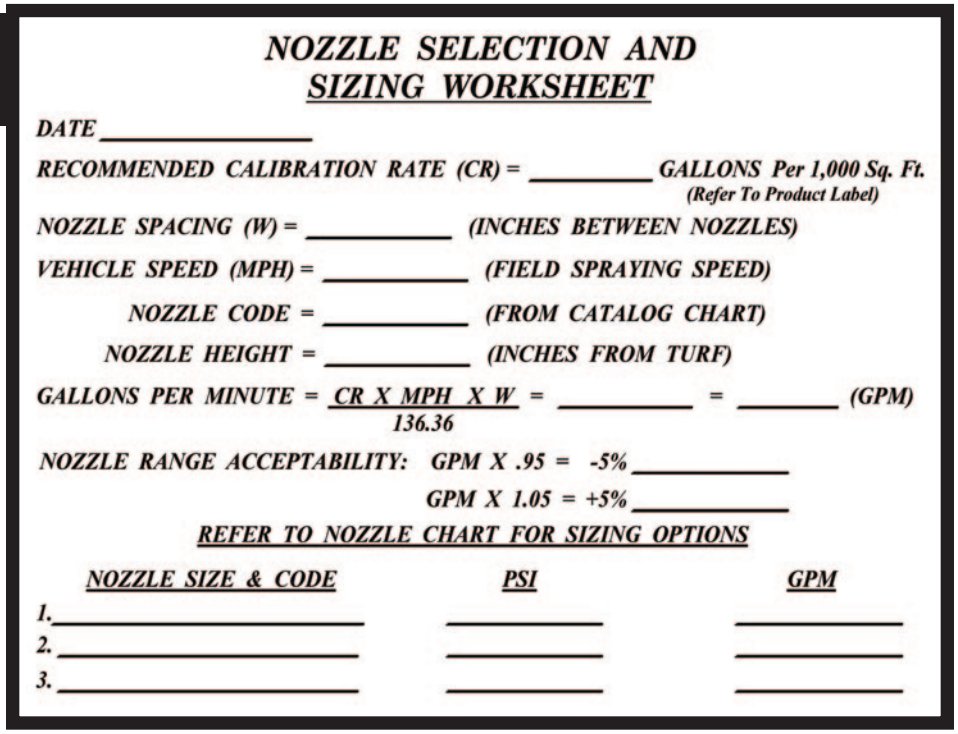
FIGURE 2



NOZZLE SELECTION AND SIZING WORKSHEET

DATE _____

RECOMMENDED CALIBRATION RATE (CR) = _____ GALLONS Per 1,000 Sq. Ft. (Refer To Product Label)

NOZZLE SPACING (W) = _____ (INCHES BETWEEN NOZZLES)

VEHICLE SPEED (MPH) = _____ (FIELD SPRAYING SPEED)

NOZZLE CODE = _____ (FROM CATALOG CHART)

NOZZLE HEIGHT = _____ (INCHES FROM TURF)

GALLONS PER MINUTE = $\frac{CR \times MPH \times W}{136.36}$ = _____ = _____ (GPM)

