



Field Pesticide Application Techniques in Wisconsin

“Okay . . . I have my applicator certification and licensing credentials, I know which pesticide products to apply for the pest problem at hand, and I’m proficient at operating the king-size spray rig that I will be calling my home for the next 3 months . . . I’m all set for tomorrow’s first solo job.

But, wait a sec. How am I to start that field again?”

This question, and the anxiety that accompanies the first-time applicator, certainly cannot be uncommon. But without a tutor to turn to, who or where does an inexperienced applicator seek help? The purpose of this fact sheet is to provide guidance in answering that question, and to help a beginning applicator achieve a quality application with the very first job.

Why should I be concerned? Because your customer wants a good applicator, one who will be remembered for the quality of a pesticide application performed rather than how fast it was done. The two most important factors in doing pesticide application work are your attitude and knowledge. Yes, that new rig and its high-tech equipment will make doing your job easier, but a good applicator is what growers are truly seeking.

Applicator Attitude

A lot is at stake with each application: every job is different, every site has different features, and every customer has different expectations. When Farmer Joe orders an application, it is *his* field that he is most concerned with – not the ten fields that you already treated today or the five fields that you must finish before your day is over. He has put his trust in you and your company.

There are three underlining principles that a professional applicator must always remember:

- **Treat each field as though it is your own:** apply the right product, at the right rate, to the right field, using the right application method.
- **Be conscious of the image you project:** the appearance of your equipment, your personal appearance, your actions, and your smile provide lasting impressions.
- **Do not try to hide an application error:** someday, you will mess up! People will more easily accept a mistake than your failure to inform them of it.

Applicator Knowledge

We already mentioned that each customer expects something different, but other people have different expectations of you as well. More specifically, your customer wants you to have the skill to assess each job site on how best to treat it; your boss wants productivity and for you to complete tasks in a timely manner; and your insurance carrier wants you to have the foresight to recognize trouble (nearby sensitive crops, drift

potential, inversion development, etc.) and for you to avoid it.

And it doesn't end here! To meet these and the expectations of still others, there is a long check list of things that you must do or think about before, during, and after an application. Although your pesticide applicator certification training manual provides book knowledge for many of these items, it lacks the hands-on component and the description of techniques of the actual spraying process. Therefore, this fact sheet will pick up where the training manual ends and focus on just one aspect of the proper application techniques: starting and spraying fields under various field conditions and obstacles.

I. Arriving at the Field

Upon your arrival, determine whether the adjoining properties are deemed sensitive (other crops, gardens, residences, public areas, etc.). If wind is low or blowing away from such areas, start spraying on that side of the field. If wind is blowing towards a sensitive area, return to the field when weather conditions are favorable.

Upon your return, and if you are still unsure whether drifting spray particles will harm a nearby sensitive area, DO NOT spray the field. Only you can make that decision – it's the correct choice, even though your customer (*and boss!*) may not appreciate it at the time. For more information on drift potential and how to minimize drift, see bulletin, "Managing Pesticide Drift in Wisconsin: Field Sprayers", available from your county Extension office, or download from <http://ipcm.wisc.edu/pat/>

Never spray a field if there is any doubt about its location!

With today's equipment and field sizes, an applicator can easily treat over 100 acres per hour. If the treatment cost is \$40 per acre and you spray 100 acres per hour, that's \$4,000 per hour or over \$1 for every second you're rolling down the field. A pretty nice income stream – until you realize that you're in the wrong field and damaging a crop whose value is \$500 per acre.

Now that income is turning into a damage claim at a rate of \$14 per second! *The big insurance claims are generally not due to drift but, rather, spraying the wrong fields.*

II. Starting the Field

The most common method for starting a field is to spray a single opening round (also called outlining a field) on all four sides of the field (Figure 1A).

An opening round allows you to treat around trees, power poles, guy wires, and other obstructions that are usually found along the field's edges. Plus, when making the back-and-forth passes to treat the inside portion of the field, the treated headlands provide adequate turning room to avoid hitting these obstructions and to get up to speed for making the next pass. The wheel tracks across the headlands also serve as approximate markers for when to shut off your booms and to begin your turn.

The advantage of a single opening round is that there is less running down of the crop in the headlands, especially if it's already emerged. However, sometimes field obstructions or adjacent sensitive crops may necessitate that two opening rounds be sprayed or, at the very least, a second swath laid down along one side of the field to provide the additional buffer.

