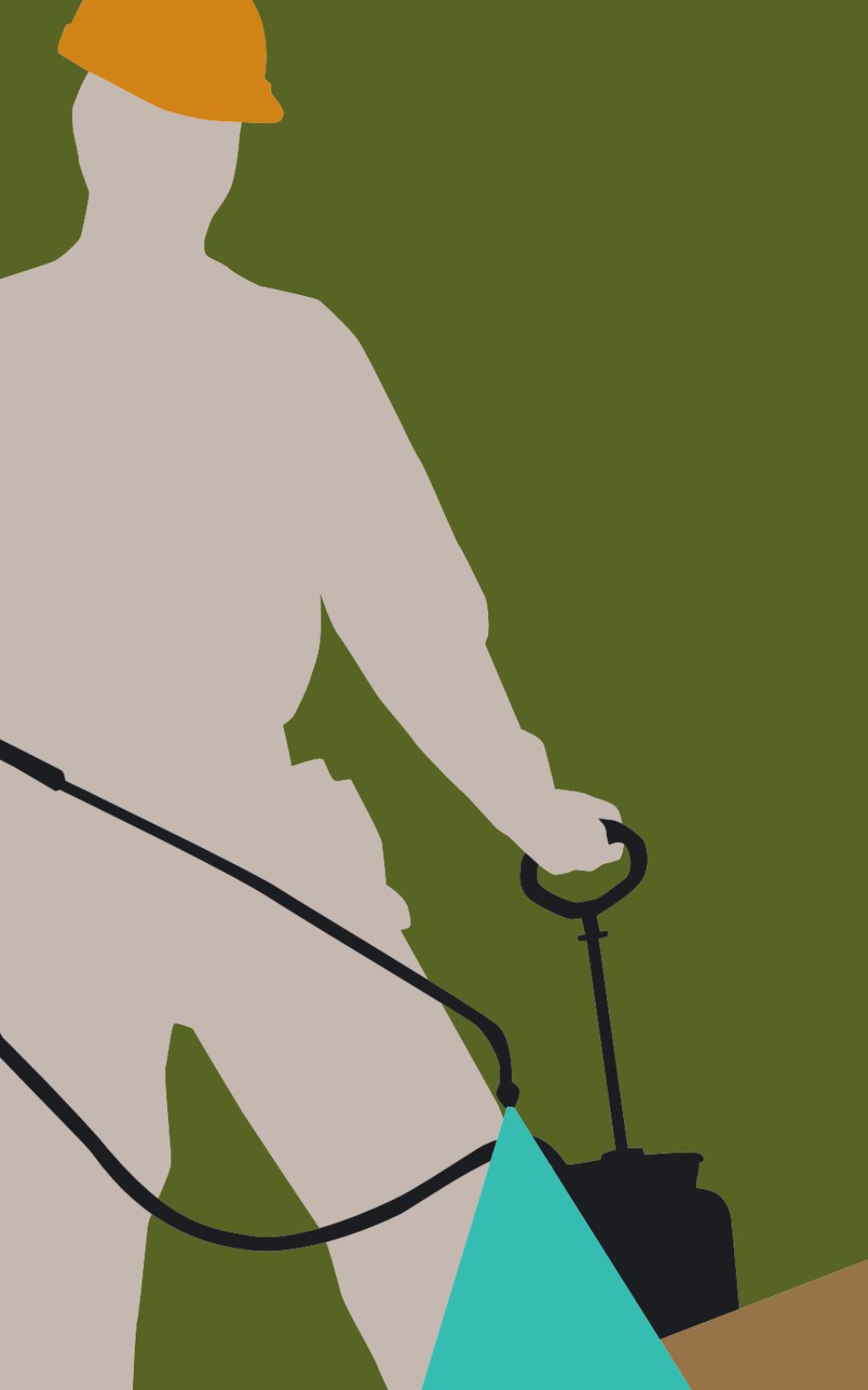


# Maximize Pours — Minimize Costs



*A Guide to Getting the Most from Concrete-Forming Panels*



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At Savona Specialty Plywood, we receive a lot of questions from concrete contractors asking how they can get more reuses from their concrete-forming panels. As a result, we've developed this guide as a resource to help you get the most out of your panels.

One of our customers tells us he regularly gets 40 pours from his HDO! Of course, not everyone can control their site and application to guarantee such a high rate of reuse. But starting with a quality panel such as Pourform®, and following the many suggestions in this guide, will help you achieve more through careful use and basic techniques.

Many of these tips are really just common sense, and you may already be following them. But sometimes it's easy to overlook or forget the obvious. So this guide highlights not just the ideal way to approach forming, but also the return on investment (ROI) you can get from diligent site practices.

# INTRODUCTION

If you **maximize** your pours, you can **minimize** your costs.

This Guide is designed to help you improve your bottom line regardless of which forming panel you use.

Let's start at the finish! Major cost savings can be made if remedial work on the finished surface can be avoided, or minimized. Choosing the right panel for the job will help you overcome these kinds of problems and related labor costs.

