HOW TO

TUFFLEX® WORKSHEET

An introduction to the basic theories, calculations, and procedures of using
TUFFLEX® Resin Binder Concentrate (RBC),
Plus some informal hints to make the process a whole lot more fun!

TUFFLEX Resin Binder Concentrate (RBC) is a breakthrough Water Catalyzed Polyurea-Urethane resin binder with entirely new capabilities and versatilities that were never available with the "old technology" moisture cure materials.

With "old technology" urethanes, you needed to spread the material in paint like coats, then wait up to 24 hours for each coat to cure from moisture derived from the air before application of the other thin coats required to build up any meaningful membrane thickness. Solvent shrinkage, odors, mediocre physical properties and high labor costs resulting from multiple application steps are additional limitations.

The addition of 25% plain tap water cures the TUFFLEX RBC so that now any thickness of membrane can be applied in a single coat. Now a coatings contractor can spread a solvent - free, virtually odorless, extra tough and flexible polyurea-urethane coating knowing that he has control of the pot-life of his mixture, the thickness of his membrane and the time of its cure. (Never add less than 15% water because there might not be enough of the catalyzing water to completely react with the RBC and out-gassing will occur.)

The TUFFLEX Technology has been used for waterproofing membranes, "T" - expansion and seismic joints, flexible sloping under-layment, crack filling, caulking, animal habitat seamless Mono-Mat Systems and by movie studios for the casting special effects props. TUFFLEX uses are only limited by your imagination.

Such a wide range of versatility could lead one to think that TUFFLEX Materials and Systems are complicated and difficult to work with. Nothing could be further from the truth!

It is this tremendous versatility - coupled with user friendliness - that is at the very heart of TUFFLEX technology and application capabilities.

As with anything new, it only takes a bit of hands-on trial & error to relieve such apprehensions. A little experience and a little ingenuity can result in a combination that will help the contractor successfully increase his bottom line of job satisfaction and monetary gain.

HINT: Make copies of the following worksheet pages to use as on-the-job reminder sheets.

The primary, and one of the most unique materials, in the **TUFFLEX** product line is the **TUFFLEX** **R**esin **B**inder **C**oncentrate **(RBC)**. This comes in two forms:

Solvent-Free "TUFF" and Solvent-Free "SOFT"

The Solvent Free "TUFF" has a Shore A hardness of about 65 and cures to an extremely TUFF flexible membrane for hard usage decks and roofing applications. The Solvent Free "SOFT" has a Shore A hardness of about 40 and is usually used as a pad in "T"-Joints, as a crack filler and as a coving & caulking material. The "TUFF" material can also be applied as the wear-surface coating on top of the "SOFT". These two materials can be "Mixed & Matched" to reach a Shore A hardness in between. A 50/50 blend or mixture of the two will result in a Shore A hardness of approximately 50.
(Refer to the "TUFF" & "SOFT" TECHNICAL BULLETINS for further information.)

The **three** most important and unique things about both RBC "TUFF" & "SOFT" are:

1. They are concentrated; so various fillers can be added.
2. They are water-cured; by adding 25% plain tap water.
3. The 25% water adds to the yield, and actually lowers the cost!

Far from being complicated, these three facts are the backbone of the TUFFLEX Materials: **Simplicity, Versatility** and **Economy.**

Water is the curing agent, and by adding the water, you also increase the yield by 25% and lower the end use cost by 25%. The advantage of a water catalyzed material is that you can apply the TUFFLEX Membrane "*thicker & quicker*" than the "old technology" elastomeric and save time & money.

It's that simple!

A bit later, we will review even more TUFFLEX Materials & Systems advantages, such as how to save additional labor and materials costs while solving some really unique problems.

Understanding and Calculating Yield

The basic "Yield" formulation is the addition of 25% water to each unit of TUFFLEX® RBC. This increases the yield by 25% and consequently, lowers the cost by 25%.

One unit of TUFFLEX **R**esin **B**inder **C**oncentrate **(RBC)**, plus 25% water, yields 1.25 units of **B**ase **M**embrane **M**ixture **(BMM)**.
RBC + 25% water = **BMM.**

For example, a 5 gallon pail of TUFFLEX **RBC** X 1.25 **yield** = 6.25 gallons of TUFFLEX **BMM**.

Total cost (Material cost + tax + shipping, etc.), divided by 1.25 yields = $_.__, this gives you the true per gallon cost of a mixed gallon unit of **BMM.**

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TUFFLEX overlay systems normally begin with proper surface preparation and priming, then the application of a base membrane of either **40-mils** on smooth surfaces, such as well finished concrete or metal ship decks, or **62.5-mils** (1/16 inch) on plywood or other less smooth surfaces. TUFFLEX RBC has also been used for 1/2-inch (500-mil) seamless animal habitat pads as described in our Mono-Mat System brochure and literature!