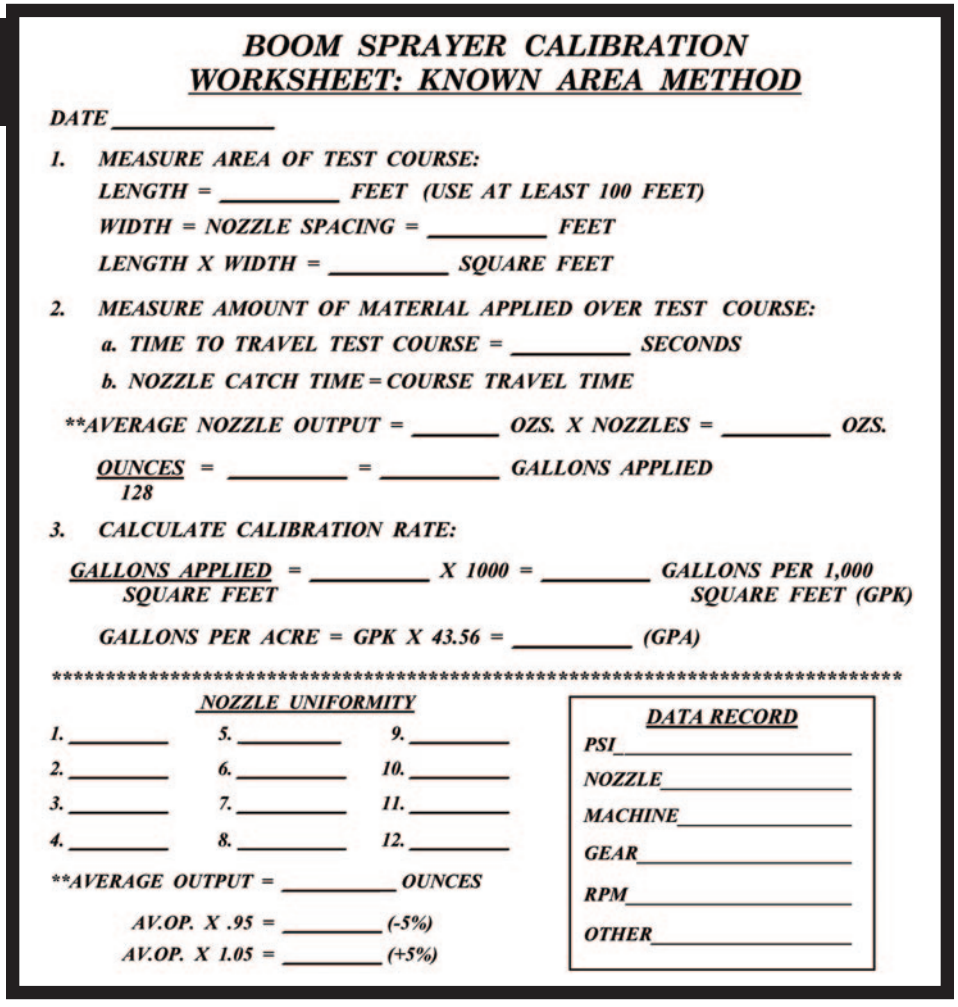
NOZZLE RANGE ACCEPTABILITY: GPM X .95 = -5% _____

GPM X 1.05 = +5% _____

REFER TO NOZZLE CHART FOR SIZING OPTIONS

NOZZLE SIZE & CODE	PSI	GPM
1.		
2.		
3.		

FIGURE 3



BOOM SPRAYER CALIBRATION WORKSHEET: KNOWN AREA METHOD

DATE _____

1. MEASURE AREA OF TEST COURSE:
   LENGTH = _____ FEET (USE AT LEAST 100 FEET)
   WIDTH = NOZZLE SPACING = _____ FEET
   LENGTH X WIDTH = _____ SQUARE FEET

2. MEASURE AMOUNT OF MATERIAL APPLIED OVER TEST COURSE:
   a. TIME TO TRAVEL TEST COURSE = _____ SECONDS
   b. NOZZLE CATCH TIME = COURSE TRAVEL TIME

**AVERAGE NOZZLE OUTPUT = _____ OZS. X NOZZLES = _____ OZS.

$\frac{OUNCES}{128}$ = _____ = _____ GALLONS APPLIED

3. CALCULATE CALIBRATION RATE:

$\frac{GALLONS\ APPLIED}{SQUARE\ FEET}$ = _____ X 1000 = _____ GALLONS PER 1,000 SQUARE FEET (GPK)

GALLONS PER ACRE = GPK X 43.56 = _____ (GPA)

****

NOZZLE UNIFORMITY

1. _____	5. _____	9. _____
2. _____	6. _____	10. _____
3. _____	7. _____	11. _____
4. _____	8. _____	12. _____

**AVERAGE OUTPUT = _____ OUNCES

AV.OP. X .95 = _____ (-5%)

AV.OP. X 1.05 = _____ (+5%)

DATA RECORD

PSI _____

NOZZLE _____

MACHINE _____

GEAR _____

RPM _____

OTHER _____

flow rate chosen for the equipment.

7. Follow nozzle manufacturer's recommendation for proper nozzle height.

BOOM SPRAYER CALIBRATION: KNOWN AREA METHOD (FIGURE 3)

1. Measure a level test course at least 100 feet long on a turf area (not a parking lot or cart path). The width of this test course will be the spacing between each nozzle in feet.

Nozzle Spacing in Inches divided by 12 = Test Course Width in Feet. Total square feet of the area is Length X Width.