Also, proper maintenance of your concrete-forming panels will further enhance the end product while at the same time preserve the life of the panels.

Simple steps covered in this Guide can save you up to 50% on your materials, and \$1,000's on labor.

# FORM FABRICATION

## High Quality Panels

Concrete-forming panels are engineered so they can easily be fabricated for either vertical or horizontal forming applications. A word of caution, however.

Formwork is a critical structural application which serves as a work platform during erection. Formwork also carries significant loads during pouring and curing of the concrete<sup>1</sup>. Therefore, it's important from a safety standpoint to always use properly certified and grade-stamped panels, and follow the formwork design engineer's specifications.

Unfortunately not all panels (imported or domestic) live up to the quality and standard that builders have come to expect. You can be confident, however, when using Savona Specialty Plywood Pourform concrete-forming panels because they meet or exceed the grade classifications of a Class 1 or Struc 1 panel. And they're manufactured under quality assurance by APA.

## Cutting Panels

Always use good quality tools when working with your forms. Carbide-tipped saw blades are recommended. Be sure to keep the blades sharp for a clean cut. Take care that the saw teeth are cutting into the overlay, not chipping it out. And always keep the "pouring" surface next to the saw. This keeps any chip-out due to cutting away from the concrete surface.

## Resealing Edges

Quality concrete-forming panels will arrive already factory edge-sealed. After panels are cut,

<sup>1</sup> Source: "Concerns over unbranded and potentially unsafe formply..." Plywood Association of Australasia



be sure to reseal any cut edges. This will slow the migration of moisture and alkalis into the panel edges. Without resealing, cut edges will break down faster, become weaker, and require replacement sooner.

Due to more stringent air pollution regulations, solvent-based enamels used for resealing edges are nearly impossible to find in the United States and many Western European countries. As an alternative, consider using a good quality water-based 100% acrylic paint designed for exterior exposure. This would provide similar or even superior performance to solvent-based enamel—and at a lower cost.

Sealing or resealing cut edges helps prevent moisture absorption and minimize swelling. Any wood exposed by cut holes or openings should be similarly resealed or painted.

### **Fastening Panels**

Follow the form-system manufacturer's specification when fastening panels to forms, and take care to ensure adequate panel spacing to allow for linear expansion (see Protecting Joints below). When an enhanced concrete surface appearance is desired, countersink the fasteners and fill with a resin-based filler such as polyurethane, epoxy or similar materials.

### **Protecting Joints**

Wood structural panels are "hygroscopic." This means they readily absorb moisture, which in turn causes linear expansion. Simply put, the ends and edges expand.

Linear expansion may cause panels to buckle after they're fastened to the supports if they don't have room to expand. To allow for this expansion, provide a minimum gap of  $\frac{1}{8}$ " at the panel ends and edges<sup>2</sup>.

It's also a good idea to fill any joints or gaps between panels with a suitable tape or expandable caulk. This prevents concrete from leaking at the joint. Be sure the caulking has set properly before pouring the concrete.

## **FORM RELEASE AGENT**

### **A Panel's First Use**

Some concrete-forming panels (like Pourform-101<sup>®</sup> and Pourform-107<sup>®</sup>) come factory treated with a form release agent. Other panels (including Pourform-HDO<sup>®</sup> and Pourform-pH<sup>®</sup>) are not pre-treated to facilitate shipping. Regardless of whether panels have been factory treated or not, it is highly recommended that before their first use—and, of course, before each subsequent reuse—all panels be lightly treated with a high-quality reactive release agent (Nox-Crete<sup>™</sup> Form Coating or equivalent). This will greatly help to maximize the quality and number of pours you get from each panel.

See next page for the correct type of release agent to use.

<sup>2</sup> *Source: APA – The Engineered Wood Association*

## Each Subsequent Reuse

Treating panels with a release agent is essential to facilitate form stripping and cleaning, to help achieve a quality concrete appearance, and to ensure each panel's maximum reuse potential.

The kind of concrete mix used can significantly affect the release performance. This, in turn, can affect the concrete surface finish. Reactive release agents (Nox-Crete Form Coating or equivalent) work well with straight or regular Portland cement concrete mixes. Combination reactive/barrier release agents, such as Nox-Crete PCE or equivalent, work best with mixes that incorporate pozzolans, such as fly ash, blast furnace slag or micro silica.



In any event, the type of release agent used should correspond to the type of finished surface or appearance required. For example, release agents with waxes or silicone should not be used when the concrete is to be painted.

**NOTE:** Do not use release agents containing diesel fuel, mineral spirits or motor oil. These can soften and eventually degrade both the overlay and the panel itself. **In most cases it will also cancel your form panel's warranty.**



For specific recommendations, contact Nox-Crete Products Group (800) 669-2738; (402) 341-1976; or [www.nox-crete.com](http://www.nox-crete.com), or your local supplier of form release agent.