There are 1,600-mil sq. ft. (msf) per gallon of liquid. If you divide 1,600 by 40 mils thickness you get 40 sq. ft. of coverage. When 25% water is added to the TUFFLEX **R**esin **B**inder **C**oncentrate **(RBC)** to act as the catalyst, the water also acts as a "filler *material*" increasing the "*yield*" of the material by 25% to 2,000 mil sq. ft. (1 gallon of RBC + 25% water = 1 ¼ gallons of ready-to-use **B**ase **M**embrane **M**ixture **(BMM)**. An extra quart of material for free!) Divide 2,000 mils by 40 mil thickness = 50 sq. ft. coverage per 1 ¼ gallon of BMM, 10 sq. ft. increase in coverage for the "free" cost of the water! RBC plus water = BMM.

It is most efficient to mix in half-pail quantities (2 ½ gals. of **RBC** plus 2 or 2 ½ quarts of catalyzing water) because pouring water into a full 5-gallon pail would cause it to overflow. Each 5-gallon pail of **RBC** plus the catalyzing 25% of free water yields 6 to 6 ¼ gallons of usable **B**ase **M**embrane **M**ixture **(BMM)**. Up to 1 ¼ gallons of additional material for **free!**

40 mil system calculations:

1 gallon of TUFFLEX **RBC** + 1 quart (25%) water = 1 1/4 gallons of **BMM**/2000 msf. Divide by 40 mil thickness = 50 sq. ft. of coverage per mixed unit (1-gallon of **RBC** + 1-quart of water). A ½ pail mixing unit of **RBC** (plus its 2 1/2 quarts of water) will cover 125 sq. ft. and a full 5 gallon pail of **RBC** (plus its 5 quarts of water) will cover 250 sq. ft. at 40 mils thickness.

62.5 mil system calculations (1/16th inch.):
1 gallon of **RBC** + 1 quart (25%) water = 1 1/4 gallons of **BMM** /2,000 msf. Divide by 62.5 mil thickness = 32 sq. ft. of coverage per mixed unit (1-gallon of **RBC** + 1-quart of water). Half pail mixing unit of **RBC** (plus its 2 1/2 quarts of water) will cover 80 sq. ft. and a full 5-gallon pail of **RBC** (plus its 5 quarts of water) will cover 160 sq. ft. at 62.5 mils thickness.

Calculating the RBC required for a 1,000 sq. ft. job

40 mil thickness:
One gallon of **RBC** + 25% water covers 50 sq. ft. at 40 mils. A 1,000 sq. ft. job divided by 50 = 20 gallons or 4 – 5 gallon pails of **RBC** needed for the job. After adding the 25% of catalyzing water, the resulting yield is 25 gallons of ready-to-use **BMM**. (One 5 gallon pail of additional material for the "cost" of the water!)
62.5 mil thickness:
One gallon of **RBC** + 25% water covers 32 sq. ft. at 62.5 mils. A 1,000 sq. ft. job divided by 32 = 31 ¼ gallons or a little over 6 – 5 gallon pails of **RBC** needed for the job. After adding the 25% of catalyzing water, the resulting yield is 38 gallons of ready-to-use **BMM.** (About 7 + gallons of additional material for the "cost" of the water!)

As with any building material, a "safety factor" allowance should be figured in to compensate for uneven substrates, joint taping, patching and waste.
Another way of figuring material usage:

1 gallon **RBC** = 1,600 mil square feet (msf)
1 quart water = 400 mil square feet
1 1/4 gallons = 2000 msf in 1 1/4 gallons of **BMM**.

Divide by the desired thickness. **Example:**

1/4 inch = 250 mils, divided into 2,000 mils (1 1/4 gal. **BMM**) = 8 sq. ft. at 1/4 inch thick.

Divide the cost per gallon of **RBC** by 2,000 msf to get the per mil cost and then multiply by the mils thickness needed to figure the membrane cost per sq. ft.

"How To" and miscellaneous ramblings

When the **RBC** is mixed with water, you have about 15 - 20 minutes +/- to apply the **BMM** and still have it flow freely and self level easily.

On large jobs that will require multiple mixing cycles, so normally mix in half pail units as the job progresses. The mixer person is the key and he must time the mixing to keep a wet edge and not get ahead or behind the applicators. (It's a lot easier than it sounds. It just takes communication, practice and experience.)

The rule of thumb when applying the **BMM** is "The quicker the better!" In other words, don't hesitate. You can detail before and after the membrane is applied, but try not to "dawdle" while the material is setting up in the pail. The quicker it goes down, the better the material will lay out and smoothly self-level.

Hint: In HOT weather you can add COLD WATER to slow down the catalyzing rate and in COLD weather, HOT WATER to speed it up. As with everything else in life, experience and practice will make things easier as time progresses. Life is a learning curve!