The disadvantage of an opening round is that by the time you get to the point of finishing up spraying the interior of the field, the foam mark that you laid down on that side of the field has disappeared and you'll need to rely on your wheel tracks when making the last swath.

An Alternative Method

When finishing a field, a partial boom swath is generally necessary when making the last pass. In a field where you sprayed all four sides in the opening round, a partial boom width is often needed to avoid swath overlap with the round you made earlier. Therefore, another option is to spray a double opening round on three sides of the field so that the partial swath occurs along the field edge rather than being sandwiched between

two sprayed swaths when all four sides are sprayed (Figure 1B). Doing so offers the same advantages as described for Figure 1A, but it also has the same disadvantage in that by the time you make the last back-and-forth inside pass, the foam mark laid down in the headlands has usually disappeared before getting back to that side of the field.

Done correctly, however, there is not a marked performance advantage of one method over the other. Therefore, the method that you eventually choose to use will most likely be based on personal preference.

Spraying Corners

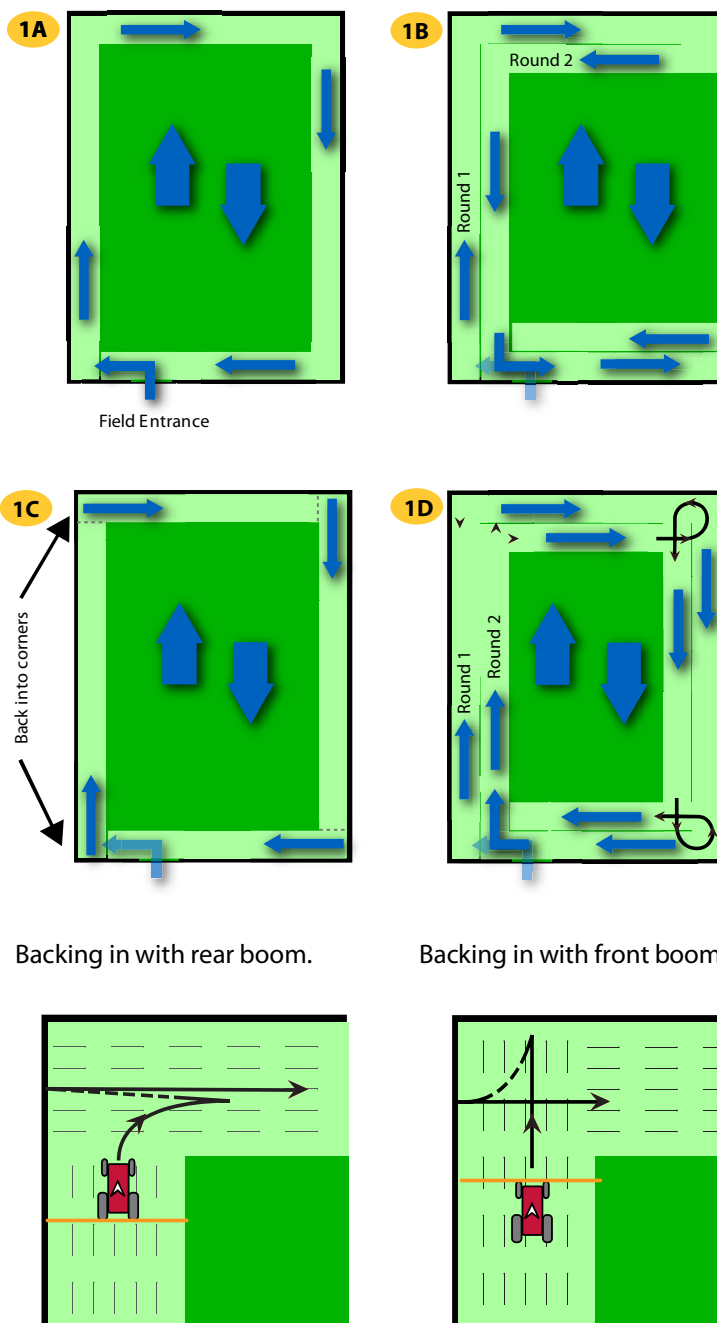
When outlining a field, you must back into each corner of the field to get complete coverage (Figure 1C). Where you stop spraying as you approach the opposite corner depends on your boom's configuration. Obviously, for front-mounted booms you'll spray up to the border's edge on the other side of the field. For rear-mounted booms, you'll need to stop spraying short of the border's edge equal to your boom length. When making a second opening round, whether spraying four sides or three sides of the field, you'll need to either again back into each corner for the second round or, if there are no obstructions, you may be able to make cloverleaf corners without backing up (Figure 1D). Due to wheel ruts made while turning, cloverleaf corners are best done in preplant or preemergence fields, or in burndown situations.

