		180/80	180/80	180/80		
Chloroform/Dichloroethane/Methylene Chloride	All	NR	NR	NR	LS	NR	
Chloropentane (1 to 5 Cl)	100	100/40	100/40	122/50	130/55	NR	
Chloropicrin (Nitrochloroform)	100	NR	NR	NR	LS	NR	
Chloropyridine (tetra)	100	80/25	80/25	122/50	122/50	NR	
Chlorosulfonic Acid	10	NR	NR	NR	NR	NR	
Chlorotoluene	100	80/25	80/25	100/40	100/40	NR	
N-Chloro-o-Tolyl N (Insecticide Emulsion)	10	122/50	122/50	122/50	122/50		
Choline Chloride	>0.5	122/50	122/50	150/65	150/65	122/50	

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Chemical

	Maximum Recommended Temperature, (˚F/˚C)					
Conc. (%)	SWANCOR 901	SWANCOR 905	SWANCOR 905-N	SWANCOR 907	SWANCOR 985	SWANCOR 977-S
Chrome Bath, 19% Chromic Acid with Sodium Fluorosilicate and Sulfate [1]		122/50	122/50	122/50	150/65	122/50	
Chrome Reduction Process [9]	25	190/90	190/90				
Chromic Acid	0.5-10 11-20 30 40	150/65 122/50 LS NR	150/65 150/65 LS NR	150/65 150/65 LS NR	150/65 150/65 LS LS	150/65 122/50	150/65 LS
Chromic Acid / Sodium Metabisulfite	15/45	122/50	150/65	150/65	150/65	122/50	
Chromic Acid /Nitric Acid Mixture	5/10	100/40	100/40	100/40	150/65	100/40	
Chromic Acid /Sulfuric Acid Mixture (Maximum Total Concentration 10%)	10	122/50	122/50	150/65	150/65	122/50	
Chromium Plate, Electroplating with a Salt Solution (with Sulfuric Acid: Not Recommended)		130/55	130/55	130/55	130/55	130/55	
Chromium Sulfate (water soluble forms)	>0.5	210/100	210/100	210/100	210/100	180/80	
Citric Acid	>0.5	210/100	210/100	210/100	210/100	150/65	
Clopidol	All			100/40	100/40		
Cobalt Chloride	>0.5	210/100	210/100	210/100	210/100	180/80	
Cobalt Citrate	12	180/80			180/80	122/50	
Cobalt Nitrate	>0.5	210/100	210/100	210/100	210/100	180/80	
Coconut Oil	100	180/80	180/80	200/95	200/95	180/80	
Cod-liver Oil	100	100/40					
Copper Chloride	Sat'd	210/100	220/105	250/120	250/120	180/80	
Copper Chloride/Ammonium Chloride (see Ammonium Hydroxide)	26/5/2						
Copper Cyanide	>0.5	210/100	210/100	210/100	210/100	180/80	
Copper Cyanide Plating Bath: 10.5% Copper 14% Sodium Cyanides 6% Rochelle Salts		160/70	160/70	160/70	160/70	160/70	
Copper Cyanide/ Potassium Cyanide/ Potassium Hydroxide [1]	7/2.5/2	150/65	150/65	80/25	80/25		
Copper Matte Dipping Bath: (30% $FeCl_3$ 19% Hydrochloric acid) [3,6,8]		180/80	200/95	200/95	200/95	180/80	
Copper Nitrate	>0.5	210/100	210/100	210/100	210/100	180/80	
Copper Plating Solution: (45% $Cu(BF_4)_2$; 19% Copper Sulfate; 8% Sulfonic) [1]		180/80	180/80	180/80	180/80	180/80	
Copper Sulfate	Sat'd	210/100	210/100	250/120	250/120	180/80	
Corn Oil	100	180/80	180/80	210/100	210/100	150/65	
Corn Starch	Slurry	210/100					
Corn Sugar/Syrup (Glucose)	All	180/80					
Cottonseed Oil	100	210/100	210/100	210/100	210/100	150/65	
Crude Oil, Sweet, Sour	100	210/100	210/100	250/120	250/120	150/65	
Cumene	100	80/25	80/25	122/50	122/50	80/25	
Cumene/Toluene/Xylene	All	80/25	80/25	122/50	122/50	NR	
Curpric Chloride(see Copper Chloride)							

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Chemical

Chemical	Conc. (%)	Maximum Recommended Temperature, (˚F/˚C) SWANCOR 901	SWANCOR 905	SWANCOR 905-N	SWANCOR 907	SWANCOR 985	SWANCOR 977-S
Cyanide Disposal (Reaction with Hypo gives Sodium Thiosulfite)					100/40		
Cyanuric Acid	All	80/25	80/25	100/40	122/50		
Cyanuric Chloride	All	122/50	122/50	122/50	122/50	122/50	
Cyclohexane	100	122/50	122/50	150/65	150/65		170/80
Cyclohexylamine	100			LS	100/40		
Cyclopentane	100	100/40	100/40	110/45	122/50		
D							
Dalapon Grass Killer (2,2-dichloropropionic acid and sodium salt)	100	NR	NR	80/25	100/40	NR	
Decanoic Acid	> 0.5	180/80	180/80	180/80	180/80	180/80	
Decanol	100	122/50	122/50	150/65	180/80		
Deionized Water [4]	100	180/80	180/80	180/80	180/80	180/80	
Demineralized Water [4]	100	180/80	180/80	180/80	180/80	180/80	
Detergents, Organic	100	160/70	160/70	180/80	200/95	160/70	
De-waxed Paraffin Distillate	100	180/80	180/80	180/80	180/80	150/65	
Diacetone Alcohol	10 100	 NR	100/40 NR	122/50 NR	122/50 LS	 NR	
Diallyl Phthalate	All	180/80		210/100	210/100	150/65	
Diammonium Phosphate	> 0.5	210/100	210/100	210/100	210/100	180/80	
Dibasic Acid: 51-61% Glutaric Acid 18-28% Succinic Acid 15-25% Adipic Acid 2% Nitric Acid	> 0.5 - 50	180/80	180/80	200/95	200/95	180/80	
Dibromonitrilo-Proprionamide	100	NR	NR	80/25	100/40	NR	
Dibromophenol [5]	100	NR	NR	100/40	100/40	NR	
Dibromopropane	100	NR	NR	80/25	100/40	NR	
Dibromopropanol	100				100/40		100/40
Dibutyl Carbitol (diethylene glycol dibutyl ether)	100	80/25	80/25	100/40	100/40		
Dibutyl Ether [5]	100	80/25		150/65	180/80		180/80
Dibutyl Sebacate	100	122/50		150/65	150/65		
Dibutyl Phthalate	100	180/80		180/80	210/100		
2,4-Dichlorophenoxyacetic Acid (Acid, Salts, Esters and Formulations)		122/50	122/50	122/50	122/50		
Dichloroacetic Acid (see Chloroacetic Acid)							
Dichlorobenzene (ortho or para)	100	NR	NR	100/40	122/50	NR	122/50
Dichloroethane	100	NR	NR	NR	80/25	NR	90/30
Dichloroethylene	100	NR	NR	NR	LS	NR	-
Dichloromethane (Methylene Chloride)	100	NR	NR	NR	LS	NR	LS
Dichloropropane	100	NR	NR	80/25	100/40	NR	
Dichloropropene [5]	100	NR	NR	NR	80/25	NR	
Dichloropropionic Acid	100	NR	NR	80/25	100/40	NR	
Dichlorotoluene	100	80/25	80/25	122/50	122/50	NR	
Diesel Fuel [5]	100	180/80	180/80	210/100	210/100	150/65	220/105
Diethanolamine	100	122/50	122/50	122/50	150/65		
Diethanolamine/Ethanolamine	80/20	122/50	122/50	122/50	122/50		

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Chemical

Chemical	Conc. (%)	Maximum Recommended Temperature, (˚F/˚C) SWANCOR 901	SWANCOR 905	SWANCOR 905-N	SWANCOR 907	SWANCOR 985	SWANCOR 977-S
Diethyl Carbonate	100	NR	NR	80/25	100/40	NR	110/45
Diethyl Ether	100	NR	NR	NR	NR	NR	
Diethyl Formamide	20	100/40	100/40	100/40	100/40	NR	
	100	NR	NR	LS	100/40	NR	
Diethyl Hydroxylamine	100	NR	NR	NR	LS		
Diethyl Ketone	20	100/40	100/40	100/40	122/50	100/40	
	100	NR	NR	NR	80/25	NR	
Diethyl Sulfate	100	100/40	100/40	122/50	122/50		
Diethylamine	20	100/40	100/40	100/40	100/40	NR	
	100	NR	NR	NR	LS	NR	
Diethylaminoethanol	100	122/50	122/50	122/50	122/50	100/40	
Diethyl Benzene	100	100/40	100/40	150/65	150/65	NR	160/70
Diethylene Glycol	100	180/80	180/80	210/100	210/100	180/80	
Diethylene Glycol Dimethylether	20	100/40	100/40	100/40	100/40	NR	
	100	NR	NR	NR	80/25	NR	
Diethylenetriaminepentaacetic Acid	All	100/40	122/50	122/50	122/50		
Diethylenetriaminepentaacetic Acid, sodium salt	40	100/40	122/50	122/50	122/50		
Di-2-Ethylhexyl Phosphoric Acid (DEHPA) in Kerosene	20	180/80	180/80	180/80	180/80		
Diglycolamine (Aminoethoxyethanol)	20	100/40	100/40	122/50	122/50	100/40	
	50	100/40	100/40	100/40	100/40	100/40	
	100	NR	NR	NR	LS	NR	
Diisobutyl Ketone	100	NR	NR	122/50	122/50	NR	
Diisobutyl Phthalate	100	150/65	150/65	150/65	150/65		
Diisobutylene	100	100/40	100/40	100/40	100/40	80/25	
Diisonoyl Phthalate	100	150/65	150/65	210/100	210/100	150/65	
Diisopropanol Amine	100	122/50	122/50	122/50	150/65	100/40	170/75
Dimethyl Acetamide	20	100/40	100/40	100/40	100/40	NR	
	100	NR	NR	NR	LS	NR	
Dimethyl Acetamide, Fumes, no condensation or coalescence	Fumes		180/80	180/80	180/80		
Dimethyl Amine	20	100/40	100/40	100/40	100/40	100/40	
	40	LS	LS	LS	LS	NR	
Dimethylammonium Hydrochloride (Dimethylamine HCl, DMA-HCl)	70	100/40	100/40	100/40	122/50	100/40	
Dimethyl Aniline	100	NR	NR	80/25	100/40	LS	
Dimethyl Formamide	20	100/40	100/40	100/40	100/40		LS
	100	NR	NR	NR	LS	NR	
Dimethyl Formamide, Fumes, no condensation or coalescence	Fumes		180/80	180/80	180/80		
Dimethyl Morpholine [5]	100	NR	NR	80/25	122/50	NR	122/50
Dimethyl Phthalate	100	150/65	150/65	180/80	180/80		
Dimethyl Sulfate	20	100/40	100/40	122/50	122/50	100/40	
	100	NR	NR	NR	LS	NR	
Dimethyl Sulfide	100	NR	NR	80/25	80/25	NR	
Dimethyl Sulfoxide	20	100/40	100/40	100/40	100/40	100/40	
	100	NR	NR	NR	LS	NR	