2. Fill machine 1/2 full of water to simulate average load and record the exact number of seconds to travel the entire test course at normal operating speed. Use a calibration jar to collect the flow from each nozzle for the same amount of time it took to cover the test course. Calculate the average nozzle output and replace or clean any nozzle with a flow rate not within 5% of the average. Average Nozzle Flow in Ounces divided by 128 oz. per gallon = Average Gallons Applied

3. Record all data for future use. Calculate your + or - 5% acceptable error range (Target Area vs. Sprayed Area). Each time you use your sprayer, the calibration rate must fall within these values. Either repair or replace components causing calibration rate inaccuracy.

TIPS: Check for wear more frequently when spraying wettable powders. Verify the accuracy of your measuring devices.

EASY METHOD SPRAYER CALIBRATION (128TH ACRE TEST)

1. Fill spray tank with clean water.

2. Verify that spacing between nozzles is equal (record in inches).

3. Perform nozzle uniformity test.

4. Measure test course. (Use chart below or formula to determine course length.) (Formula: 4080 / Nozzle Spacing in Inches = Test Course in Feet.)

5. Drive the test course at your normal spraying speed and record travel time in seconds.

6. Park sprayer while maintaining the same engine RPM used to drive the test course.

7. Set pressure to be used while spraying.

8. Collect the output from one nozzle for the same amount of time it took to travel the course.

9. Each ounce collected equals a gallon per application rate. (Example: 52 ounces collected equals 52 gallon per acre application rate)

Nozzle Spacing - Test Course Chart	
Nozzle Spacing (Inches)	Test Course Length (Feet)
20	204
18	227
16	255
14	291
12	340
10	408

TANK MIXING (FIGURE 4)

1. Determine the recommended application rate from the product label. This value can be in fluid or dry ounces.

2. Enter the calibration rate measured from the sprayer.

3. Calculate the product per gallon ratio according to the worksheet.

4. Calculate the amount of product required for each tank or partial tank. Before adding product, you should fill the tank 1/2 full of water and begin agitation. After product's been added, bring tank up to desired level/volume.

For planning purposes, it may be useful to calculate the following:

5. Estimate the area to be treated. This value will be slightly larger than actual green or fairway size due to overspray of irregular areas.

6. Estimate the total water requirements. You can use this figure to determine how many spray tanks the application will require.

7. Estimate the product requirements and check if supplies are adequate before mixing.

TIPS: Verify the markings on your spray tank for accuracy and use a dipstick or flow meter to measure partial tanks. Do

FIGURE 4

TANK MIXING WORKSHEET

*DATE*_____

*PRODUCT NAME*_____

PRODUCT LABEL RATE = _____ *OUNCES PER 1,000 SQUARE FEET*

ACTUAL CALIBRATION RATE = _____ *GALLONS PER 1,000 SQUARE FEET*

PRODUCT PER GALLON = $\frac{\text{PRODUCT LABEL RATE}}{\text{CALIBRATION RATE}}$ = _____ *OUNCES OF PRODUCT PER GALLON OF WATER*

AREA TO BE SPRAYED (estimated) = _____ *1,000 SQUARE FEET*

TOTAL WATER REQUIRED = CALIBRATION RATE X AREA TO SPRAY = _____

TOTAL PRODUCT RQUIRED = PRODUCT RATE X AREA TO SPRAY = _____

****

PRODUCT IN TANK # 1 = GALLONS OF WATER X PRODUCT PER GALLON

(If Required, Calculate Additional Tank Mixes)

PRODUCT IN TANK # 2 = GALLONS OF WATER X PRODUCT PER GALLON

FIGURE 5

CALIBRATION:
ADVANCED SECTION WORKSHEET

DATE _____

1. *CALIBRATE THE MPH YOU NEED TO GET EXACTLY 2.0 GALLONS PER 1,000 SQUARE FEET.*

2. *CALCULATE THE GPM NEEDED FOR 2.0 GALLON PER 1,000 SQUARE FEET. DO YOU NEED TO SELECT A LARGER VOLUME NOZZLE?*

3. *CALCULATE THE ACTUAL NOZZLE PRESSURE.*
   (Refer to Nozzle Manufacture's Flow Chart)

$$\frac{GPM_1}{GPM_2} = \frac{\sqrt{PSI_1}}{\sqrt{PSI_2}}$$

not mix more solution than is required for the operation.