**“Switching from diesel oil to a good reactive release oil initially cost us 20% more for our release. But now, we use less of it and we save 20% on stripping time and panel repair costs, plus we get 20% more pours!”**

*Al Wohldmann, Wohldmann Construction, St. Peters, Missouri.*

## POURING & VIBRATING

Not all panels are created equal. Some—Pourform concrete-forming panels, for example—are exceptionally strong and durable and also resist abrasion and impact. But as with any surface, they can be damaged if not properly used.

### **Pouring**

Maintain a rate of pour and slump factor consistent with the design value of the form and bracing you're using. Pouring too fast or too much can cause

a “blowout,” with the concrete breaking through the forming panels. Not only is this a big safety concern, it will also require hours of costly repair work.

During vertical concrete placement, take care to direct the flow of concrete away from the face of the forming panel. This minimizes the possibility of stripping away the panel’s coating of release agent, and thus reduces the time you spend stripping later. It also improves the concrete finish. And it helps prevent the overlay from suffering excessive abrasion or scouring.

### **Vibrating**

Use a vibrator for concrete consolidation and to minimize “bugholes.” Always equip the vibrator with a rubber covered head to help prevent vibrator burns on the panels. Such burns can cause severe abrasion of the overlay and face veneer, adding costly repair time after stripping.

Be sure not to let the vibrator come in direct contact with the form panels. Such contact can damage the overlay as well as the substrate. This would greatly reduce the quality of the finish as well as the panel’s life.



In addition, vibrators should never be used to move concrete horizontally within the formwork because this can lead to aggregate segregation, removal of form release agent, and unnecessary abrasion/scouring of the panel overlay surface. Instead, lower the vibrator vertically into the concrete at regularly spaced intervals and allow it to descend by gravity. Hold the vibrator stationary until adequate consolidation is attained (approximately 5-15 seconds), and then slowly withdraw it<sup>3</sup>.

**“I was always told when vibrating walls to allow the vibrator to descend by gravity vertically to a depth of no more than four feet below the top of the concrete. If you went deeper, you would lose control of the vibrator. It could get hung up in the rebar or begin working horizontally in the form. The vibrator should also never be allowed to stay in one spot too long.”**

*Ernie Montgomery, Mid-South Lumber, Atlanta, Georgia.*

<sup>3</sup> Source: Cement Association of Canada

## STRIPPING & CLEANING

### Stripping

Do not use metal bars, pry bars or other sharp objects because they can damage the panel edge and overlay surface. Wooden wedges or simple 2x4s are recommended.

Banging on forms with a hammer during stripping, although a common practice, is not recommended. It not only damages the panels, it may also indicate there are other problems, such as poor form maintenance, inadequate form release agent, or poor form design<sup>4</sup>.



**“We used to use hammers to pry and found we were spending hundreds of dollars to repair the concrete finish after damaging the panels—not to mention the odd panel breakage and replacement. Since switching to wooden wedges to remove the panels, we get more reuse from them and our average finish repair cost has dropped by 20%.”**

*Steve Swingler, Swingler Construction, Teutopolis, Illinois.*

### Cleaning

Soon after the panels are stripped, they should be cleaned and checked for wear. (See next section on repair.) Cleaning immediately—while any concrete residue is still soft—reduces the need for aggressive scraping.

Use a hardwood wedge and a stiff, fiber brush. Burlap can be used but will be less effective. Do not use wire brushes as they can damage the overlay as well as the underlying wood fibers. If you encounter a hard scale of concrete, you can usually remove it by lightly tapping on the back side of the form.



<sup>4</sup> Source: NPCA – “Mind your Ps and Qs”

Also be sure to remove any nails or left-over concrete projecting from panels in order to prevent them getting scarred while being stacked. Remember, a damaged form panel means more concrete repair.

After panels are cleaned (and before they're stacked), re-treat them with a form release agent. This improves the wood's moisture retention and slows down the drying rate. In turn, this helps to minimize face checking and improve subsequent finishes. It may also reduce the amount of release agent required for subsequent pours.

## PANEL REPAIR

When panels are stripped, besides cleaning them, inspect them for wear, and repair or replace them as required. Repairs should be done after a panel is clean and dry.

If the panel surface is damaged, repair any gouges or nicks in order to restore the surface continuity. The surface can be repaired with fast-drying polyurethanes, epoxy, or polyester putties or patching material.

On prefabricated forms using two working overlaid faces (i.e. 100/100 or 120/120 HDO), the plywood face can be reversed if damaged, and tie holes can be patched with metal plates, plugs or plastic materials. Remove any nails and fill any holes with patching plaster, plastic wood, or other suitable materials.



**“Sometimes replacing a damaged panel seems counter-intuitive. But now we'll replace a questionable panel with a new one, and cut the damaged one for another use. This speeds up our stripping and cuts our repair costs.”**

*Michael Berger, Keystone Projects Ltd., Vancouver, British Columbia.*

After cleaning and repairing panels, reapply the release agent and store the panels out of the sun and safe from rain or moisture. Follow the recommendations contained in the next section on storage.