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Chemical

Chemical	Maximum Recommended Temperature, (˚F/˚C)						
	Conc. (%)	SWANCOR 901	SWANCOR 905	SWANCOR 905-N	SWANCOR 907	SWANCOR 985	SWANCOR 977-S
Dimethyl Sulfoxide (DMSO) -Water Solution	20				70/20		
2,2-Dimethyl Thiazolidine	1	150/65	150/65	180/80	180/80		
Dimethylcarbonate	100	NR	NR	NR	NR	NR	
Dimethylformamide/Acetonitrile/Methanol	26/9/7	NR	NR	NR	LS	NR	
Dioctyl Phthalate (DOP)	100	150/65	150/65	210/100	210/100	150/65	220/105
Diphenyl Oxide (Diphenyl Ether, Phenyl Ether)	100	80/25	80/25	122/50	122/50	NR	
Dipotassium Phosphate	>0.5	210/100	210/100	210/100	210/100	180/80	
Dipropylene Glycol	100	180/80	180/80	210/100	210/100	150/65	220/105
Dipropylene Glycol Monomethyl Ether	20 100	100/40 NR	122/50 NR	150/65 NR	150/65 70/20	100/40 NR	
Distilled Water [4]	100	180/80	180/80	180/80	180/80	180/80	
Divinylbenzene	100	100/40	100/40	122/50	122/50	NR	
DMA 4 Weed Killer 2,4-D	100	122/50	122/50	122/50	122/50		
DMA 6 Weed Killer	100	122/50	122/50	122/50	122/50		
Dodecanol (Lauryl Alcohol)	100	150/65	150/65	180/80	180/80	122/50	
Dodecene	100	150/65	150/65	180/80	180/80	122/50	
Dodecyl Benzene Sulfonic Acid [9]	100	180/80	200/95	210/100	210/100		
Dodecyl Benzene Sulfonic Acid/Sulfuric Acid/Water/Oil	85/10/4/1	150/65	150/65	150/65	150/65	150/65	
Dodecyldimethylamine	100	180/80	180/80	200/95	210/100		
Dodecylmercaptan	100	180/80	180/80	200/95	210/100		

E

Epichlorohydrin	100	LS	NR	NR	80/25	NR	
Epoxidized Castor Oil	100	100/40				100/40	
Epoxidized Soybean Oil	100	150/65	150/65	150/65	150/65	150/65	160/70
Ester, Fatty Acid	100	180/80	180/80	180/80	180/80	150/65	
Ethanol (see Alcohol, Ethyl)							
Ethanol, Fumes, no condensation or coalescence	Fumes	150/65	180/80	180/80	180/80	150/65	
Ethanol/Ethylacetate/ Methanol/DMF	35/29/10/10	NR	NR	NR	LS	NR	
Ethanolamine	20 100	100/40 80/25	100/40 80/25	122/50 90/30	122/50 100/40	 NR	
Ethephon	100				100/40		
Ethoxy Acetic Acid	10 100	 NR	 NR	100/40 NR	100/40 LS	 NR	
Ethoxylated Alcohol, C12-C14	100	80/25	80/25	100/40	122/50		
Ethoxylated Nonyl Phenol	100	NR	NR	LS	100/40	NR	
Ethyl Acetate, EAC	100	NR	NR	LS	80/25	NR	80/27
Ethyl Acetate, Fumes, no condensation or coalescence	Fumes		180/80	180/80	180/80		
Ethyl Acetate/Sodium Hydroxide [1,4]	4/0 - 50	122/50	122/50	100/40	100/40		
Ethyl Acrylate, EA	100	NR	NR	70/20	80/25	NR	LS
Ethyl Amine	20 70	100/40 NR	100/40 NR	100/40 NR	100/40 LS	100/40 NR	
Ethyl Bromide	100	NR	NR	LS	LS	NR	
Ethyl Chloride	100	NR	NR	80/25	80/25	NR	

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Chemical

Chemical	Conc. (%)	Maximum Recommended Temperature, (˚F/˚C) SWANCOR 901	SWANCOR 905	SWANCOR 905-N	SWANCOR 907	SWANCOR 985	SWANCOR 977-S
Ethyl Ether	100	NR	NR	NR	NR	NR	
Ethyl Sulfate	100	100/40	100/40	100/40	100/40	100/40	
2-Ethylhexyl Alcohol	100	150/65	160/70	180/80	180/80	122/50	
Ethyl-3-Ethoxy Propionate	100	NR	NR	LS	80/25	NR	
Ethyl Benzene	100	80/25	80/25	100/40	122/50		120/49
Ethylbenzene/Benzene	67/33	NR	NR	80/25	100/40	NR	
Ethylene Chloride (see Dichloroethane)	100	NR	NR	NR	80/25	NR	
Ethylene Chlorohydrin	20	100/40	122/50	150/65	150/65	100/40	
	100	100/40	100/40	100/40	100/40	NR	
Ethylene Diamine	20	100/40	100/40	100/40	100/40	100/40	
	100	NR	NR	NR	LS	NR	
Ethylene Dibromide	100	NR	NR	NR	NR	NR	
Ethylene Dichloride (see Dichloroethane)	100	NR	NR	NR	80/25	NR	
Ethylene Dichloride /Ethylene Dibromide /Tetra Ethyl Lead (above water solubility)	5/5/5	NR	NR	NR	LS	NR	
Ethylene Glycol	100	210/100	210/100	210/100	210/100	150/65	
Ethylene Glycol Monobutyl Ether	20	100/40	122/50	150/65	150/65	100/40	
	100	100/40	100/40	100/40	100/40	NR	
Ethylene Glycol/Sulfuric Acid	0-40/0-10	150/65	180/80	180/80	180/80		
Ethylene Oxide	100	NR	NR	NR	NR	NR	
Ethylenediaminetetraacetic Acid (EDTA)	All	180/80	180/80	180/80	180/80	180/80	
Ethylenesulfonic Acid, Sodium Salt [9]	All	160/70	160/70	160/70	160/70		
Eucalyptus Oil	100	140/60	140/60	140/60	140/60		
F							
Fatty Acid/Sterol/Triglyceride	All	210/100	210/100	250/120	250/120	150/65	
Fatty Acid/Sulfuric Acid	5/2	210/100	210/100	210/100	210/100		
Fatty Acids	All	210/100	210/100	250/120	250/120	150/65	
Ferric Acetate	All	180/80	180/80	180/80	180/80		
Ferric Chloride	>0.5	210/100	210/100	210/100	210/100	180/80	
Ferric Chloride/Ferrous Chloride	5/20	210/100	210/100	210/100	210/100	180/80	
Ferric Chloride/Ferrous Chloride/Hydrochloric Acid	48/0.2/0.2	210/100	210/100	220/105	220/105	180/80	
Ferric Chloride/ Hydrochloric Acid [3,6,8]	0-29/1-20	180/80	180/80	220/105	220/105	180/80	
Ferric or Ferrous Sulfate/ Sulfuric Acid	0-40/0-25	210/100	210/100	210/100	210/100	180/80	
Ferric Sulfate	>0.5	210/100	210/100	210/100	210/100	180/80	
Ferrous Chloride	>0.5	210/100	210/100	210/100	210/100	180/80	
Ferrous Chloride/ Hydrochloric Acid [3,6,8]	0-29/1-20	180/80	180/80	210/100	210/100	180/80	
Ferrous Chloride+Manganese Chloride+ Ferric Chloride/Hydrochloric Acid [3,6,8]	1-60/0-20	180/80	210/100	210/100	210/100	180/80	
Ferrous Nitrate	>0.5	210/100	210/100	210/100	210/100	180/80	
Ferrous Sulfate	>0.5	210/100	210/100	210/100	210/100	180/80	
8-8-8 Fertilizer Composition (Parts by wt: 30 Phosphoric Acid, 29 Ammonia, 104.3 Water, 10.4 Uran, 26.0 Potash, 3.0 Borax pH 8.2)		150/65	150/65	150/65	150/65	150/65	
Flue Gas, Dry	All	325/162	320/160	320/160	400/205		
Flue Gas, Wet	All	180/80	180/80	210/100	210/10	180/80	

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Chemical

Chemical	Conc. (%)	Maximum Recommended Temperature, (˚F/˚C) SWANCOR 901	SWANCOR 905	SWANCOR 905-N	SWANCOR 907	SWANCOR 985	SWANCOR 977-S
Fluoboric Acid [1,4]	All	210/100	210/100	210/100	210/100	150/65	
Fluoride Salts/Hydrochloric Acid [1,2,5]	30/10	122/50	122/50	122/50	122/50	122/50	
Fluorine in Flue Gas, Wet [1]	2	180/80	180/80	210/100	210/100	180/80	
Fluosilicic Acid [1,4]	0-10	180/80	180/80	180/80	180/80	150/65	
	11-35	100/40	100/40	100/40	100/40	100/40	
Fluosilicic Acid Fumes [1,4]	All	180/80	180/80		180/80	150/65	
Fluosilicic/Hydrofluoric/ Phosphoric Acids [1,4]	22/5/5	100/40	100/40	100/40	100/40	100/40	
Fluozirconic Acid, Fluotitanic Acid, Ammonium Hydroxide [1,4]	5/4/3	100/40	100/40	100/40	100/40	100/40	
Fly Ash Slurry		180/80	180/80	180/80	180/80	180/80	
Formaldehyde	All	122/50	122/50	150/65	150/65		
Formaldehyde/Methanol	0-37/0-15	122/50	122/50	150/65	150/65		
Formamide	20	100/40	122/50	150/65	150/65	100/40	
	100	70/20	70/20	70/20	70/20		
Formic Acid	10	180/80	180/80	180/80	180/80	150/65	
	25	122/50	122/50	150/65	150/65	122/50	
	50	122/50	122/50	122/50	122/50		
	85	80/25	80/25	80/25	100/40		
	98				100/40		
Freon 113 Refrigerant		100/40	100/40	100/40	100/40		
Fuel C (50/50 Isooctane/Toluene)	100				122/50		
Fuel C/Methyl t-Butyl Ether (MTBE) Note: Fuel C is 50% toluene and 50% isooctane)	85/15				122/50		
Fuel Oil	100	180/80	180/80	210/100	210/100	150/65	
Furfural [5]	0-10	100/40	100/40	122/50	122/50		220/104
	100	NR	NR	NR	LS	NR	
Furfural in Organic Solvent	0-20	NR	NR	100/40	100/40		LS
Furfural/Acetic Acid/Methanol	30/10/5	NR	NR	NR	LS	NR	
Furfuryl Alcohol [4]	20	100/40	100/40	122/50	150/65	100/40	
Furfuryl Alcohol [4]	100	NR	NR	NR	80/25	NR	