INSTRUCTIONS FOR THE ADVANCED SECTION (FIGURE 5)

You've measured the actual calibration rate of the sprayer. You want to spray a calibration rate of 2.0 gallons per 1000 square feet. Determine how to make the adjustments in question #1 and #2.

1. If you only want to change your sprayer speed to achieve the new calibration rate, how fast would you need to go? MPH = 136.36 X GPM divided by CR x W

2. Instead of changing your speed to achieve a new calibration rate, you decide to change only nozzle flow. What is the new GPM? Do you need to select a larger nozzle or just change the pressure? GPM = CR X MPH X W divided by 136.36

3. This is a useful method to calculate your actual nozzle operating pressure. The formula allows you to compare field measurements to nozzle performance charts. This calculation is used primarily to track the amount of pressure drop in your sprayer.

GPM (1) = Measured nozzle flow from sprayer (Actual Catch).

GPM (2) = Flow rate from nozzle performance chart.

PSI (1) = Actual nozzle operating pressure. PSI (1) is X, the unknown value. Find X to solve the equation.

PSI (2) = Nozzle pressure from chart that corresponds with GPM (2).

LAWN GUNS, BACKPACK AND BOOMLESS SPRAYER CALIBRATION (FIGURE 6)

1. Pick a level turf area and mark a rec-

FIGURE 6

LAWN GUNS, BACKPACKS and BOOMLESS SPRAYERS CALIBRATION WORKSHEET: KNOWN AREA METHOD

DATE _____

1. MEASURE AREA OF TEST COURSE:
   LENGTH = _____ FEET
   WIDTH = _____ FEET
   LENGTH X WIDTH = _____ SQUARE FEET
2. MEASURE AMOUNT OF MATERIAL APPLIED OVER TEST COURSE:
   a. TIME TO TRAVEL TEST COURSE = _____ SECONDS
   b. NOZZLE OUTPUT (catch time-same as travel test course) = _____ OUNCES

   $\frac{\text{OUNCES}}{128} = \frac{\quad}{128} =$ _____ GALLONS APPLIED
3. CALCULATE CALIBRATION RATE:
   $\frac{\text{GALLONS APPLIED}}{\text{SQUARE FEET}}$ = _____ X 1000 = _____ GALLONS PER 1,000 SQUARE FEET (GPK)
   GALLONS PER ACRE = GPK X 43.56 = _____ (GPA)

USEFUL FORMULAS

$\frac{\text{OUNCES}}{128} = \text{GALLONS}$

GALLONS Per 1,000 Sq. Ft. X 43.56 = GALLONS Per ACRE

DATA RECORD

PSI _____
NOZZLE _____
SPRAYER _____
OTHER _____

FIGURE 7

SPREADER CALIBRATION WORKSHEET: KNOWN AREA METHOD

DATE _____

1. MEASURE AREA OF TEST COURSE:

   LENGTH = _____ FEET

   WIDTH = _____ FEET

   LENGTH X WIDTH = _____ SQUARE FEET

2. MEASURE AMOUNT OF MATERIAL APPLIED OVER TEST COURSE:

   MATERIAL WEIGHT PRIOR TO APPLICATION = _____ POUNDS

   MATERIAL WEIGHT AFTER APPLICATION = _____ POUNDS

   TOTAL AMOUNT OF MATERIAL APPLIED = _____ POUNDS

3. CALCULATE CALIBRATION RATE:

   POUNDS APPLIED / SQUARE FEET = _____ X 1000 = _____ POUNDS PER 1,000 SQUARE FEET

   POUNDS PER 1,000 SQUARE FEET X 43.56 = _____ POUNDS PER ACRE

USEFUL FORMULAS

OUNCES / 16 = POUNDS

GRAMS / 454 = POUNDS

DATA RECORD

SPREADER_____

SETTING_____

MATERIAL_____

PASS WIDTH_____

MACHINE_____

GEAR_____

RPM_____

OTHER_____

Pesticide Compatibility

- Read Product Label
  - Review formulation compatibility statements
- Jar Test
  - Use a 1-quart clear glass jar and add 1-pint of clear water
    - add 1-1/2 teaspoons for each pound per acre recommended of the wettable powder
    - followed by 1 teaspoon for each quart per acre recommended of the liquid pesticide
    - shake the jar and let it stand for 2-3 minutes
    - if pesticides are non-compatible;
      - products may separate and form layers *or* a greasy film will form in the mixing container

Note: In some cases a compatibility agent can be added to solve the problem

TIPS:

Maintain a constant operating speed and pressure throughout entire application. Verify the accuracy of your measuring devices. Calibrate your equipment at the same speed, pressure and overlap as you will use in the field.

tangular test course (length X width - square feet) of approximately: 500-2,000 square feet for backpack sprayers and lawn guns, and 20,000-40,000 square feet for boomless sprayers.