Charging Booms

Start out of the first corner and charge your booms while running. However, realize that a full rate is not being applied at the outer ends of your boom and that some weeds will survive. As this is not acceptable to most growers, one method to

Figure 1: Starting the field.

When entering a field, turn left if your cab is on the left, or turn right if your cab is on the right.



minimize the area where little or no pesticide is applied is to switch to manual override on your rate controller and increase output to fill the boom faster. Then, as you start out, switch back to your normal setting. An alternative method is

to plop a foam mark when the booms become fully charged (or use colored dye) and retreat that area either by shutting off sections of the boom in the same consecutive order that they were first charged, or by driving at normal speed at the beginning of the run and increasing your speed as you near the foam mark. With experience, you'll soon know how many seconds and gallons of mix it will take to charge your boom and you can use that information rather than using foam or dye.

With any retreating method, you are responsible to avoid the over application of pesticides. One method to help minimize your chance of exceeding the label rate is to spray at half-rate while charging your boom and again at half-rate when retreating the area with a charged boom. With this method, at least a half-rate will be applied to the outer boom areas at the beginning of the second run, and increase to full rate near the end of the run.

Realize, too, that not every spray job needs to begin with an empty boom. For example, when spraying the same mix to multiple fields, shut off your fully charged boom when finishing one field rather than emptying it. That way, you can immediately start your subsequent field with a full boom.

Under no circumstance should you charge the boom while the spray rig is stationary with the boom backed into a fence line or field border. A fence line is most likely not a registered site for the pesticide you are applying (thus, making it an illegal application), and stationary charging of booms may kill grass in ditches, damage the crop along the field edge, or carryover and injure next year's crop. An exception to stationary charging is when you're blowing out rinse water after a thorough cleaning of the spray tank.

Spraying Field Borders

In comparison to the rest of the field, borders take quite a beating: frequent equipment traffic, wheel ruts, higher potential for overlaps, and increased risk of crop damage. A common occurrence when spraying field borders is that the end nozzle along a field's edge is not applying the full labeled rate (Figure 2A). This is because

most nozzles are designed for some spray pattern overlap to provide full coverage across the length of the boom. If overlap is not correct, inadequate pest control may result, especially along fence rows where weed and insect pressure is already high.

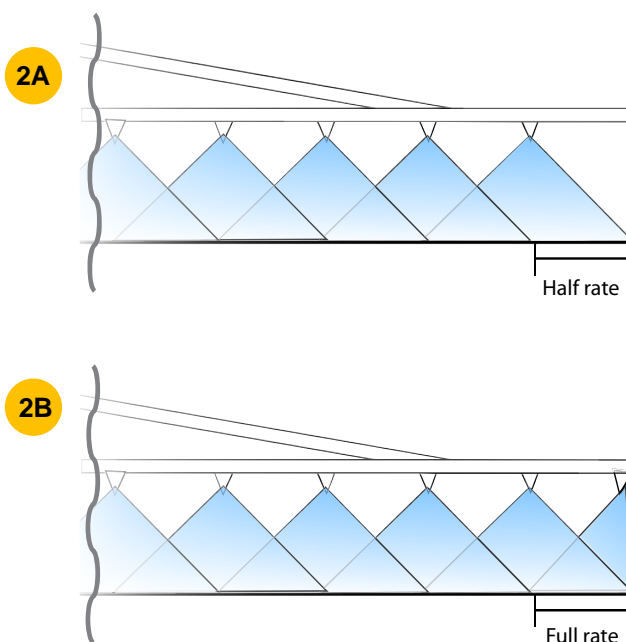
To overcome this, install an off-center nozzle at the end of the boom to provide 100% overlap (Figure 2B). This nozzle is turned on to give a full rate at the field edges, but turned off when spraying the remainder of the field. The nozzle opening should be half the size of the other tips on the boom to achieve one-half rate.