G

Galecron (Chlordimeform) Insecticide 100		80/25	80/25	122/50	122/50		
Gallic Acid	Sat'd	180/80	180/80	180/80	180/80		
Gasohol (5% Methanol)		122/50	122/50	122/50	122/50	122/50	
Gasohol (Up to 10% Alcohol)		100/40	NR	100/40	122/50	NR	
Gasohol (10-100% Alcohol)		NR	NR	NR	100/40	NR	
Gasoline, Aviation	100	180/80	180/80	180/80	180/80	150/65	
Gasoline, Leaded	100	180/80	180/80	180/80	180/80	150/65	
Gasoline, No Lead, No Methanol	100	122/50	122/50	150/65	150/65		
Gasoline/MTBE	85/15	100/40			122/50		
Glucose	100	180/80					
Glutamic Acid	50	122/50	122/50	122/50	122/50		
Glutaraldehyde	50	122/50	122/50	122/50	122/50	122/50	
Glutaric Acid	50	122/50	122/50	122/50	122/50		
Glycerine	100	210/100	210/100	210/100	210/100	150/65	
Glycine and Derivatives	All	100/40	100/40	100/40	100/40		

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Chemical

Chemical	Conc. (%)	Maximum Recommended Temperature, (˚F/˚C) SWANCOR 901	SWANCOR 905	SWANCOR 905-N	SWANCOR 907	SWANCOR 985	SWANCOR 977-S
Glycol	100	210/100	210/100	210/100	210/100	150/65	
Glycolic Acid (Hydroxyacetic acid)	70	100/40	100/40	100/40	100/40		
Glyconic Acid	50	180/80	180/80	180/80	180/80	150/65	
Glyoxal	40	100/40	100/40	100/40	100/40		
Glyphosate	All			100/40	100/40		
Gold Plating Solution (23% Potassium Ferrocyanide with Potassium Gold Cyanide and Sodium Cyanide)		210/100	210/100	210/100	210/100	180/80	
Sodium Polyacrylate Dispersants		180/80	180/80	180/80	180/80		
Gypsum Slurry (see also Calcium Sulfate)	All	210/100	210/100	210/100	210/100	180/80	

H

Hard Chrome Plating Baths (with Sulfuric Acid: Not Recommended)		140/60					
Heptane	100	210/100	210/100	210/100	210/100	180/80	210/99
Heptane, Fumes, no condensation or coalescence	Fumes	180/80	180/80	180/80	180/80	180/80	
Herbicides		122/50	122/50	122/50	122/50	122/50	
Hexachloroethane	100	LS	LS	100/40	122/50	NR	
Hexadecanol	100	150/65	150/65	180/80	180/80	122/50	
Hexamethylenetetramine	40	100/40	100/40	122/50	122/50		
Hexane	100	160/70	160/70	160/70	160/70		170/75
Hexanoic Acid	100	80/25	80/25	122/50	122/50	80/25	
Hexylene Glycol		150/65			150/65		150/65
Hydraulic Fluid (Glycols)	100	180/80	180/80	180/80	180/80		
Hydrazine	20 100	NR	LS NR	LS NR	LS LS	NR	
Hydrazine/Sodium Phosphate	5/10		LS	LS	LS		
Hydriodic Acid	40 57	150/65	150/65 100/40	150/65 100/40	150/65 100/40	150/65	
Hydrobromic Acid	0-25 48 62	180/80 150/65 100/40	180/80 150/65 100/40	180/80 150/65 100/40	180/80 150/65 100/40	180/80 150/65 100/40	
Hydrobromic Acid/Bromine	40/2		100/40	100/40	100/40		
Hydrochloric Acid [3,6]	1-15	180/80	210/100	220/105	230/110	180/80	230/110
Hydrochloric Acid [3,6,8]	16-20 21-25 26-30 31-32 33-34 35-36 37	180/80 150/65 150/65 150/65 122/50 122/50 100/40	210/100 180/80 180/80 150/65 122/50 122/50 100/40	220/105 180/80 180/80 180/80 160/70 140/60 122/50	230/110 210/100 200/95 180/80 160/70 140/60 122/50	180/80 180/80 180/80 150/65 122/50 122/50	230/110 180/80 180/80 180/80 122/50 122/50 122/50
Hydrochloric Acid & Dissolved Organics [3,6,8]	0-33%HCl	NR			150/65	NR	
Hydrochloric Acid + Aluminum + Aluminum chloride [3,6]	<15%HCl	180/80	180/80				
Hydrochloric Acid/Aluminum Chloride [3,6,8]	30/0-40	150/65	150/65	180/80	180/80	150/65	
Hydrochloric Acid + Chlorine [3,6]	0.5-20%HCl	180/80	180/80	210/100	210/100	180/80	

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Chemical

Chemical	Maximum Recommended Temperature, (˚F/˚C)						
	Conc. (%)	SWANCOR 901	SWANCOR 905	SWANCOR 905-N	SWANCOR 907	SWANCOR 985	SWANCOR 977-S
Hydrochloric Acid, Fumes + Free Chlorine, dry above 210°F/100°C [3,6,8]				350/175	350/175		
Hydrochloric Acid, Fumes [3]		210/100	210/100	350/175	350/175	180/80	
Hydrochloric Acid/Bromine/Chlorine [3,6,8]	22/0.1/0.1	150/65	180/80	180/80	210/100	180/80	
Hydrochloric Acid/Calcium Chloride [3,6,8]	27/15	150/65	180/80	180/80	200/95	180/80	
Hydrochloric Acid/Diethylene Triamine (as Hydrochloride)/Ammonium Chloride [3,6,8]	<33/>10/10				150/65		
Hydrochloric Acid/ Ferric Chloride [3,6,8]	1-20/0-29	180/80	180/80	220/105	220/105	180/80	
HydrochloricAcid/Ferric Chloride/Organics [3,4,6,8]	28/35/1	NR	NR	NR	150/65	NR	
Hydrochloric Acid/Ferrous Chloride [3,6,8]	1-20/0-29	180/80	180/80	210/100	210/100	180/80	
Hydrochloric Acid/Formaldehyde [3,4,6,8]	25/3	NR	NR	NR	150/65	NR	
Hydrochloric/Hydrofluoric Acid [1,4,6,8]	36/1			100/40	100/40		
Hydrochloric Acid/Hydrofluoric Acid [1,4,6,8]	Max total 20 15/0.1-1 25/6	100/40 180/80 100/40	100/40 210/100 100/40	100/40 210/100 122/50	100/40 210/100 122/50	100/40 180/80	
Hydrochloric/Hydrofluoric/Phosphoric Acid/Nitrobenzene [1,4]	15/1/1/0.5	NR	NR	LS	100/40	NR	
Hydrochloric/Hydrofluoric/Xylene	15/15/70				NR		
Hydrochloric/Hydrofluoric Acid [1,4,6,8]	0.5-20/0-1 30/15	150/65	150/65	180/80	180/80 100/40		
Hydrocyanic Acid	All	210/100	210/100	210/100	210/100	180/80	
Hydrofluoric Acid [1,4]	10 20	150/65 100/40	150/65 100/40	150/65 100/40	150/65 100/40	150/65 100/40	
Hydrofluoric/Nitric Acid [1,4]	15/15 6/20	122/50	130/55	100/40 140/60	100/40 140/60	100/40	
Hydrofluoric/Nitric Acid [1]	3-5/30-35	NR	NR	LS	LS	NR	
Hydrofluoric/Nitric/Sulfuric Acid [1,4]	8/20/2			140/60	140/60		
Hydrofluosilicic Acid/ Polyaluminum Hydroxychloride (or Polyaluminum Chloride, PAC) [1,4]	1-22/1-35	100/40	100/40	100/40	100/40	100/40	
Hydrofluosilicic Acid [1] (see Fluosilicic Acid)	0-10 11-35	180/80 100/40	180/80 100/40	180/80 100/40	180/80 100/40	150/65 100/40	
Hydrofluosilicic Acid/Zinc Chloride [1]	20/All	100/40	100/40	100/40	100/40	100/40	
Hydrogen Bromide, Dry Gas	100	180/80	180/80	210/100	210/100	180/80	
Hydrogen Bromide, Wet Gas	100	180/80	180/80	180/80	180/80	180/80	
Hydrogen Chloride, Dry Gas [9]	100	210/100	210/100	350/175	350/175	180/80	380/195
Hydrogen Chloride, Wet Gas	100	210/100	210/100	230/110	230/110	180/80	
Hydrogen Fluoride, Dry Gas/Vapor (if wet max. 40°C/100°F) [1,4,9]		180/80	180/80	180/80	180/80	180/80	
Hydrogen Peroxide [2,4,9]	5 30 35 50	150/65 100/40 80/25 NR	150/65 100/40 90/30 NR	150/65 150/65 100/40 NR	150/65 150/65 100/40 LS	150/65 100/40 NR NR	
Hydrogen Peroxide/Caustic [1,2,4] (See individual listing for details)		185/85	185/85	185/85		180/80	
Hydrogen Peroxide/Caustic Bleach - Aqueous Solution with up to 0.56 wt.% Hydrogen Peroxide, pH =10.7, 2% Sodium Silicate Pentahydrate, 0.2% Chelating Agent, 0.2% Chelant [1,2,4]		185/85	185/85	185/85		180/80	

* "NR" represents Not Recommended, "All" represents 100%, "LS" represents Limited Service, in general 3 days to 1 year lifetime at room temp. (Max 40˚C), usually sufficient for secondary containment .