2. Measure the exact amount of time to travel the test course under normal spraying conditions. Use a catch can or bag and calibration jar to measure nozzle flow in ounces from the machine for the same exact amount of time it took to cover the test course.

Ounces collected divided by 128 ounces = Gallons applied over test course

3. Calculate the calibration rate according to the worksheet and use it for tank mixing.

4. Record all data for future use.

TIPS: Maintain a constant operating speed and pressure throughout entire application. Verify the accuracy of your measuring devices. Calibrate your equipment at the same speed, pressure and overlap as you will use in the field.

SPREADER CALIBRATION (FIGURE 7)

1. Select a level area, preferably covered with turf and mark a rectangular test course of approximately: 1,000-5,000 square feet for small spreaders, and 10,000-40,000 square feet for larger spreaders.

2. Measure the exact amount of material applied over the area.

This can be done by:

A. Place a (weighed) known amount of material in the spreader. Re-weigh the material left in the spreader after completing the test course; or B. On larger machines, it may be necessary to place calibration marks on the spreader bin or place. A known amount of material in the spreader and measure the total area covered after all material is used.

3. Calculate the calibration rate according to the worksheet.

4. Record all data for future use.

TIPS: Maintain a constant operating speed throughout application. Flow rate and distance of throw vary according to the size and weight of the material. Follow manufacturer's recommendations for overlap. If unavailable, determine the amount of overlap required by placing a series of catch cans perpendicular to spreader travel and measuring the application pattern or use between 75-100% overlap of the width of throw.

Spreader Calibration: Known Area Method

Single Pass Calibration

Measure area of test course…

Test Course Length (ft.) **x** Effective Pattern Width (ft.) = Total sq. ft.

Example: 25 ft. length **x** 5 ft. effective pattern width **=** 125 square feet

Note: Rotary / Broadcast spreader effective pattern width is typically between 75% - 100% less than the overall pattern width.

I.e.: overall pattern width = 10 feet; effective pattern width = 5 feet

1. **Set the rotary spreader's rate gate opening to the recommendation published on the fertilizer bag (*per spreader brand, model, etc.*).**
2. **Partially fill the spreader with a pre-weighed amount of fertilizer to be used in the application.**
3. **Walk at *your* normal application pace. Achieve your application pace several feet before crossing the test course "Starting-line" and maintain your application pace several feet after crossing the test course "Finish-line".**

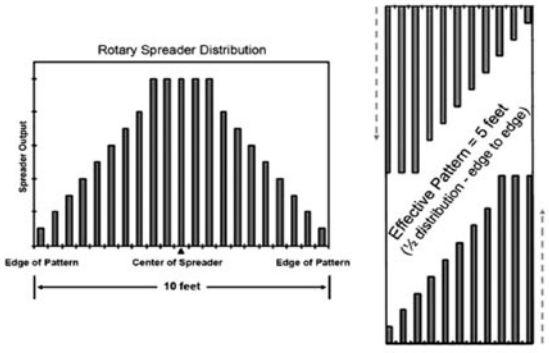
*** Turn the spreader on when the wheels are directly over the "Starting-line"… … (*example: 0 feet*).**

*** Turn the spreader off when the wheels are directly over the "Finish-line"… … (*example: 25 feet*).**

4. **Weigh the amount of fertilizer left in the spreader and subtract that amount from the pre-weighed amount.**

Note: A fraction of an ounce digital or analog scale is required for Single Pass Calibration.

Rotary Spreader Effective Pattern



SAFETY—THE "THREE C'S" PROGRAM

Control the spill. Immediate steps must be taken to control the spill. Make sure you are properly protected, isolate the area, avoid contact with the material, drift, or fumes, and evacuate any nonessential people from the area. Do not leave the spill unless someone can relieve you, preferably someone who has "Three C's" training. Once the spill is under control, get help immediately and notify your supervisor. Depending on the size of the spill, you may need to contact "HAZMAT", police, fire and rescue units, and the Dept. of Natural Resources.