Spray Pattern Overlap

As already mentioned, most nozzles are designed for some spray pattern overlap to provide full coverage. The amount of overlap required, anywhere from 30% to 100%, is determined by the nozzle spray angle and nozzle spacing on the boom. A third factor, nozzle (boom) height, affects the amount of overlap actually achieved. Nozzle height is measured from the nozzle tip to the top of the target. Thus, for preplant and preemergence applications, the

Figure 2: Spray coverage of the boom end.

How to achieve 100 percent coverage.



soil surface is the target but, for postemergence applications, measure from the top of the weed to get an accurate height.

As the boom is lowered, pattern overlap will decrease resulting in a lower rate of pesticide applied between nozzles. This is why it is important to keep the boom as parallel as possible with the target surface. To help maintain a relatively uniform application over uneven field surfaces, use nozzles designed for 100% overlap.

Figure 3 shows the importance of keeping the boom level, and using nozzles and spacing that provide 100% overlap. In Figure 3A, the arrow points to a 30% overlap as intended (the portion of the boom nearest the spray rig), but as the boom extends outward over an inclining field surface, the overlap decreases to the point of leaving unsprayed gaps between nozzles. Figure 3B also shows decreasing overlap the farther the boom extends from the spray rig, but with 100% overlap there is a better chance of achieving some overlap with the end nozzles even though it's less than perfect.

Swath Overlap

Swath overlap between passes must be the same as the spray pattern overlap to get the same

pesticide coverage. For example, if the spray pattern overlap is 100% along the boom, then the swath overlap between passes also must be 100%. The greater the pattern overlap and nozzle spacing, the greater the leeway between passes before skips appear or over-applying a pesticide.

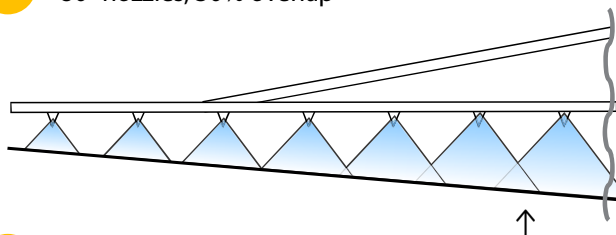
Figure 4 shows the difference in leeway between passes, and the advantage of greater spray pattern overlap and nozzle spacing when swathing. A perfect overlap requires that you drive exactly the same distance between passes as the nozzle spacing you are using (20" in Figure 4A; 30" in Figure 4B). In Figure 4A, skips occur when you drive greater than 26" apart between passes, and over apply pesticide if you drive less than 20", giving you a 6" margin for error. But with 100% overlap and 30" nozzle spacing, you have 30" of leeway before skipping or overapplying, a 400% increase in your margin of safety.

Foam Markers

The location of the foam marker will affect the positioning of the boom on the return pass relative to the foam. In Figure 5A, the marker is attached even with the last nozzle at the end of the boom. If your nozzle spacing is 30", position

Figure 3: Keep the boom level.

3A 80° nozzles, 30% overlap



3B 110° nozzles, 100% overlap

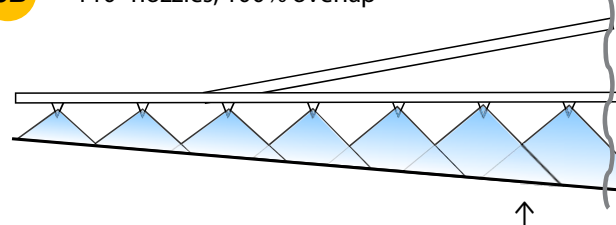
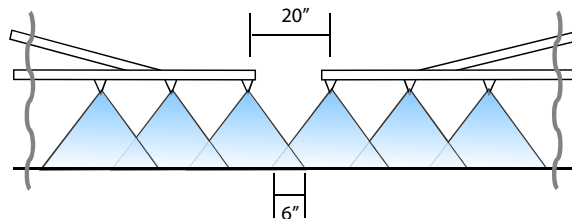
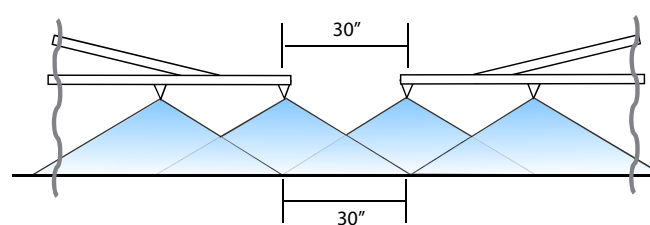


Figure 4: Boom spacing and overlap.