Chemical

	Maximum Recommended Temperature, (˚F/˚C)						
	Conc. (%)	SWANCOR 901	SWANCOR 905	SWANCOR 905-N	SWANCOR 907	SWANCOR 985	SWANCOR 977-S
Hydrogen Sulfide [9]	5	210/100	210/100	350/175	350/175	180/80	
Hydrogen Sulfide, Aqueous	All	210/100	210/100	210/100	210/100	180/80	
Hydrogen Sulfide, Dry Gas	All	210/100	210/100	230/110	230/110	180/80	122/50
Hydrosulfite Bleach, Aqueous Solution containing 5% Zinc Hydrosulfite and 2.5% Tripolyphosphate		180/80	180/80	180/80	180/80	180/80	
Hydroxyacetic Acid (Glycolic Acid)	20 70	100/40 100/40	100/40 100/40	122/50 100/40	150/65 100/40	100/40	
Hydroxylamine Acid Sulfate (Hydroxylammonium Acid Sulfate, HSA), Reaction of Hydroxylamine Acid Disulfate with steam to form HAS, Sulfuric Acid, Ammonium Sulfate	>0.5				210/100		
Hypochlorous Acid [2,4]	0-10	100/40	100/40	100/40	100/40	100/40	
Hypophosphorous Acid	0-50	122/50	122/50	122/50	122/50	122/50	
I							
Imidazoline Acetate/Solvent [4]	20 60	100/40 NR	100/40 NR	110/45 NR	122/50 100/40	NR NR	
Incinerator Gases (see Flue Gas) Insecticide Emulsions	0.5-10	122/50	122/50	122/50	122/50		
Iodine, Crystals	100	150/65	150/65	150/65	150/65	150/65	
Iodine, Vapor	100	150/65	150/65	150/65	180/80	150/65	
Iron and Steel Cleaning Bath: 9% Hydrochloric, 23% Sulfuric acid	9	180/80	180/80	210/100	210/100	180/80	
Iron Plating Solution: 45% $FeCl_2$; 15% $CaCl_2$; 20% $FeSO_4$; 11% $(NH_4)_2SO_4$		180/80	180/80	250/120	250/120	180/80	
Isoamyl Alcohol	20 100	150/65 122/50	150/65 122/50	150/65 140/60	180/80 150/65	150/65 122/50	
Isobutyl Alcohol	20 100	150/65 122/50	150/65 122/50	150/65 122/50	180/80 150/65	100/40 NR	
Isodecanol	100	122/50	122/50	150/65	180/80	122/50	
Isononyl Alcohol	100	150/65	150/65	150/65	150/65	100/40	
Isooctyl Adipate	100	122/50	122/50		150/65	100/40	
Isooctyl Alcohol	100	150/65	150/65	150/65	150/65	122/50	
Isopropanol Amine	100	122/50	122/50	122/50	122/50	NR	
Isopropyl Alcohol (Isopropanol)	100	122/50	122/50	122/50	122/50	NR	
Isopropyl Amine	0.5-50 100	100/40 NR	100/40 NR	100/40 NR	100/40 LS	 NR	
Isopropyl Myristate	100	210/100		230/110	230/110	150/65	
Isopropyl Palmitate	100	210/100	210/100	230/110	230/110	150/65	
Itaconic Acid	0.5-40	140/60	140/60	140/60	140/60	140/60	
J，K							
Jet Fuel, Generalu	100	140/60	140/60	140/60	140/60	140/60	
Kerosen	100	180/80	180/80	180/80	180/80	150/65	
Kraft Recovery Boiler Breeching (see Flue Gas)							

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Chemical	Conc. (%)	Maximum Recommended Temperature, (˚F/˚C) SWANCOR 901	SWANCOR 905	SWANCOR 905-N	SWANCOR 907	SWANCOR 985	SWANCOR 977-S
L							
Lactic Acid	All	210/100	210/100	210/100	210/100	150/65	
Latex (Emulsion in Water; for specific latices see under chemical/polymer name)	All	122/50	122/50	122/50	122/50	122/50	
Lauroyl Chloride	100	100/40		122/50	122/50		
Lauryl Alcohol	100	150/65	150/65	180/80	180/80	122/50	
Lauryl Chloride	100	210/100	210/100	210/100	210/100	150/65	
Lauryl Mercaptan	100	180/80	180/80	200/95	210/100		
Lead Acetate	Sat'd	210/100	210/100	230/110	230/110		
Levulinic Acid	Sat'd	210/100	210/100	230/110	230/110		
Lignin Sulfonate	All	180/80	180/80	180/80	180/80	150/65	
Lime Slurry (see Calcium Hydroxide)							
Limestone Slurry (see Calcium Carbonate)	All	180/80	180/80	180/80	180/80	180/80	
Linseed Oil	100	210/100	210/100	230/110	230/110	150/65	
Liquid Petroleum Gas (LPG)	100	140/60	140/60	140/60	140/60	140/60	
Lithium Bromide	Sat'd	210/100	210/100		250/120	180/80	
Lithium Carbonate [1]	All	180/80	180/80	180/80	180/80	180/80	
Lithium Chloride	>0.5 Sat'd	210/100 210/100	210/100 210/100	210/100 250/120	210/100 250/120	180/80 180/80	
Lithium Hydroxide [1]	All	180/80	180/80	180/80	100/40	180/80	
Lithium Hypochlorite [1,2,4]	All	180/80	180/80	180/80	100/40	180/80	
M							
Magnesium Bisulfite	>0.5	210/100	210/100	210/100	210/100	180/80	
Magnesium Carbonate	All	180/80	180/80	180/80	180/80	180/80	
Magnesium Chloride	Sat'd	210/100	210/100	250/120	250/120	180/80	270/130
Magnesium Fluosilicate [1]	All	180/80		180/80	180/80	180/80	
Magnesium Hydroxide	>0.5	210/100	210/100	210/100	210/100	180/80	
Magnesium Nitrate	All	210/100	210/100	210/100	210/100	180/80	
Magnesium Phosphate	>0.5	210/100	210/100	210/100	210/100	180/80	
Magnesium Sulfate	Sat'd	210/100	210/100	250/120	250/120	180/80	250/121
Magnesium Sulfate/ Phosphoric Acid	1-40/0-36	210/100	210/100	210/100	210/100	210/100	
Maleic Acid	>0.5	180/80	180/80	210/100	210/100	180/80	230/110
Manganese Chloride (Manganous Chloride)	>0.5	210/100	210/100	210/100	210/100	180/80	
Manganese Nitrate (Manganous)	>0.5	210/100	210/100	210/100	210/100	180/80	
Manganese Sulfate (Manganous Sulfate)	>0.5	210/100	210/100	210/100	210/100	180/80	
Melamine Formaldehyde Resin	All	100/40	100/40	122/50	122/50	100/40	
Mercaptoacetic Acid	All	NR	NR	80/25	100/40	NR	
Mercaptoethanol	10			180/80	180/80		
Mercuric Chloride	>0.5	210/100	210/100	210/100	210/100	180/80	
Mercurous Chloride	>0.5	210/100	210/100	210/100	210/100	180/80	
Mercury	100	210/100	210/100	250/120	250/120	150/65	
Metal Pickling Solutions (Sulfuric-, Hydrochloric-, and/or Phosphoric Acids) [3]	0.5-15 Total	210/100	210/100	210/100	210/100		
Methacrylic Acid	25 100	100/40 NR	100/40 NR	100/40 NR	122/50 LS	100/40 NR	
Methane/Nitrogen	70/30	140/60	180/80	200/95	200/95	140/60	
Methane Sulfonic Acid [9]	20-100	NR	NR	NR	100/40	NR	

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Chemical

	Maximum Recommended Temperature, (˚F/˚C)						
	Conc. (%)	SWANCOR 901	SWANCOR 905	SWANCOR 905-N	SWANCOR 907	SWANCOR 985	SWANCOR 977-S
Methanol (Alcohol, Methyl) [5]	5 20 40-100	122/50 NR NR	122/50 NR NR	122/50 100/40 NR	122/50 100/40 100/40	122/50 NR NR	130/54 130/54
Methanol, Fumes, no condensation or coalescence	Fumes		180/80	180/80	180/80		
Methanol/Ethanolamine	0-60/0-20	NR	NR	NR	100/40	NR	
Methanol/Formaldehyde/Sulfuric	60/20/2	NR	NR	NR	100/40	NR	
Methanol/Formaldehyde	0-15/0-37	122/50	122/50	150/65	150/65		
Methanol/Formaldehyde	35/4	NR	NR	NR	100/40		
1-Methoxy-2-Propanol	100	NR	NR	NR	70/20	NR	
Methyl Acetate	20 100	100/40 NR	100/40 NR	100/40 LS	100/40 LS	100/40 NR	
Methyl Bromide	10 100	80/25 NR	80/25 NR	80/25 NR	80/25 LS	NR NR	
Methyl Butyl Ketone (MBK), includes Methyl t-Butyl Ketone (MTBK) and other Isomers	100	80/25	80/25	100/40	122/50	NR	
Methyl Chloride, Gas	All	100/40	100/40	150/65	150/65	NR	
Methyl Chloride, Fumes, no condensation or coalescence	Fumes		180/80	180/80	180/80		
Methyl Distearyl Ammonium Chloride/Isopropanol	75/25	122/50	122/50	122/50	122/50		
Methyl Ethyl Ketone	20 100	100/40 LS	100/40 LS	100/40 LS	100/40 70/20	100/40 NR	 70/21
Methyl Ethyl Ketone, 2-Butanol, Triethylamine, 2-Butoxy Ethanol	<25 Total	LS	LS	80/25	100/40	NR	
Methyl Formate	5	100/40	110/45	122/50	122/50		
Methyl Isobutyl Ketone (MIBK)	100	80/25	80/25	100/40	122/50	NR	NR
Methyl Mercaptan (Gas)	All	100/40	100/40	150/65	150/65	NR	
Methyl Methacrylate (MMA)	All	NR	NR	70/20	80/25	NR	LS
N-methyl-2-pyrrolidone	10 100	 NR	 NR	 NR	LS LS	 NR	
Methyl t-Butyl Ether	100	NR	NR	80/25	80/25	NR	
Methyl t-Butyl Ether (MTBE)/ Fuel C (Fuel C is 50% toluene and 50% isooctane)	15/85	100/40	100/40	122/50	122/50	NR	
Methyl t-Butyl Ether, Fumes, no condensation or coalescence	Fumes		180/80	180/80	180/80		
2-Methyl-3-butenenitrile	All	80/25	80/25	100/40	100/40		
Methylamine	20 40 100	100/40 LS NR	100/40 LS NR	100/40 LS NR	100/40 LS LS	100/40 NR NR	
Methyldiethanolamine	20 100	122/50 122/50	122/50 122/50	150/65 122/50	180/80 150/65	100/40	
Methylene Chloride	100	NR	NR	NR	LS	NR	LS
Methylene Chloride, Fumes, no condensation or coalescence	Fumes		180/80	180/80	180/80		
Methylene Chloride/Methanol/Water	1/4/95	100/40	100/40	100/40	122/50	100/40	
Methyl Styrene	100	80/25	80/25	100/40	122/50	NR	NR