# STORAGE & HANDLING

Take care during storage and handling so that panels are not dropped, chipped or dented, and that corners are not damaged. If they are, it will add costly repair time before and during use.

If you damage even one panel in a unit, it can increase your repair and finish costs dramatically. For example:

- Let's say you spend 15 minutes to repair a panel and 15 minutes after each pour to repair the concrete flaws
- Doesn't seem so much perhaps, but if you use the panel 5 times, your storage practices will end up costing you an extra 90 minutes/1-½ hours i.e. 15 minutes panel repair plus 5 times the 15 minutes concrete repair
- And if you use the panel 40 times—your extra cost is 615 minutes/10-¼ hours
- So clearly, a little care in handling the product can save you big time in labor cost

## Unloading with a Forklift

Use a forklift or crane to unload newly delivered bundles from trucks. Take care not to drop the panels or stab them with the forklift's forks.



## Appropriate Equipment

Handling time and damage potential can both be minimized if proper stack-handling equipment and trailers are used to store and haul panels before and between jobs. Ideally, it's best to use equipment specially designed for handling panels.

## Safe Location

Store panels as level as possible, out of the sun's UV rays, and on a well-drained location away from traffic areas where equipment might be moving around.

## Careful Stacking

Panels can be stored in the condition they arrive in from the mill—as bundles. Typically, bundles have all the panels facing up, except for the top panel, which is turned face down for protection.

If moisture is expected, cut the straps to prevent edge damage arising from potential swelling. (See next page for more information on straps.)

Once the panels have been made into forms, they should be restacked face-to-face and back-to-back. This prevents their being damaged on-site by getting walked-on or driven over by trucks or other equipment. Proper stacking also protects panel overlays from getting scratched if improperly cleaned panels slide across one another while being re-stacked.

Also be sure to remove any nails or left-over concrete sticking out from the panels. This further protects the panels from getting scarred while they're being re-stacked.

### **Cutting Steel Straps**

If left on, steel straps can rust and bleed, thereby damaging and staining panel edges. If the panels are stained, the concrete is likely going to get stained too.

Be careful when cutting straps. Use gloves and eye protection whenever possible. Just one job-site injury could end up costing thousands of dollars to settle! Make sure the strapping is placed properly in the job-site dumpster and not left on the ground where someone could trip over it, or where it could get caught in equipment.



### **Protection from Moisture**

Use stickers to keep panels off the ground and out of the mud and water. Use three stickers equally spaced under each bundle. Stickers between stacked bundles must align with those on the ground to avoid panel stress. Without properly used stickers, the resulting bowing and cupping can affect the panels' surface finish.

Because panels readily absorb moisture causing them to expand, storage conditions must protect them from rain and ground moisture. If plastic tarps are used, be aware that they may trap ground moisture. To avoid this, arrange the bundle and tarps to allow air circulation under the tarps. To facilitate this, consider adding stickers on top of the bundle as well as underneath.



### **Protection from Sun**

Whenever possible, protect panels from prolonged sunlight exposure to prevent the overlay from splitting and cracking. Splitting or cracking speeds up the face degradation process.

# THE POURFORM FAMILY

## Engineered for Peak POURFORMance

With proper care and handling, Pourform concrete-forming panels make your job easier and more rewarding. That's because Pourform is engineered to provide:

- **Far more pours per panel**
- **Lower overall costs**
- **Easier stripping**
- **Consistently higher quality finish**
- **Better solution than non-overlaid panels**

So don't be misled by products promising lower upfront costs. Pourform easily out-performs the competition.

### *Pourform—More pours per panel*

## The POURFORMance Formula

Formwork costs (both labor and materials) can add as much as 40% to 60% to the total installed concrete budget! But you can put a ceiling on those costs by using Savona Specialty Plywood Pourform panels. Every time you re-use a panel, your actual cost per panel drops. And that can make a huge difference in your return on investment (ROI).

Pourform-107 is widely recognized for giving by far the highest number of quality reuses. Not only do you get more pours per panel, you get higher performance all around.

### **Higher Reuse=Lower Cost**

BRAND	# PANELS REQ'D FOR 10 POURS	PRICE PER SHEET	COST PER REUSE: 5 POURS	COST PER REUSE: 10 POURS	COST PER REUSE: 11 POURS	COST PER REUSE: 12 POURS
Pourform MDO (107)	1	\$46.00	\$9.20	\$4.60	\$4.18	\$3.83
Brand X-MDO	1	\$43.00	\$8.60	\$4.30	—	—
Brand Y-MDO	1	\$42.00	\$8.40	\$4.20	—	—
BBOES	2	\$30.00	\$12.00	\$6.00	—	—

*NOTES: A 10-pour service life is for illustration only. In fact, when used properly, Pourform MDO can provide may additional pours per panel. The actual amount of reuse depends on proper application, treatment and a chemically active release agent, maintenance, and storage & handling. Prices shown are also for illustration only—check current pricing with your local retailer.*

And that's the POURFORMance formula.