Set Up Time

When the water is added, the final set up time will still depend on the weather and temperature. The additional of a chemical catalyst (The **green** colored vile.) is another tool to help meet your job needs. One vial of "green" is shipped with each pail of **RBC** and should be added when the pail is boxed and mixed in order to get the settled solids off the pail bottom and prior to the addition of water. This vial brings the pail up to the "normal" amount of catalyst. (This amount is kept out during manufacturing for better storage life.) If this vial is forgotten, the material will just take a little longer to set up. (But don't ever forget the water!!!)In cold weather, additional "**green**" chemical catalyst may be added to speed up the cure time. One additional 1 oz. vial per half pail mixing unit will maximize the curing time (1 for "normal" and 2 additional = 3 total per 5 gallon pail of RBC). The additional cost is only 2 to 3 cents per sq. ft. and it really speeds things up! The working time does not measurably change, just the end cure time, which means that you can get back on the cured membrane earlier to finish the job quicker.

Curing Time

On a "normal" 70-degree +/- day, the set up without additional chemical catalyst will be about 3 to 4 hours. With the addition of the "green" chemical catalyst, (3 vials max. per pail on very cold

days) the time can drop to about 2 to 3 hours, or even quicker in warmer weather. As always, experience is the only true teacher!

Adding filler material to the RBC

TUFFLEX RBC can be thickened with rubber granules or sand in order to use it in some really unique and very cost-effective applications.

The two rules of thumb are:

1. If you need the TUFFLEX mixture thick, mix it thick. If you need it thin, mix it thin. (Add more or less filler material.)
2. Don't ever forget the water!!!!!!

Yes, it's that simple. Mix thick or thin as needed after you throw in 25% water. It's almost contractor proof!

By using the TUFFLEX mixtures as your caulking or sloping materials, you will not have the waiting time that you would if you used cementitious or non-TUFFLEX caulking materials. These other materials must be allowed to dry out, out-gas and cure completely by being left open to the air. The TUFFLEX mixtures are internally curing materials and may be covered with the next application step as soon as they cure firm enough so that they do not lift up when applied over. (We call this "materials receptive." As long as you don't pull up more than you put down, you can proceed!)

Cove up the walls, patch the cracks, tape the joints, and slope to drain then cover those steps, with the membrane coat application. The materials will bond to each other and cure out as one flexible and monolithic unit. The entire deck can "rock & roll" as a unit. This really speeds up total completion time. Remember, time is money! When rubber granules are added to the TUFFLEX RBC it obviously creates a more flexible system than when sand has been added. But, both rubber and sand have their place on the job site.

Rubber is usually used when "caulking" or "spackling" mixtures are needed for filling cracks or coving up walls. You can use bulk guns or disposable tubes for application after the material has been mixed and thickened.) With the fillers, the cost is even less. Try to find a tougher or better caulk at any price!
(Refer to the TUFFLEX SPECIFICATION: "CRACK FILLING AND CAULKING MATERIALS" and the TUFFLEX "How to" Photo Job History: "Coving and Caulking with thickened TUFFLEX Materials" for further information.)

The TUFFLEX "Sand Slurry" is made with the "TUFF" material because you can add quite a bit of sand and it will still remains a very tough and solid material. A mixture of 1/2 to 1 unit of sand will still be a very fluid and easy to work mixture for filling surface spalling and general patching. By adding 1 ½ to 2 units of sand (With corresponding per unit cost savings) you can mix a stiff enough batch to form a sloping angle. If the deck flexes, the Sand Slurry will not de-laminate under the membrane like a cementitious or epoxy material would. This is why it works so well on plywood and twisting ship decks. Just part of the TUFFLEX "Rock & Roll" theory!
(Refer to the TUFFLEX SPECIFICATION: "SAND SLURRY SPECIFICATION and APPLICATION GUIDE".)

Readily available 20 mesh silica sand is fine for the Sand Slurries, and either the EPDM texture rubber or the finer ground black tire rubber can be used for the caulking or coving tasks. If a lot of rubber is needed, the properly cleaned black tire grindings are less expensive than the EPDM texture rubber.

"T" Joint

In the TUFFLEX "T" Joint system, the "SOFT" binder is used in the expansion joint and the "TUFF" material is applied as a membrane over the top to form a monolithic "T" Joint. The joint will still be visible as it expands and contracts, but the edge wear, high heel shoe penetration problems and edge leakage are eliminated.

Many more uses for TUFFLEX Materials & Systems can be found in our brochures, specifications book, on our web site www.tufflexpolymers.com and the Photo Job Histories on our CD, which is available through our web site or by calling our office.

Compatible Solvents

Use with caution, since solvents are flammable.

Always check your local V.O.C. limiting requirements when selecting solvents for clean up. Sometimes, in some regulatory areas, the primers and color coats can be cut with solvent for economy and/or ease of application. Please check the specific TUFFLEX Technical Data Sheet for further info.

Xylene and Toluene are compatible for use with epoxy primers and urethane grade PDA Acetate is compatible with polyurea-urethanes. **Never** use a solvents that contains alcohol, it has a negative effect on polyurea-urethane membranes.

Always read and understand the MSDS information for all materials used on the job site.