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Chemical

Chemical	Conc. (%)	Maximum Recommended Temperature, (˚F/˚C) SWANCOR 901	SWANCOR 905	SWANCOR 905-N	SWANCOR 907	SWANCOR 985	SWANCOR 977-S
Mineral Oils, Aliphatic	100	210/100	210/100	250/120	250/120	150/65	270/130
Molasses	100	180/80					
Monochloroacetic Acid (see Chloroacetic Acid)							
Monochlorobenzene	100	NR	NR	80/25	100/40	NR	
Monoethanolamine (see Ethanolamine)							
Monomethylhydrazine	100	NR	NR	NR	LS	NR	
Morpholine [4]	20 100	100/40 NR	110/45 NR	122/50 NR	122/50 80/25	100/40 NR	
Morpholine/Cyclohexylamine	All	NR	NR	NR	80/25	NR	
Motor Oil	100	210/100	210/100	250/120	250/120	150/65	
Muriatic Acid (see Hydrochloric Acid)							
Myristic Acid	100	210/100	210/100	250/120	250/120	150/65	

N

Naphtha	100	180/80	180/80	210/100	210/100	180/80	
Naphtha, Heavy Aromatic	100			122/50	122/50		
Naphthalene	100	210/100	210/100	210/100	210/100	180/80	
Neutralizer & Desmut	All	150/65	150/65	150/65	150/65	150/65	
Nickel Chloride	>0.5	210/100	210/100	210/100	210/100	180/80	
Nickel Nitrate	>0.5	210/100	210/100	210/100	210/100	180/80	
Nickel Plating Solution #1 11% Nickel Sulfate 2% Nickel Chloride 1% Boric Acid		180/80	180/80	180/80	180/80	180/80	
Nickel Plating Solution #2: 44% Nickel Sulfate 4% Ammonium Chloride 4% Boric Acid		180/80	180/80	180/80	180/80	180/80	
Nickel Plating Solution #3 15% Nickel Sulfate 5% Nickel Chloride 3% Boric Acid		210/100	210/100	210/100	210/100	180/80	
Nickel Sulfamate	All	180/80	180/80	180/80	180/80	180/80	
Nickel Sulfate	>0.5	210/100	210/100	210/100	210/100	180/80	
Nitric Acid [4]	0-5 6-10 11-20 21-29 30-35 36-40 70	150/65 150/65 122/50 100/40 80/25 NR NR	150/65 150/65 122/50 100/40 90/30 NR NR	180/80 150/65 150/65 122/50 100/40 80/25 NR	180/80 150/65 150/65 122/50 100/40 100/40 LS	150/65 122/50 122/50 100/40 NR NR NR	180/80 150/65 150/65 122/50 100/40 100/40 LS
Nitric Acid Fumes [4]	<60 (soln.)	180/80	180/80	180/80	180/80	180/80	180/80
Nitric Acid Fumes, no condensation [4]	>60 (soln.)	180/80	180/80	180/80	180/80	180/80	
Nitric Acid /Hexavalent Chrome (Chromic Acid)	10/5	100/40	100/40	100/40	150/65	100/40	
Nitric Acid/Hydrogen Peroxide/ Hydrofluoric Acid [1,2,4]	30/5/0.5	80/25	90/30	100/40	100/40	NR	

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Chemical

Chemical	Conc. (%)	Maximum Recommended Temperature, (˚F/˚C) SWANCOR 901	SWANCOR 905	SWANCOR 905-N	SWANCOR 907	SWANCOR 985	SWANCOR 977-S
Nitric/Hydrofluoric Acid [1,4]	25/3	100/40	100/40	122/50	122/50	100/40	
	30-35/3-5	NR	NR	LS	LS	NR	
	15/15			100/40	100/40		
	20/6	122/50	130/55	140/60	140/60	100/40	
Nitric/Hydrofluoric/Sulfuric Acid [1,4]	20/8/2			140/60	140/60		
Nitric/Phosphoric Acid [4]	24/23	100/40	100/40	122/50	122/50	100/40	
Nitric/Sulfuric Acid [4]	20/20	100/40	100/40	122/50	122/50	100/40	
Nitric/Sulfuric/Phosphoric Acid	20/5/2	100/40	100/40	122/50	122/50	100/40	
Nitric/Phosphoric Acid [4]	5 & 5	150/65	180/80	180/80	180/80	150/65	
Nitrobenzene [5]	100	NR	NR	80/25	100/40	NR	100/40
Nitrophenol	11	NR	NR	80/25	100/40	NR	
N-methyl-2-pyrrolidone	10				LS		
	100	NR	NR	NR	LS	NR	
Noncondensable Blow Down Gases (see Flue Gas or Blow Down)							
O							
Octanoic Acid	100	180/80	180/80	210/100	210/100		220/104
Oil, Sour Crude	100	210/100	210/100	250/120	250/120	150/65	210/100
Oil, Sweet Crude	100	210/100	210/100	250/120	250/120	150/65	210/100
Oleic Acid	100	210/100					
Oleum (Fuming Sulfuric)		NR	NR	NR	LS	NR	
Olive Oils	100	210/100					
Ortho-Dichlorobenzene (see Dichlorobenzene)							
Oxalic Acid	Sat'd	122/50	122/50	122/50	122/50		
Ozone in solution [9]	2 mg/L	100/40	100/40	100/40	100/40	100/40	
P							
Palladium Suspensions in Ammonium Hydroxide (see Ammonium Hydroxide)							
Palladium Suspensions in Hydrochloric Acid (see Hydrochloric Acid)							
Palmitic Acid	100	210/100					
Paper Mill Effluent (see Sulfite/Sulfate Liquors (Pulp Mill))							
Para-Dichlorobenzene (see Dichlorobenzene)							
Peanut Oil	100	180/80					
Pentabromo Diphenyl Oxide	100	80/25	80/25	122/50	122/50	NR	
Pentachlorophenol	All	122/50	122/50	122/50	122/50	122/50	
Pentanedioic Acid (see Glutaric Acid)							
Peracetic Acid [1,2,4,9]	20	100/40	100/40	100/40	100/40		
	35	NR	NR	NR	LS	NR	
Perchloric Acid	10	150/65	150/65	150/65	150/65	150/65	
	30	100/40	100/40	100/40	100/40	100/40	
Perchloroethylene [5]	100	80/25	80/25	122/50	122/50	NR	120/49
Phenol (Carbolic Acid) [4]	0-2	80/25	80/25	100/40	122/50	NR	
	5	NR	NR	80/25	122/50	NR	
	10	NR	NR	LS	122/50	NR	
	15	NR	NR	LS	90/30	NR	
	88	NR	NR	NR	70/20	NR	
Phenol Formaldehyde Resin	All	100/40	100/40	122/50	122/50	100/40	
Phenol Sulfonic Acid [9]	All	80/25	80/25	80/25	80/25		90/30
Phenol/Methanol/Anionic Detergent	15/10/20	NR	NR	NR	LS	NR	

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Chemical

Maximum Recommended Temperature, (˚F/˚C)

Chemical	Conc. (%)	SWANCOR 901	SWANCOR 905	SWANCOR 905-N	SWANCOR 907	SWANCOR 985	SWANCOR 977-S
Phenolic Resin/Phenol [4]	80/20 90/10				80/25 122/50		
Phosphoric Acid	0.5-85 85-100	210/100 210/100	210/100 210/100	210/100 210/100	210/100 220/105	180/80 180/80	
Phosphoric Acid (Polyphosphoric Acid)	115	210/100	210/100	210/100	220/105	180/80	
Phosphoric Acid (Superphosphoric Acid 76% P_2O_5)	105	210/100	210/100	210/100	220/105	180/80	
Phosphoric Acid/Tributyl Phosphate (Vapor Phase, Condensation	85/0.5	122/50	122/50	140/60	140/60	100/40	
Phosphoric Acid with Phosphorous Pentoxide, Hydrochloric Acid and Sulfuric Dioxide	Fumes	210/100	210/100	230/110	230/110	180/80	
Phosphoric Acid, Vapor [9]	All	210/100	210/100	250/120	250/120	180/80	
Phosphoric Acid/Gypsum	61/39	210/100	210/100	210/100	210/100	180/80	
Phosphoric Acid/Sulfuric Acid	85/15	100/40	100/40	100/40	122/50	100/40	
Phosphoric Acid/Tributyl Phosphate/ Hydrofluoric Acid (no condensation of TBP)	88/0.1/0.03	180/80	180/80	180/80	210/100		
Phosphoric Acid/Zinc Chloride	0-100/0.5-70	210/100	210/100	210/100	210/100	180/80	
Phosphoric Acid/Hydrochloric Acid, sat'd with Cl_2 [3,6]	15/9	210/100	210/100	210/100	210/100		
Phosphoric/Sulfuric Acid	0-45/0.5-40	210/100	210/100	210/100	210/100	180/80	
Phosphoric/Sulfuric/Hydrofluoric [1,4]	0-75/1/0-3	150/65	150/65	150/65	150/65	150/65	
Phosphorous Acid	70	180/80	180/80	180/80	180/80	180/80	
Phosphorous Acid 70%/ Hydrochloric Acid 37% [3,7]	0-100/1-10	210/100	210/100	210/100	210/100	180/80	
Phosphorous Acid 70%/ Hydrochloric Acid 37% [3,7,8]	0-100/11-20	150/65	150/65	150/65	180/80		
Phosphorus Oxychloride	100	NR	NR	NR	LS	NR	
Phosphorus Trichloride	100	NR	NR	NR	LS	NR	
Phthalic Acid	All	210/100	210/100	210/100	210/100		
Picric Acid (Alcoholic)	10	NR	NR	NR	100/40	NR	
Pine Oil	100	190/90	190/90	190/90	190/90		
Polyacrylamide	All	180/80	180/80	180/80	180/80	180/80	
Polyacrylic Acid	All	180/80	180/80	180/80	180/80	180/80	
Polyethyleneimine	All	180/80	180/80	180/80	180/80		
Polyphosphoric Acid H_3PO_4	115	210/100	210/100	210/100	220/105	180/80	
Polyvinyl Acetate Adhesives	All	122/50	122/50	122/50	122/50		
Polyvinyl Alcohol	100	180/80	180/80	180/80	180/80		
Polyvinyl Chloride Latex with 35 parts Dioctylphthalate	All	122/50	122/50	122/50	122/50		
Potassium Aluminum Sulfate	Sat'd	210/100	210/100	250/120	250/120	180/80	
Potassium Bicarbonate	> 0.5	180/80	180/80	180/80	180/80	180/80	
Potassium Bromide	> 0.5	210/100	210/100	210/100	210/100	180/80	
Potassium Carbonate [1]	0 - 50	180/80	180/80	150/65	150/65	180/80	
Potassium Carbonate/Boric Acid/ Potassium Metavanadate [1]	20/4/1	180/80	180/80	150/65	150/65	180/80	
Potassium Chloride	> 0.5	210/100	210/100	210/100	210/100	180/80	
Potassium Dichromate	> 0.5	210/100	210/100	210/100	210/100	180/80	