### **Anything less costs you more!**

## **Exceptional Strength and Durability**

Expressly designed for concrete-forming applications, Savona Speciality Plywood Pourform panels are widely appreciated for their exceptional strength, rigidity and dimensional stability.

Made from tough, northern inland species of Douglas fir, Pourform plywood panels are manufactured from logs carefully selected for their tight grain.

The panels are overlaid with a durable, resin-impregnated surface custom engineered to resist abrasion and moisture penetration. Properly used, Pourform panels are easy to strip from concrete surfaces. This ease of use minimizes concrete build-up, physical damage, and the need for repairs. All in all, these and other superior qualities ensure reliable repeat performance on site and a high-quality finish.

## **A Pourform for Every Project**

For over 40 years, Pourform products have been recognized as the industry's proven performers. The Pourform family spans every concrete-pouring need, from low-reuse to high-reuse to special applications.

Following is a basic selection guide to help you choose the Pourform panel that will provide the best performance—and therefore the best value—for your project. For complete information, visit [www.savonapourform.com](http://www.savonapourform.com), or contact your supplier.



## POURFORM-101°

### VALUE POURFORMance

- A premium plywood MDO panel at a reduced cost, with Class 1 panel performance
- Can provide 6-12 reuses with proper care
- Factory-treated with a chemically active Nox-Crete release agent
- Non-architectural matte concrete finish—cleaner, smoother and more consistent than BB plyform
- Standard panel size: 4'x 8'
- Thicknesses:  $\frac{5}{8}$ ,"  $\frac{11}{16}$ ,"  $\frac{3}{4}$ ." Other thicknesses available on special order
- Savona's distinctive black edge-seal protection



## POURFORM-107°

### REPEAT POURFORMance

- 40-year reputation as the most dependable and popular high-quality Struc 1 plywood MDO
- Can provide 10-15 reuses with proper care
- Proprietary hi-flow MDO overlay—highest resin content in the industry
- Factory-treated with a chemically active Nox-Crete release agent
- Non-architectural matte concrete finish
- Standard panel sizes: 4'x 8', 4'x 9', 4'x 10'
- Thicknesses:  $\frac{5}{8}$ ,"  $\frac{11}{16}$ ,"  $\frac{3}{4}$ ." Other thicknesses available on special order
- Savona's unique Orange® edge-seal protection



## POURFORM-HDO®

### *PREMIUM POURFORMance*

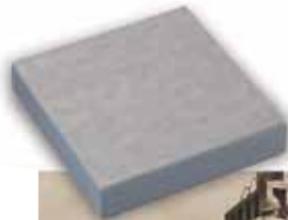
- Ideal for high-rise & large-scale projects
- A Struc 1 plywood panel with exceptional strength and reusability
- Can provide 15-25 reuses with proper care
- Consistently smooth, glossy finish. Architectural finish possible
- Various overlay combinations of paper and resin to suit specific reuse and finish requirements
- Standard panel sizes: 4'x 8', 4'x 9', 4'x 10'
- Thicknesses:  $\frac{1}{2}$ ",  $\frac{5}{8}$ ",  $\frac{11}{16}$ ",  $1\frac{1}{8}$ ". Other thicknesses available on special order
- Savona's distinctive green edge-seal protection



## POURFORM-pH®

### *ENDURING POURFORMance*

- High performance Series-Rated hardwood faced plywood panel
- Overlay resin content 100% chemical resistant and impervious to fast-cure, highly alkaline aggressive concrete mixes
- Can provide 25-50 or more reuses with proper care
- High-quality and superior alternative to imported PSF panels
- Consistently smooth concrete finish
- Standard panel size: 4'x 8'
- Thicknesses:  $\frac{1}{2}$ ",  $\frac{5}{8}$ ",  $\frac{11}{16}$ ",  $\frac{3}{4}$ ". Other thicknesses available on special order
- Savona's distinctive gray edge-seal protection



## FREQUENTLY USED TERMS

The following list includes many of the more commonly used terms regarding concrete-forming plywood.

**Accelerator:** An admixture which, when added to concrete, increases the rate of hydration, shortens the time of set, and increases the rate of hardening or strength development.

**Admixture:** A material other than water, aggregates, or cement that is used as an ingredient in concrete or mortar. It is added to the batch immediately before or during the mixing operation to control setting and early hardening or workability, or to provide additional cementing properties.

**Architectural concrete:** Structural or non-structural concrete that is permanently exposed to view and therefore requires special attention to uniformity of materials, forming, placing, and finishing.

**BBOES:** Stands for B-B plywood; Oiled face & Edge-Sealed edges.

**B-B Plyform:** Usually a sanded plywood panel with a B-grade face and back and C-grade inner plies. Used in concrete form grades where reuse is of little or no importance.