Contain the spill. Contain the spill in as small an area as possible. Use a rake or a shovel to make a dam or dike around the spill to keep it from spreading. Block off any ditches or depressions in the area of the spill to insure the spill's containment. Do not allow the flow of material to reach any bodies of water.

Liquid pesticide spills can be further contained by the use of absorbent materials such as sand, sawdust, kitty litter or absorbent pads. Before using absorbent material, make sure the chemical is compatible with the absorbent material used. A reaction may occur between the spill and the material used to clean up the spill. Pesticides with strong oxidizers may create a fire when mixed with sawdust, thereby compounding an existing problem. (Chlorites in some herbicides and ammonium nitrate in some fertilizers are two examples of oxidizers.)

Dry pesticide spills can be contained by lightly misting the material with water, or by covering the spill with plastic.

Clean up the spill. Liquid: Spread absorbent material over the contaminated area, sweep it up and place it in a heavy-duty plastic bag. Repeat this procedure until the spill is cleaned up.

Dry: Material must be swept up and reused if possible. If material gets wet, becomes contaminated with soil or other debris, it must be swept up and placed in a heavy-duty plastic bag.

To decontaminate or neutralize the area, mix full strength, ordinary household bleach and hydrated lime. Wear protective clothing and work the preparation into the spill area with a course broom. Place the contaminated preparation in a heavy-duty plastic bag. Repeat this procedure several times to insure neutralization of the pesticide. Never hose down the contaminated area to dilute the pesticide. Activated charcoal can be used to minimize significant plant injury in smaller spills. Charcoal can tie up or absorb enough chemical to reduce long-term contamination.

Soil contamination: Remove the top two or three inches of soil, cover with at least two inches of lime and cover the lime with fresh top soil. Dispose of the contaminated soil.

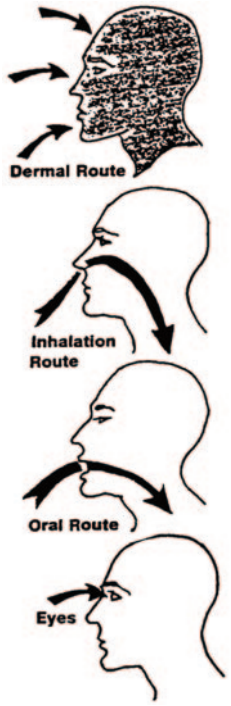
Clean or dispose of all equipment and materials used in the clean up in a manner consistent with label requirements and any EPA, local or state regulations.

All materials used to control, contain, and clean up a pesticide spill must be handled as hazardous waste and must be disposed of in a manner consistent with the label requirements and any EPA, local or state regulations. ■

Jim Nedin has been associated with the turf industry for 40 years. He began his professional career as a golf course superintendent in the early 70's and has taught turf industry related seminars for 30 years. Jim is a private service business consultant, and is currently working with select Toro distributors and The Toro Company, providing technical service support and training, jimwex2@gmail.com.

Routes of pesticide exposure

TO EFFECTIVELY GUARD AGAINST PESTICIDE EXPOSURE, we must first realize the risk involved when handling pesticides and how they enter our bodies.



FOUR ROUTES OF ENTRY

- **Dermal**. Studies show that about 97% of all pesticide exposures occur through contact with the skin. This absorption is accomplished by careless handling, while mixing or loading, applying or disposing of pesticides and their containers. The most common of these would be splashes, spills, or drift, while mixing or loading (handling the pesticide in its most concentrated form).

- **Inhalation**. We all know that the lungs oxygenate our blood. So if we inhale a sufficient amount of a pesticide into our lungs, complete and rapid pesticide poisoning will occur when the blood passes through our lungs then out, to travel in the blood stream throughout the entire body. Poisoning by inhalation is not limited by any means. Damage to tissue in the nose, throat, and lungs can also produce long-term health problems and illnesses.

- **Oral**. More often than not, children are victim of this type of exposure, greatly due to a careless applicator or even a parent who has removed a pesticide from its original container and put it into an unmarked bottle or other storage container. However, for our purposes, one must realize that oral exposure can occur with a simple lick of the lips, smoking, chewing (tobacco or gum), eating or drinking, while handling pesticides.

- **Eyes**. The eye though very small can absorb enough pesticide to be significantly hazardous. Poisoning here is most generally accomplished through the rubbing of one's eyes with contaminated hands. Spills, splashes and drift are also methods of entry to guard against.