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Chemical

	Maximum Recommended Temperature, (˚F/˚C)						
	Conc. (%)	SWANCOR 901	SWANCOR 905	SWANCOR 905-N	SWANCOR 907	SWANCOR 985	SWANCOR 977-S
Potassium Ferricyanide	> 0.5	210/100	210/100	210/100	210/100	180/80	
Potassium Ferrocyanide	> 0.5	210/100	210/100	210/100	210/100	180/80	
Potassium Fluoride	All	180/80	180/80	180/80	180/80	180/80	
Potassium Gold Cyanide	12	210/100	210/100	210/100	210/100	180/80	
Potassium Hydroxide [1,4]	0 - 45	150/65	150/65	80/25	80/25		
Potassium Hydroxide/Potassium Cyanide/Copper Cyanide [1]	2/2.5/7	150/65	150/65	80/25	80/25		
Potassium Hypochlorite, Potassium Hydroxide, Potassium Metasilicate [1,2,4]	50/40/10	122/50					
Potassium Iodide	All	210/100	210/100	210/100	210/100	210/100	
Potassium Nitrate	> 0.5	210/100	210/100	210/100	210/100	180/80	
Potassium Oxalate	All	150/65	150/65	150/65	150/65	150/65	
Potassium Permanganate	> 0.5	210/100	210/100	210/100	210/100	180/80	
Potassium Persulfate	All	210/100	210/100	210/100	210/100	180/80	
Potassium Pyrophosphate	60	130/55	130/55	150/65	150/65	130/55	
Potassium Silicofluoride [1]	All	100/40	100/40	100/40	100/40	100/40	
Potassium Sulfate	> 0.5	210/100	210/100	210/100	210/100	180/80	
Propane	100	140/60	140/60	140/60	140/60	140/60	
Propanol (n-)	100	100/40	100/40	100/40	122/50	NR	
Propanol (n-) no condensation or coalescence	Fumes	180/80	180/80	180/80	180/80	180/80	
Propionic Acid	0-50 100	180/80 NR	180/80 NR	180/80 80/25	180/80 100/40	180/80 NR	
Propionyl Chloride	100	NR	NR	NR	LS	NR	
Propyl Acetate	100	NR	NR	NR	80/25	NR	
Propyl Bromide	100	NR	NR	LS	80/25	NR	
Propyl Chloride	100	NR	NR	LS	80/25	NR	
Propylene Glycol	100	210/100	210/100	210/100	210/100		
Propylene Glycol Monomethyl-Ether Acetate[4]	20 100	100/40 NR	100/40 NR	122/50 NR	122/50 70/20	100/40 NR	
Propylene Glycol/ Ethoxylated Fatty Alcohols/ Diethylene Glycol Monobutyl Ether	60/20/20	100/40	100/40	122/50	122/50	NR	
Propylene Glycol/ Monoethanolamine	0-99/1	80/25	80/25	90/30	100/40	NR	
Propylene Oxide	100	NR	NR	NR	NR	NR	
Propylene Oxide, no condensation or coalescence	Fumes		180/80	180/80	180/80		
Pulp Paper Mill Blow Down (Non condensable Gases, see also Blow Down)							
Pyridine	20 100	100/40 NR	100/40 NR	100/40 NR	100/40 LS	NR NR	

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Quaternary Amine Salts	>0.5	180/80	180/80	180/80	180/80		
Quinoline	20 100	100/40	100/40	100/40	100/40 LS		
Rayon Spin Bath					140/60		
Rayon Spinning	Fumes	140/60	140/60	140/60	140/60		
Recovery Boiler Gases (see Flue Gas)							

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Chemical	Conc. (%)	Maximum Recommended Temperature, (˚F/˚C) SWANCOR 901	SWANCOR 905	SWANCOR 905-N	SWANCOR 907	SWANCOR 985	SWANCOR 977-S
S							
Salicylic Acid	All	160/70					160/70
Salt Brine	Sat'd	210/100	210/100	250/120	250/120	180/80	
Scrubbing Low MW Amines with 10% Sulfuric Acid (see Amine Salts)							
Sea Water		210/100	210/100	210/100	210/100	180/80	
Selenious Acid	All	210/100	210/100	210/100	210/100	180/80	
Silicon Tetrafluoride/Hydrofluoric/ Sulfuric Acid [1,4]	<10 Total	122/50	122/50	122/50	122/50	122/50	
Silver Nitrate	> 0.5	210/100	210/100	210/100	210/100	180/80	
Silver Plating Solution: 4% Silver 7% Potassium 5% Sodium Cyanides 2% Potassium Carbonate [1]		180/80	180/80	150/65	150/65		
Sodium Acetate	>0.5	210/100	210/100	210/100	210/100		
Sodium Alkyd Aryl Sulfonates	All	180/80	180/80	180/80	180/80	150/65	
Sodium Aluminate [1]	All	160/70	160/70	122/50	122/50	122/50	
Sodium Benzoate	All	180/80	180/80	180/80	180/80	180/80	
Sodium Bicarbonate	All	180/80	180/80	180/80	180/80	180/80	
Sodium Bicarbonate/ Sodium Carbonate [1]	15/20	180/80	180/80	150/65	150/65	180/80	
Sodium Bifluoride [1]	All	122/50	122/50	122/50	122/50	122/50	
Sodium Bisulfate	> 0.5	210/100	210/100	210/100	210/100	180/80	
Sodium Bisulfide (Hydrosulfide)	All	180/80	180/80	180/80	180/80	180/80	
Sodium Bisulfite	> 0.5	210/100	210/100	210/100	210/100	180/80	
Sodium Borate	> 0.5	210/100	210/100	210/100	210/100	180/80	
Sodium Borohydride SWS (Stabilized Water Solution)	All	100/40					
Sodium Bromate	> 0.5	210/100	210/100	210/100	210/100	180/80	
Sodium Bromide	> 0.5	210/100	210/100	210/100	210/100	180/80	
Sodium Carbonate [1]	All	180/80	180/80	150/65	150/65	180/80	
Sodium Carbonate/ Sodium Bicarbonate [1]	20/15	180/80	180/80	150/65	150/65	180/80	
Sodium Chlorate, Stable	> 0.5	210/100	210/100	210/100	210/100	180/80	
Sodium Chlorate/Sodium Chloride	34/20	210/100	210/100	210/100	210/100	180/80	
Sodium Chloride	> 0.5	210/100	210/100	210/100	210/100	180/80	
Sodium Chloride (see Salt Brine)	Sat'd	210/100	210/100	250/120	250/120	180/80	
Sodium Chloride with Chlorine, pH>9 (see Chlorinated Brine)							
Sodium Chloride with Chlorine, pH 2.5-9 [9]		LS	LS	LS	LS	LS	
Sodium Chloride, pH < 2.5, Cl_2 Sat'd (see Chlorinated Brine)							
Sodium Chloride/Ethyl Vanillin	0.1-25/1	122/50					
Sodium Chloride/ Magnesium Oxide/Lime	0.5-26/0.1-20/0.1-10	210/100	210/100	210/100	210/100	180/80	
Sodium Chloride/Sodium Hydroxide [1,4]	0.5-10/0.1-2	180/80	180/80	150/65	100/40	122/50	
Sodium Chloride/Sodium Chlorate	20/34	210/100	210/100	210/100	210/100		
Sodium Chlorite, pH<6 (see Chlorine Dioxide)							
Sodium Chlorite, pH>6	All	180/80	180/80	180/80	180/80	180/80	
Sodium Chlorite/Sodium Hypochlorite, pH>11 [1,2,4]	0.1-25/ 0.1-15	100/40	100/40	100/40	100/40	100/40	
Sodium Chromate	> 0.5	210/100	210/100	210/100	210/100	180/80	