**Blow:** A localized delamination caused by steam pressure building up during the hot pressing operation.

**Blowout:** Term used when ready-mixed concrete breaks through the forming boards due to insufficient bracing, pouring too fast, or pouring too much.

**Bond:** To glue together—as in, veneers are *bonded* to form a sheet of plywood.

**Bow:** Distortion of a wood structural panel so that it no longer lies flat lengthwise.

**Brace / bracing:** A concrete-forming accessory that acts as a temporary support for aligning vertical concrete formwork. One end of the brace attaches to the form and the other anchors to the ground.

**Bug hole (blowhole):** A small regular or irregular cavity (not exceeding 15mm in diameter) resulting from entrapment of air bubbles in the surface of formed concrete during placement and compaction.

**Bundle:** A unit or stack of wood panels held together with bands for shipment. (Stack size varies throughout the industry, with the average stack running about 30" to 33" high.)

**Cast-in place:** Concrete that is poured into forms erected at the job site.

**Cement:** Finely powdered mixtures of inorganic compounds that harden when combined with water (hydration). Cement is only one component of concrete. The gray powder is the "glue" in concrete.

**Cementitious:** Having the properties of cement.

### Cement Types:

- **Type I Normal** – A general purpose cement suitable for practically all uses in residential construction. It should not be used, however, where it will be in contact with high sulfate soils or be subject to excessive temperatures during curing.
- **Type II Moderate** – Cement used where precaution against moderate sulfate attack is important: for example, in drainage structures where sulfate concentrations in ground-water are higher than normal.
- **Type III High Early Strength** – Cement used when high strengths are desired at very early periods, usually within a week or less. Also used when it's desirable to remove forms as soon as possible or put the concrete into service quickly.

- **Type IV Low Heat** – A special cement used when the amount and rate of heat generated during curing must be kept to a minimum. The development of strength is slow and appropriate for large concrete masses such as dams.
- **Type V Sulfate Resisting** – A special cement intended for use only in construction exposed to severe sulfate action, as occurs in Western states having soils of high alkali content.

**Center (Centers):** Inner ply or plies of a plywood panel where the grain runs parallel with that of the face and back plies.

**Checking:** When wood exposed to alternating moist and dry conditions eventually develops open cracks or “checks.”

**Class I, II:** Term used to identify different group combinations of wood species in the plywood substrate of concrete-forming panels.

**Concrete:** Hardened building material created by combining a mineral (sand, gravel, or crushed stone – fine or coarse aggregate), a binding agent (natural or synthetic cement), and water.

**Concrete Form:** The mold into which fresh concrete is placed in order to set.

**Consolidation:** Compaction usually accomplished by vibrating newly placed concrete to the minimum practical volume.

**Core (Cores):** In conventional plywood, inner plies where the grain runs perpendicular to that of the outer plies. In composite panels, a layer of reconstituted wood.

**Core Gap (Center Gap):** An open veneer joint extending through, or partially through, a plywood panel. Product Standard PS 1 specifies that the average of all gaps shall not exceed  $\frac{1}{2}$ ", and that every effort be made to produce closely butted core joints.

**Crossband (Cores):** In plywood, the veneer layers with grain direction running perpendicular to that of the face plies.

**Cup:** Crosswise distortion of a wood structural panel from its flat plane.

**Curing:** The hardening of concrete.

**Delamination:** Separation between plies or within reconstituted wood due to adhesive bond failure. Separation in an area immediately over or around a permitted defect does not constitute delamination.

**Edge Seal:** A coating (sealant, paint) applied to the edges of a wood structural panel to reduce its water absorption.

**Face:** The highest-grade side of any veneer-faced panel that has outer plies of different veneer grades. Also, either side of a panel where grading rules draw no distinction between faces. For example, the face of an A-C panel is the side with the A-grade outer ply. Both sides of an A-A or B-B panel are referred to as faces.

**Face Checking:** Partial separation of wood fibers parallel to the wood's grain or a panel's veneer surface caused chiefly by the strains of weathering and seasoning.

**Face Grain:** Direction of the grain on the outer ply (face) of a veneer-faced panel in relation to its supports. A panel's greatest stiffness and strength is where it runs parallel to the face grain.

**Fly Ash:** The fine ash resulting from burning coal in electric utility plants. Used as a key mineral admixture for many high performance concretes.

**Form:** A temporary erected structure or mold for supporting and containing concrete during placement and while it's setting and gaining sufficient strength to become self-supporting.

**Formwork:** Temporary structures or forms made of wood, metal, or plastic used when placing concrete to ensure the slurry is shaped to its desired final form.

**Grain:** The natural growth pattern in wood. The grain runs lengthwise in the tree and is strongest in that direction. Similarly, grain usually runs the long dimension in the face and back veneers of a plywood panel, making it stronger in that direction.

**Hardwood:** Wood of deciduous or broad-leaved trees (oak, maple, ash, walnut) as distinct from the softwood of coniferous or needle-leaved trees (pine, fir, spruce, hemlock).