4A 30% overlap, 20" spacing



4B 100% overlap, 30" spacing



the end of the boom on the return pass 30" from the foam mark (i.e., the outside edge of the spray pattern should reach the foam mark).

Some foam markers are placed on an extension attached to the end of the boom (Figure 5B). The length of this extension is 50% of the nozzle spacing. With such setups, you would position the foam marker on the return pass directly above the foam.

III. Finishing the Field

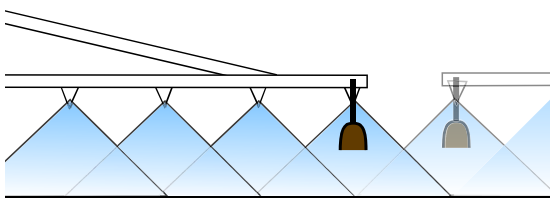
After outlining a field, begin spraying the interior of the field.

Field With Rows

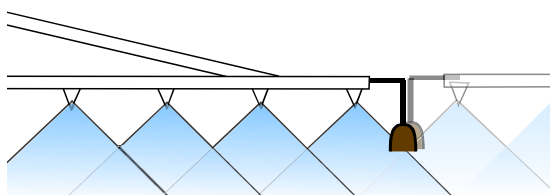
If planter tracks or crop rows are visible, it is best to straddle them. With narrow rows (e.g., 20 inches), your spray rig's tires may be wider than the width of the row. For such situations, growers may want you to spray perpendicular to rows because the wheels will do less crop damage.

Figure 5: Foam markers.

5A Foam marker is even with end nozzle



5B Foam marker on an extension equal to 50 percent of nozzle spacing

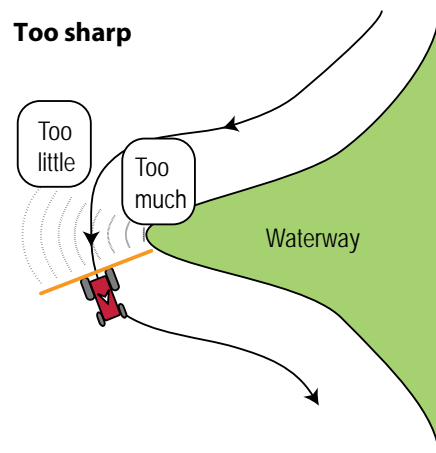


Spraying While Turning

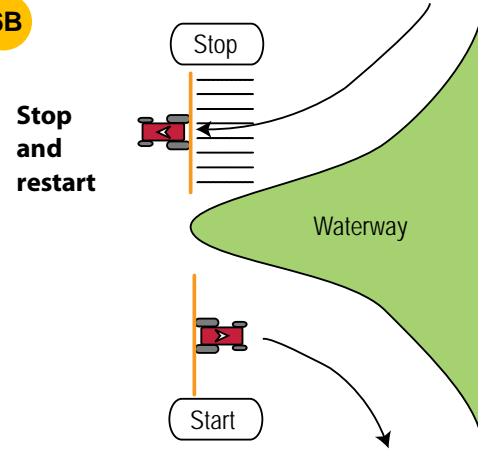
Spraying while making sharp turns can result in 3 to 4 times the desired pesticide rate along the inner boom, and as high as 40 to 50 times at the pivot position. Yet, the rate of pesticide near the end of the outer boom can be 1/2 to 1/10 the desired rate (Figure 6A). It should be obvious, then, that one must avoid the practice of sharp turns while spraying!

Figure 6: Sharp turns and even rates.