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Chemical

Chemical	Conc. (%)	Maximum Recommended Temperature, (˚F/˚C) SWANCOR 901	SWANCOR 905	SWANCOR 905-N	SWANCOR 907	SWANCOR 985	SWANCOR 977-S
Sodium Cyanide	> 0.5	210/100	210/100	210/100	210/100		
Sodium Dichromate	> 0.5	210/100	210/100	210/100	210/100	180/80	
Sodium Dimethyldithiocarbamate/ Disodium Ethylene Bisdithiocarbamate	0.1-15/ 0.1-15	100/40	100/40	122/50	122/50	100/40	
Sodium Diphosphate	> 0.5	210/100	210/100	210/100	210/100	180/80	
Sodium Dodecylbenzene Sulfonate	All	160/70	160/70	160/70	160/70		
Sodium Ferricyanide	> 0.5	210/100	210/100	210/100	210/100		
Sodium Ferrocyanide	> 0.5	210/100	210/100	210/100	210/100	180/80	
Sodium Fluoride	All	180/80	180/80	180/80	180/80	180/80	
Sodium Fluoroborate [1]	> 0.5	200/95			200/95		
Sodium Fluorosilicate [1]	All	122/50	122/50	122/50	122/50	122/50	
Sodium Gluconate	> 0.5	180/80	200/95	210/100	210/100	150/65	
Sodium Glycolate	> 0.5	180/80	180/80	200/95	210/100	150/65	
Sodium Hexametaphosphate	All	180/80	180/80	180/80	180/80	180/80	
Sodium Hydrosulfide (Sodium Bisulfide)	All	180/80	180/80	180/80	180/80	180/80	
Sodium Hydroxide [1,4]	All	180/80	180/80	150/65	100/40	150/65	
Sodium Hydroxide/ Sodium Bisulfite [1,4]	All	180/80	180/80	150/65	100/40	150/65	
Sodium Hydroxide/Sodium Chloride/Sodium Sulfate/Sodium Hypochlorite (active Chlorine) [1,2,4]	1-20/1-15/ 1-8/0-15	180/80	180/80	150/65	100/40		
Sodium Hydroxide/Organics (within solubility limits, i.e., no phase separation or coalescence)	8/trace	180/80					
Sodium Hydroxide/Sodium Hypochlorite [1,4]	0-20/0-0.1	180/80					
Sodium Hypochlorite, pH>11 (active Chlorine) [1,2,4]	0.5-5.25 5.25-18 18-21 21-25	150/65 150/65	180/80 150/65 120/50 100/40	150/65 120/50	100/40	150/65 150/65	
Sodium Lauryl Sulfate	All	160/70	160/70	160/70	160/70		
Sodium Metabisulfite	> 0.5	210/100	210/100	210/100	210/100	180/80	
Sodium Methyldithiocarbamate	All	180/80	180/80	180/80	180/80		
Sodium Monophosphate	> 0.5	210/100	210/100	210/100	210/100	180/80	
Sodium Myristyl Sulfate	All	160/70	160/70	160/70	160/70		
Sodium Nitrate	> 0.5	210/100	210/100	210/100	210/100	180/80	
Sodium Nitrite	> 0.5	210/100	210/100	210/100	210/100	180/80	
Sodium Oxalate	> 0.5	210/100	210/100	210/100	210/100	180/80	
Sodium Perchlorate	60	100/40	100/40	100/40	100/40	100/40	
Sodium Persulfate	All	210/100	210/100	210/100	210/100	180/80	
Sodium Phosphate, mono-, di-, tribasic	> 0.5	210/100	210/100	210/100	210/100	180/80	
Sodium Polyacrylate, pH 9-10.5	All	180/80	180/80	180/80	180/80		
Sodium Sarcosinate	40	122/50	122/50	122/50	122/50		
Sodium Silicate	> 0.5	180/80	180/80	150/65	150/65	180/80	
Sodium Sulfate	> 0.5	210/100	210/100	210/100	210/100	180/80	
Sodium Sulfate/SodiumSulfite	> 0.5	210/100	210/100	210/100	210/100	180/80	
Sodium Sulfhydrate (see Sodium Hydrosulfide)							
Sodium Sulfide	> 0.5	210/100	210/100	210/100	210/100	180/80	
Sodium Sulfite	> 0.5	210/100	210/100	210/100	210/100	180/80	
Sodium Sulphite/Sodium Hydroxide/Toluene	22/10/5	80/25	80/25	100/40	100/40	NR	
Sodium Tartrate	> 0.5	210/100	210/100	210/100	210/100	180/80	

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Chemical

Chemical	Conc. (%)	Maximum Recommended Temperature, (˚F/˚C) SWANCOR 901	SWANCOR 905	SWANCOR 905-N	SWANCOR 907	SWANCOR 985	SWANCOR 977-S
Sodium Tetraborate	All	180/80	180/80	180/80	180/80	180/80	
Sodium Thiocyanate	All	180/80	180/80	180/80	180/80	180/80	
Sodium Thiosulfate	All	180/80	180/80	180/80	180/80	180/80	
Sodium Tripolyphosphate	> 0.5	210/100	210/100	210/100	210/100	180/80	
Sodium Xylene Sulfonate	All	160/70	160/70	160/70	160/70		
Solder Plate (see Plating Chemicals)							
Solvent Extraction Solutions: 4% Trioctylphosphine Oxide (TOPO) 4% Di 2-Ethylhexyl Phosphoric Acid (DEHPA) 92% Kerosene		180/80	180/80	180/80	180/80		
Sorbitol Solutions	All	160/70	160/70	160/70	180/80		
Sour Crude Oil (see Crude Oil)							
Soy (Soya) Sauce		160/70					
Soya Oil	100	210/100	210/100	210/100	210/100	150/65	
Spearmint Oil	100	100/40					
Stannic Chloride	> 0.5	210/100	210/100	210/100	210/100	180/80	
Stannous Chloride	> 0.5	210/100	210/100	210/100	210/100	180/80	
Steam, Dry, No Condensation		210/100	210/100	220/105	220/105	180/80	
Steam, Wet, Condensation		180/80	180/80	180/80	180/80	180/80	
Stearic Acid	All	210/100	210/100	210/100	210/100	150/65	
Styrene [5]	100	NR	NR	100/40	122/50	NR	120/50
Styrene Acrylic Emulsion	All	122/50	122/50	122/50	122/50		
Styrene-Butadiene Latex	All	140/60	140/60	140/60	140/60	140/60	
Succinonitrile, Aqueous	All	80/25	80/25	100/40	100/40	NR	
Sugar/Sucrose	All	210/100					
Sugar Beet, Liquor	All	180/80					
Sugar Cane, Liquor & Sweetwater	All	180/80					
Sulfamic Acid	0.5 - 10 11 - 15 16 - 25	210/100 180/80 150/65	210/100 180/80 150/65	210/100 180/80 150/65	210/100 180/80 150/65	180/80 150/65 150/65	
Sulfamic/Boric/Glycolic Acid	0.5-25/0.5-30/0.5-10	150/65	150/65	150/65	150/65		
Sulfanilic Acid (meta)	> 0.5	210/100	210/100	210/100	210/100	180/80	
Sulfanilic Acid (para)	All	210/100	210/100	210/100	210/100	180/80	
Sulfate Process Noncondensable Gases (see Flue Gas)							
Sulfated Detergents (see Sulfonated Detergents)							
Sulfated Tall Oil Fatty Acid (see Tall Oil)							
Sulfides Scrubbing with Caustic (see Sodium Hydroxide)							
Sulfite/Sulfate Liquors (Pulp Mill)		200/95	200/95	200/95	200/95	180/80	
Sulfonated Detergents	100	160/70	160/70	180/80	180/80	160/70	
Sulfur Chloride	Fumes	200/95	200/95	200/95	200/95	180/80	
Sulfur Chloride	100	NR	NR	NR	LS	NR	
Sulfur Dioxide (see Flue Gas)							
Sulfur Trioxide, Dry	Fume	210/100	210/100	210/100	300/150	180/80	320/160
Sulfur Trioxide, Wet (see Sulfuric Acid)							
Sulfur, Molten (Dry)	100			250/120	300/150		
Sulfur, Wettable, Fungicide	All	180/80	180/80	180/80	180/80	180/80	
Sulfuric/Nitric/Phosphoric Acids	0-13/0-11/0-30	-30	150/65	150/65	150/65	150/65	

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Chemical

Chemical	Conc. (%)	Maximum Recommended Temperature, (˚F/˚C) SWANCOR 901	SWANCOR 905	SWANCOR 905-N	SWANCOR 907	SWANCOR 985	SWANCOR 977-S
Sulfuric Acid [4,7]	0-25	210/100	210/100	220/105	220/105	180/80	220/105
	26-50	210/100	210/100	210/100	210/100	180/80	210/100
	51-70	180/80	180/80	180/80	180/80	180/80	180/80
	71-75	100/40	100/40	122/50	180/80	100/40	180/80
	76-80	100/40	100/40	100/40	122/50		80/25
	> 80	NR	NR	LS	LS	NR	LS
Sulfuric Acid/ Ammonium Bifluoride [1]	0-75/0.1-3	100/40	100/40	122/50	150/65		
Sulfuric Acid/Copper Sulfate	0-25/1-35	210/100	210/100	210/100	210/100		
Sulfuric Acid/Copper Sulfate/Sodium Persulfate/EDTA	13/12/1/1	130/55	130/55	130/55	130/55	130/55	
Sulfuric Acid/Hydriodic Acid	60/20	100/40	100/40	100/40	122/50		
Sulfuric Acid/ Hydrofluoric Acid [1,4]	25/10	100/40	100/40	100/40	122/50		
	10/10	100/40	100/40	100/40	150/65		
Sulfuric Acid/ Hydrogen Peroxide [2]	1-20/1-10	150/65	150/65	150/65	150/65		
Sulfuric Acid/Hydrogen Peroxide/ Ammonium Sulfate/Copper Sulfate [2]	10/5/5/5	100/40	100/40	100/40	100/40		
Sulfuric Acid/Hydrogen Sulfide	1-50/0-10	210/100	210/100	210/100	210/100	180/80	
Sulfuric Acid/Methanol	30/5				122/50		
Sulfuric Acid/Nitric Acid	20/5	150/65	150/65	180/80	180/80	150/65	
Sulfuric Acid/Phosphoric Acid	0-25/0-25	180/80	180/80	180/80	180/80	180/80	
Sulfuric Acid/Sodium Dichromate (see Sulfuric Acid/ Chromic Acid Mixture)							
Sulfuric Acid/ Hydrochloric Acid [3,6,8]	50/15	100/40	100/40	122/50	122/50		
Sulfuric Acid/ Hydrochloric Acid [3,6]	1-25/1-10	180/80	210/100	210/100	210/100	180/80	
Sulfuric Acid/ Hydrofluoric Acid [1,4]	1-20/3-6	130/55	130/55	140/60	140/60	100/40	
Sulfuric Acid/Hydrofluoric Acid	30-35/3-5	LS	LS	LS	LS	LS	
Sulfuric Acid/Inorganic Salts	0.5-20/ 0.5- 50	210/100	210/100	210/100	210/100	180/80	
	21-50/ 0.5-20	180/80	180/80	180/80	180/80	180/80	
Sulfuric Acid/Sulfate Salts, Max. Total Concentration 80% (see Sulfuric Acid)							
Sulfuric Acid/Chromic Acid Mixture (Maximum Total Concentration 10%)		122/50	122/50	150/65	150/65	122/50	
Sulfuric/Hydrochloric/Hydrofluoric/ Phosphoric Acids/Chlorinated	40/20/5/35/1	NR	NR	LS	LS	NR	
Sulfuric/Hydrofluosilicic Acids/MIBK [1,4]	25/10/2	LS	LS	100/40	122/50		
Sulfuric/Lactic Acids/ Sodium Sulfate	50/20/0-10	100/40	100/40	122/50	150/65	100/40	
Sulfurous Acid	10	122/50	122/50	122/50	122/50	122/50	
Superphosphoric Acid (76% P_2O_5)	105	210/100	210/100	210/100	210/100	180/80	
Surfactant, Anionic	All	100/40	100/40	100/40	122/50		