**HDO:** See *High Density Overlay*.

**High Density Overlay (HDO):** Plywood finished with a resin-impregnated fiber overlay system with a minimum of 54% resin content on the pouring face, that provides a hard extremely smooth or uniform surface, requiring no additional finishing. HDO is highly resistant to chemicals, abrasion, and comes in varying overlay combinations: 100/30; 100/100; 120/30; 120/120. These numbers represent the combined weight of paper and resin in pounds per 1000 sq. ft. (msf). The first number corresponds to the pouring face of the panel; the second number to the panel back. A variety of combinations are offered because resin content on the pouring face directly affects the concrete surface finish, as well as the number of reuses obtained from each panel. Depending on the combination of overlays on the pouring face, one can achieve architectural concrete finish in either a semi-gloss or high-gloss finish, although some evidence of underlying grain shall be permitted.

**Honeycomb:** A method by which concrete is poured without puddling or vibrating. (This allows the edges to have voids or holes after the forms are removed.) Also, an area in a foundation wall where the aggregate (gravel) is visible. When not desired as the finish, honeycombs can usually be remedied by applying a thin layer of grout or other cement product over the affected area.

**Hydration:** The reaction of cement with water to form a chemical compound. During the hydration of cement, the compound calcium hydroxide  $\text{Ca(OH)}_2$  is produced.

**Hygroscopic:** The property of a material such as plywood to readily take up and retain moisture.

**Inner Plies:** All plies of a plywood panel except the face and back.

**Kerf:** A slot made by a saw. Also denotes the width of a saw cut.

**Knot:** Natural growth characteristic of wood caused by a branch base imbedded in the tree trunk.

**Knothole:** Void produced when a knot drops out of veneer.

**Layer:** In plywood, a layer consists of one or more adjacent plies having the wood grain in the same direction.

**Lay-Up:** In manufacturing wood structural panels, the stage when veneers or reconstituted wood layers are "stacked" in preparation for pressing into complete panels.

**Lift:** Layer of concrete. Also used to refer to a unit of plyform.

**MDO:** See *Medium Density Overlay*.

**Medium Density Overlay (MDO):** Plywood finished with an opaque resin-treated fiber overlay with a minimum of 35% resin content by % of weight of paper and resin in pounds per 1000 sq. ft. (msf). It provides a smooth matte finish, uniformly textured surface, and reasonable reuse. Concrete finish will be of the non-architectural variety because the overlay will transmit moderate grain/patch transference to the concrete surface.

**O & ES:** Oiled and edge-sealed.

**Overlaid Plywood:** Plywood panels with factory-applied, resin-treated fiber faces on one or both sides.

**P & TS:** Plugged and touch-sanded. Usually noted more simply as PTS.

**Patch:** A wooden insert filling a defect in veneer. *Boat* patches are oval shaped with sides tapering to points or small rounded ends. *Router* patches have parallel sides and rounded ends. *Sled* patches are rectangular with feathered ends.

**pH scale:** A numerical range used to define a substance's acidity or alkalinity. The scale ranges from 0 (strong acid) to 14 (strongly alkaline). Pure water has a pH of 7. Fresh concrete has a pH of about 13.

**Plasticizer:** An agent used to increase the fluidity of fresh cement with the same cement/water ratio, thus improving the workability and placement of the concrete mixture.

**Plug:** A circular or dog-bone shaped wood patch or a synthetic filler of fiber and resin used to fill openings and provide a smooth, level, durable surface.

**Ply:** A single veneer in a panel.

**Plyform:** Also see *B-B Plyform*. Plyform is an APA – The Engineered Wood Association designation and includes MDO and HDO.

**Portland cement:** A special synthetic blend of limestone and clay used to make concrete and generally believed to be stronger, more durable, and more consistent than concrete made from natural cement. Portland cement is made by mixing calcareous material like limestone with silica-, alumina-, or iron-oxide-containing materials. These materials are burned together and the resulting product is ground up to form Portland cement.

**Pour:** To cast concrete.

**Pozzolan:** A material made of silica, which in itself possesses little or no cementitious value but will, in finely divided form and in the presence of moisture, chemically react with calcium hydroxide at ordinary temperatures to form compounds possessing cementitious properties.

**Precast concrete:** Concrete that is cast in a mold either at a factory or on site.

**Product Standard:** A product manufacturing or performance specification, specifically, APA product performance standards. The PS 1 or PS 2 designations can be found in the lower portion of the APA trademark of manufactured panel. PS 1 specifications refer to construction and industrial plywood. PS 2 specifications set performance standards for composite and nonveneer panels, such as OSB.

**Ready-mixed concrete:** Concrete usually batched in a plant away from the construction site.

**Rebar:** Reinforcing bar-ribbed steel bars designed to strengthen concrete.

**Release agent:** Material used to prevent bonding of concrete to a surface, such as to forms.

**Repairs:** Any patch, plug or shim in a veneer.

**Retarders:** Admixtures that increase the setting time by slowing down hydration.

**Sacking:** Removing or alleviating defects on a concrete surface by applying a mixture of sand and cement to the moistened surface and rubbing with a coarse material, such as burlap.