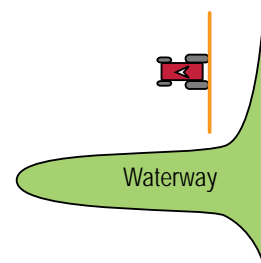
6A Too sharp



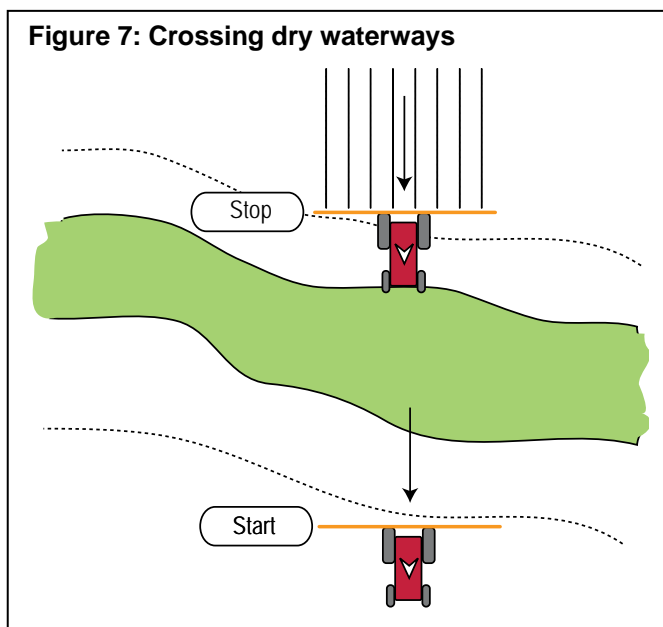
6B



6C Back into corners



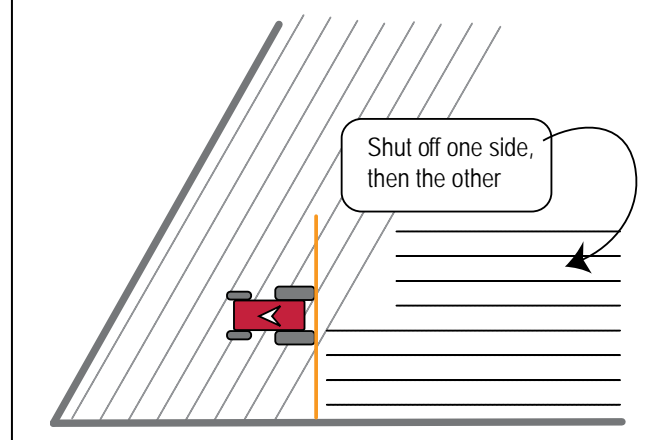
To minimize uneven application rates when spraying around waterways or other irregular-shaped areas, outline those areas with a single round. For the waterway shown in Figure 6B, spray in a straight line as much as possible along the waterway's edge. Then, when you reach the end of the waterway, turn off the sprayer, make your turn, and begin spraying again in a straight line on the other side of the waterway. If the waterway is more squarish at the field border as shown in Figure 6C, back into the corners like you did when starting a field and then outline each side of the waterway as just described. If you're able to drive across a waterway (Figure 7), first outline each side of the waterway. Then, when making the back-and-forth inside passes, shut off sections of the boom that reach the waterway first to avoid swath overlap with the outline round (see next section about spraying point rows).



Spraying Point Rows

A row crop planted in irregularly-shaped fields creates rows of different lengths. Although you outline such fields like you do with any other field, spraying point rows (i.e., uneven row lengths) is a challenge in preventing swath overlap. Shut-off switches controlling every 2 to 3 nozzles provide greater flexibility in treating uneven row lengths without overlap (Figure 8) or,

Figure 8: Irregular-shaped fields



as discussed earlier, when finishing the field with the last swath that is narrower than the boom length. Applicators find it easier to spray from long to short rows. Doing so allows you to turn on sections of the boom in the return swath in the reverse order as you shut them off.

Credits & Acknowledgements

Authors: Roger Flashinski, UW-Extension Pesticide Applicator Training Program, and Chris Boerboom, UW-Extension Weed Scientist, University of Wisconsin-Madison.

The authors wish to acknowledge Agrilience, Agronomy Services, for their permission to use portions of their work, Commercial Applicator Manual, rev December 2001. Special thanks to Harold Giddley, Cooperative Services, Denmark, Wisconsin, for his review from the perspective of a professional commercial applicator, and the sharing of his spraying experiences. We also extend our appreciation for the graphics and layout created by Roger Schmidt, IPM Program, University of Wisconsin.



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