TOXICITY (LD50, LC50)

What do we need to know about these two numbers? Simply put, the higher the LD50 or LC50 number, the lower the incidence of poisoning has occurred in laboratory testing of that pesticide. On the other hand, the lower that number, the greater the incidence of poisoning has occurred in lab testing, and those pesticides will generally carry a signal word of "Danger." Signal words are derived from LD (lethal dose) or LC (lethal concentrate) numbers, so if you can't find one of these numbers on the label, or MSDS, follow the signal word precautions.
For personal safety, always wear protective gear and always wash up immediately following contact with any pesticide.

Personal protective equipment

YOU NEED TO DECIDE! Read the label. The formulation, signal word, precautionary statements, personal protective equipment statements, the application method, and the projected length of exposure indicate the personal protective equipment you need.

MINIMUM EXPOSURE

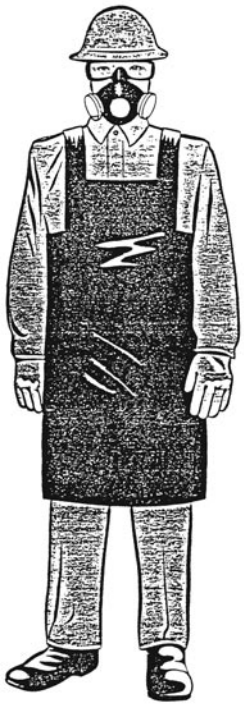
- (Such as granular applications and many other routine pesticide activities.)
- Protective suit (such as fabric coveralls) worn over normal work clothes.
- Chemical-resistant gloves such as rubber, vinyl, or plastic (never use fabric, leather, or paper gloves).
- Socks and shoes or boots

MAXIMUM EXPOSURE

- (Such as direct contact with drenching spray, mist blower or knapsack applications, or handling very highly toxic pesticides.)
- Chemical-resistant hood or hat
- Goggles or face shield
- Respirator (if the label requires it or if dusts, mists, fogs, or vapors will be generated).
- Chemical-resistant protective suit worn over normal work clothes.
- (A chemical-resistant protective suit may cause heat stress under some conditions.)
- Chemical-resistant gloves such as rubber, vinyl, or plastic (never use fabric, leather, or paper gloves).
- Chemical-resistant boots or footwear (never wear leather or canvas footwear).

Handling Concentrates

- This is the minimum protective clothing and equipment you should wear while mixing and loading pesticides which are moderately to highly toxic.
- Protective suit (such as fabric coveralls) worn over normal work clothes.
- Chemical-resistant apron
- Chemical-resistant gloves such as rubber, vinyl, or plastic (Never use fabric, leather or paper gloves)
- Chemical-resistant boots or footwear (Never wear leather or canvas footwear)



- Face Shield or goggles
- Respirator
(If the label requires it)

Removing paint from synthetic turf

WE CAUGHT MOST OF GRANT DAVISSON'S PRESENTATION on removing paint from synthetic turf at January's STMA Conference and then we spoke recently with the turf manager of the Minnesota Vikings to fill in the gaps in our notes:

Davisson calls it the "Zen" factor, the ability to chill out before you paint. "I preach this to new people; relax, have a clear head, and let the machine be an extension of your body," he said. "You have to romance it like dancer when your using a gun to paint logos. You can't be rigid. It's great to see after they figure it out."

Davisson says before you paint, you must prepare the field and do it on a good weather day. Groom and clean the turf before painting and clean any areas of built-up paint. Get your supplies together: tape measures, strings, machines, stencils, drift guards, and make sure and test the paint. Then, Davisson adds, "Measure twice then measure again."

REMOVING THE PAINT

Davisson says removing paint is easier with better results if done by hand and there is a craftsmanship element to it but that he's also used a Mantis machine that's done a good job, he says, especially if you can't rinse. "If you can rinse with a hose you must have drainage underneath," he says, "otherwise you are just pushing the paint into the infill. With no drainage, you probably will need a day and a half to drain.

"The #1 way to remove paint is brushes you work by hand, but watch out for those with metal bristles because you can tear your turf fibers. Plastic bristles might be preferred because while metal does a great job, it hurts the turf.

Davisson recommends scrubbing the hashmarks by hand in particular, saying the extractor machines aren't perfect.