**Scarf (Scarf Joint):** An angled or beveled joint in plywood or veneer used to splice pieces together. The length of the scarf is 8 times the thickness.

**Shim:** A long narrow wooden or synthetic repair not more than  $\frac{3}{16}$ " wide.

**Site-cast concrete:** Concrete that's poured and cured in its final position at a construction project.

**Silica Fume:** A residue from the manufacturing of silicon and ferro-silicon metals. Since silica fume particles are 100 times smaller than cement grains, they can be used to fill in the spaces between cement grains, thus minimizing the concrete's permeability. Silica fume particles have a large surface area, making this pozzolanic material an ideal supplement to produce high-strength concrete. Using silica fume also improves concrete's freeze-thaw resistance.

**Slag:** A vitreous smelting refuse, also called *clinkers*. It is produced by grinding a pelletized or granulated iron blast furnace slag to the fineness of cement. Processed slag exhibits cement-like properties and is being used increasingly in high-performance concrete mixes.

**Slump:** A measure of consistency in plastic concrete equal to the number of inches of subsidence in a truncated cone of concrete when it is released immediately after being molded in a standard slump cone.

**Slump Test:** A test to determine the plasticity of concrete.

**Slurry:** A mixture of water and finely divided materials such as Portland cement, slag, or soil in suspension.

**Softwood:** Wood of coniferous or needle-leaved trees (pine, fir, spruce, hemlock) as distinct from the hardwood of deciduous or broad-leaved trees (oak, ash, maple, walnut).

**Stickers:** Wood strips, also called *dunnage*, placed under units of plyform to elevate them off the ground. Stickers should be kept in line when stacking units vertically. Using three evenly spaced stickers is recommended.

**Stripping:** Removing the formwork from concrete.

**Structural 1 (Struc 1):** Panels that are specially designed for engineered applications such as structural components where design properties—including tension, compression, shear, cross-panel flexural properties and nail bearing—are of significant importance.

**Superplasticizer:** A concrete admixture that makes concrete extremely fluid without additional water.

**Tilt-up:** A method of concrete construction where members are cast horizontally near their eventual position and then tilted into place after the forms are removed.

**Veneer:** A thin sheet of wood laminated with others under heat and pressure to form plywood. Also called ply.

**Veneer Grade:** The standard grade designations of softwood veneer used in panel manufacture. The six grades are:

**N:** Special order “natural finish” veneer. Select all heartwood or all sapwood. Free of open defects. Some repairs permitted.

**A:** Smooth and paintable. Neatly made repairs permitted. Also used for a natural finish in less demanding applications.

**B:** Solid surface veneer. Router or sled repairs and tight knots permitted.

**Cplugged:** An improved C veneer, with splits limited to  $\frac{1}{8}$ " in width and knotholes and borer holes limited to  $\frac{1}{4}$ " by  $\frac{1}{2}$ ".

**C:** Knotholes up to 1" in diameter. Occasional knotholes  $\frac{1}{2}$ " larger permitted—but only if the total width of all knots and knotholes within a specified section do not exceed certain limits. Limited splits permitted. Minimum veneer grade permitted in exterior plywood.

**D:** Knots and knotholes up to 3" in width, and up to  $\frac{1}{2}$ " larger under certain specified limits. Limited splits permitted.

**Vibration:** Energetic agitation of freshly mixed concrete while it's being placed in order to help in evenly distributing and consolidating the concrete in the formwork.

**Void:** See *Core gap*.

**Waler:** Horizontal timbers used to brace concrete form sections.

**Water-Cement Ratio:** Ratio of the amount of water (excluding that absorbed by the aggregates) to the amount of cement in a concrete mix. Almost always expressed as unit weight of water per unit weight of cement.

## HANDY LIST OF CONTACTS FOR INFORMATION

### APA – The Engineered Wood Association

Product Support Help Desk

Tel: (253) 620-7400

[www.apawood.org](http://www.apawood.org)

### Cement Association of Canada

Tel: (613) 236-9471

[www.cement.ca](http://www.cement.ca)

### Nox-Crete Products Group

Tel: Toll free 1-800-669-2738

or (402) 341-1976

[www.nox-crete.com](http://www.nox-crete.com)

### Portland Cement Association

Tel: (847) 966-6200

[www.cement.org](http://www.cement.org)





*For more information, please contact:*

**Savona Specialty Plywood**

7273 Kamloops Lake Drive, PO Box 127  
Savona, BC V0K 2J0  
Phone: 250-373-5600  
Fax: 250-373-5665  
Email: [pourform@apgroup.ca](mailto:pourform@apgroup.ca)  
Web: [www.savonapourform.com](http://www.savonapourform.com)

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