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Tall Oil (Storage)	100	200/95	200/95	220/105	220/105		
Tall Oil Reactor [9]		210/100	210/100	220/105	220/105		
Tallow/Sulfuric Acid	99/1	180/80					
Tannic Acid	> 0.5	210/100	210/100	210/100	210/100	150/65	

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Chemical

Chemical	Conc. (%)	Maximum Recommended Temperature, (˚F/˚C) SWANCOR 901	SWANCOR 905	SWANCOR 905-N	SWANCOR 907	SWANCOR 985	SWANCOR 977-S
Tap Water, Hard [4]	All	210/100	210/100	210/100	210/100	180/80	
Tap Water, Soft [4]	All	180/80	180/80	180/80	180/80	180/80	
Tartaric Acid	> 0.5	210/100	210/100	210/100	210/100	150/65	
t-Butyl Methyl Ether (MTBE)	20 100	100/40 NR	100/40 NR	122/50 80/25	122/50 80/25	80/30 NR	
Tetrabutyltin	100	122/50	122/50	122/50	122/50		
Tetrachloroethane	100	100/40	100/40	122/50	130/55	NR	
Tetrachloroethylene (Perchloroethylene) [5]	100	80/25	80/25	122/50	122/50	NR	130/55
Tetrachloropyridine	100	80/25	80/25	122/50	122/50	NR	
Tetrahydrofuran	0-5 10-100	100/40 NR	100/40 NR	122/50 NR	122/50 LS	 NR	
Tetrahydrofuran, Fumes,no condensation or coalescence	Fumes		180/80	180/80			
Tetramethyl Ammonium Hydroxide [1]	0 - 10	122/50	122/50	100/40			
Tetra-n-Butylammonium Hydroxide [1,4]	40	100/40	100/40	100/40			
Tetra-n-Butylphosphonium Hydroxide [1,4]	40	100/40	100/40	100/40			
Tetrapotassium Pyrophospate	0 - 60	130/55	130/55	150/65	150/65	130/55	
Tetrasodium Ethylenediaminetetraacetic Acid (Tetrasodium Salt of EDTA)	All	180/80	180/80	150/65	150/65	180/80	
Textone Liquid Product (see 50% Aqueous Solution of Sodium Chlorite)							
Thermal Oxidizer (HCl Absorption) (see Flue Gas, Wet)							
Thioglycolic Acid (see Mercaptoacetic Acid)							
Thionyl Chloride	100	NR	NR	NR	LS	NR	LS
Thiourea	0 - 50	150/65	150/65	150/65	150/65	150/65	
Tin Fluoborate Plating Bath: 18% Stannous Fluoborate 7% Tin 9% Fluoboric Acid 2% Boric Acid [1]		210/100	210/100	210/100	210/100	180/80	
Titanium Dioxide	All	180/80	180/80	180/80	180/80	180/80	
Titanium Dioxide/Sulfuric Acid	0 - 30/30	210/100	210/100	210/100	210/100	180/80	
Titanium Tetrachloride	All	150/65	150/65	180/80	180/80		
Tobias Acid (2-Naphthylamine-1-Sulfonic) [9]	100	210/100	210/100	210/100	210/100		
Toluene [5]	100	80/25	80/25	100/40	122/50	NR	130/55
Toluene Sulfonic Acid [9]	>0.5	180/80	200/95	210/100	210/100		210/100
Toluene, no condensation or coalescence	Fumes		180/80	180/80	180/80		
Toluidine (o-, p-, m-)	100	NR	NR	NR	70/20	NR	
Tomato Sauce	All	190/90					
Transformer Oils (Ester types)	100	122/50		150/65	150/65		
Transformer Oils (Silicone and Mineral Oils)	100	210/100	230/110	250/120	300/150		
Tributyl Phosphate	100	122/50	122/50	140/60	140/60	100/40	
Trichloroacetic Acid (see Chloroacetic Acid)							
Trichloroethane	100	100/40	100/40	122/50	122/50	NR	
Trichloroethylene	100	NR	NR	NR	LS	NR	
Tricresyl Phosphate	100	160/70	160/70	160/70	160/70		
Triethanolamine	100	122/50	122/50	122/50	150/65	NR	

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Chemical

	Conc. (%)	Maximum Recommended Temperature, (˚F/˚C) SWANCOR 901	SWANCOR 905	SWANCOR 905-N	SWANCOR 907	SWANCOR 985	SWANCOR 977-S
Triethylamine	All	122/50	122/50	122/50	122/50	NR	
Triethylamine/Triethylamine Hydrochloride/ Hydrochloric Acid [3]	50/20/5	122/50	122/50	122/50	122/50	NR	
Triethylene Glycol (see Ethylene Glycol)							
Trifluoroacetic Acid (see Chloroacetic Acid)							
Trimethyl Ammonium Chloride (Trimethylamine HCl, TMA-HCl)	70	100/40	100/40	100/40	122/50	100/40	
Trimethyl Benzene	100	80/25	80/25	122/50	122/50	NR	
Trimethylamine	20 100	100/40 80/25	100/40 80/25	122/50 80/25	122/50 100/40	NR	
Trimethylamine, Fumes, no condensation or coalescence	Fumes		180/80	180/80	180/80		
Trimethylene Chlorobromide		NR	NR	80/25	100/40	NR	
Trioctyl Phosphine Oxide/Di 2-Ethylhexyl Phosphoric Acid (DEHPA)/Kerosene	4/4/92	180/80	180/80	180/80	180/80		
Trioctylphosphate	100	160/70	160/70	160/70	180/80	100/40	
Tripropylene Glycol (see Ethylene Glycol)							
Trisodium Phosphate	Sat'd	210/100	210/100	250/120	250/120	180/80	
TRITON X-100 Wetting Agent (see Ethylene Glycol)							
Turpentine	100	150/65	150/65	210/100	210/100	100/40	230/110
Tween Surfactant (see Ethylene Glycol)							

U

Uran Fertilizer Urea-Ammonium Nitrate Composition: 44.3% Ammonium Nitrate 35.4% Urea 20.3% Water		150/65	150/65	150/65	150/65	150/65	
Uranium Extraction (see Kerosene) Uran							
Urea	All	160/70	160/70	160/70	160/70	150/65	
Urea Formaldehyde Resin	All	100/40	100/40	122/50	122/50	100/40	
Urea/Ammonium Nitrate/Water	35/44/20	150/65	150/65	150/65	150/65	150/65	
Urine (see Urea)	All						

V

Vinegar	100	210/100	210/100	210/100	210/100	150/65	
Vinyl Acetate	20 100	100/40 NR	100/40 NR	100/40 NR	100/40 LS	NR NR	
Vinyl Chloride	100	NR	NR	NR	LS	NR	
Vinyl Chloride Fumes, no condensation	All		180/80	180/80	180/80		
Vinyl Toluene [5]	100	80/25	80/25	122/50	122/50	NR	130/55

W

Water Deionized [4]	100	180/80	180/80	180/80	180/80	180/80	
Water Vapor, no condensation (see Flue Gas, Dry)							
Water Vapor, Wet [4]	Sat'd	180/80	180/80	180/80	180/80	180/80	
Water, Distilled [4]	100	180/80	180/80	180/80	180/80	180/80	
Water, Phenol (see Phenol)							

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Chemical

Chemical	Conc. (%)	Maximum Recommended Temperature, (˚F/˚C) SWANCOR 901	SWANCOR 905	SWANCOR 905-N	SWANCOR 907	SWANCOR 985	SWANCOR 977-S
Water, Sea, Desalination	All	180/80	180/80	180/80	180/80	180/80	
Water, Steam Condensate [4]	100	180/80	180/80	180/80	180/80	180/80	
Water, Tap, Hard [4]	100	210/100	210/100	210/100	210/100	180/80	
Water, Tap, Soft [4]	100	180/80	180/80	180/80	180/80	180/80	
Whey	All	150/65					
White Liquor (Pulp Mill) [1,4]	All	180/80	180/80	180/80	100/40	180/80	

X~Z

Xylene [5]	100	80/25	80/25	122/50	122/50	NR	140/60
Xylene, No Condensation or Coalescence	Fumes		180/80	180/80	180/80		
Xylene/Methyl Ethyl Ketone/Butyl Acetate/Methyl Acetat	50/20/ 20/10	NR	NR	NR	LS	NR	
Zinc Chloride	Sat'd	210/100	210/100	250/120	250/120	180/80	
Zinc Cyanide Plating Bath: 9% Zinc 4% Sodium Cyanides 9% Sodium Hydroxide [1,4]		180/80	180/80	180/80	100/40	180/80	
Zinc Electrolyte (Zinc Sulfate, 35 g/L Sulfuric Acid; see Sulfuric Acid)							
Zinc Fluoborate Plating Bath: 49% Zinc Fluoborate 5% Ammonium Chloride 6% Ammonium Fluoborate [1]		200/95	200/95	200/95	200/95	180/80	
Zinc Nitrate	Sat'd	210/100	210/100	250/120	250/120	180/80	
Zinc Phosphate (slurry)	> 0.5	180/80	180/80	180/80	180/80	180/80	
Zinc Sulfate	Sat'd	210/100	210/100	250/120	250/120	180/80	

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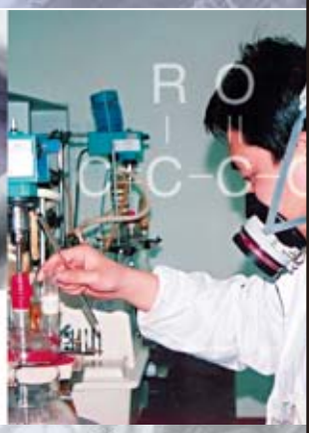

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NT28-011-E 2017.12.1000