"Talk to your manufacturers, both the turf company and the paint company, about removal products. There are sprays that will sit for 5-10 minutes and then you can scrub the paint off with damaging the fibers."

Davisson says you spray the remover product and let it set to give the chemical time to work. "When you scrub by hand using plastic bristles, first go one way then the other. This is a great workout and also can be used as punishment!" says Davisson. "For quicker changeovers, you can use a machine, for example hiring out a Stanley Steemer."

Getting "ghosts" of paint, the result of not doing a good enough job cleaning off paint, happens to everyone, Davisson says. "You'll get a faint image that you can groom in a couple of different directions, which will take eyes off the ghost."

REPLACING INFILL

Whether you extract the paint or scrub it away, you will displace infill, perhaps an estimated half pound for every 15 minutes of mechanical scrubbing. Davisson uses an infill depth meter to check where infill have been moved so he can replace it and brush and groom it in. "Grooming afterward is important, it disperses the crumb rubber evenly and gets your blades to stand up. Having those fibers stand up is more important than any patterns the marketing department might prefer, he says.

"Also, if you don't regularly remove the paint that built-up paint will increase compaction on your field and becomes a safety issue," he says.

ASK THE EXPERT

Doug Schattinger, president of Pioneer Athletics, answered a few questions via email recently on the subject of removing paint from synthetic turf.

SportsTurf: What is the difference between regular field paint and paint manufactured to be more easily cleaned from synthetic turf?

Schattinger: First, you have grass paint that is sometimes relabeled as removable synthetic turf paint. The recommended remover solution is often something like Simple Green or other general cleaner available from a large hardware store.

In reality using grass paints on a synthetic turf field is a double-edged sword. First, there is nothing in the chemistry of grass paints that would encourage the paint to stick to polypropylene. Second, there is nothing in the chemistry in grass paints to allow for removal from synthetic turf fibers (or any other surface). Therefore, we commonly find that grass paints will unevenly flake off the synthetic turf fibers and what paint remains on the fibers can be incredibly difficult to remove. Usually cleaning products like Simple Green are used in the hope that with sufficient scrubbing and any decent detergent, the paint will come off enough to meet minimum expectations.

Unfortunately, the paint that does come off comes off in flakes. The flakes get caught in the infill which can cause compaction and elevated G-Max ratings over time. Paint manufacturers will sometimes recommend that the customer add soap to the paint before application with the hopes that this would make removal easier. This can make the paint a little easier to remover. However, adding soap does not prevent the paint from flaking off and contaminating the infill.

Next you have removable synthetic turf paint with specially formulated remover solutions. These paints are designed to be removed from a synthetic turf field when the resin (glue) dissolves when interacting with the remover solution. When you apply the remover solution to a painted surface, you should be able to wipe a paper towel across the surface and wipe away paint with no scrubbing or agitation.

To remove the paint completely, the customer would apply the remover solution, agitate the painted fibers and rinse the paint through the infill. The latex (glue) should completely dissolve. When thoroughly rinsed through the infill, there should be no paint build-up in the infill. Agitating the paint with a special machine or a deck brush allows the re-

TIPS for removing paint on artificial turf

When painting artificial turf, it is important to put down a light coat. Airless sprayers are ideal for application of just enough paint to hide the green without soaking down into the rubber infill. It takes several days of good drying weather for paint to fully cure. Keep this in mind when deciding whether you want the paint to remain for a short of long period of time before removal. It is easier to remove paint a day or two after application, but it holds up better if it has a few good days to dry before use, especially if foul weather is expected.

Avoid removing paint in the heat of the day as it gives the remover more time to break down the coating before drying.- David Simmons, World Class Paints

mover solution to interact with the entire coated surface, not just the top layer. Each removable synthetic turf paint performs differently.

There are two key elements in this system that need to work together: First, the paint needs to be carefully formulated:

- It needs to stick to polypropylene fibers.
- The pigments must be carefully chosen so they do not stain white lines or colored logos.
- The resin system must release completely when exposed to the remover solution.
- The formulation must be friendly to players and the environment.

Second, the remover solution needs to be carefully formulated for synthetic turf:

- The remover solution must completely dissolve the resin system.
- The remover solution must not harm the backing layers, the glues used to adhere seams in the turf, or the urethane backing.
- The remover solution must not alter or harm the infill materials.
- The remover solution must be friendly to players and the environment.

ST: What procedures do you recommend that your customers follow to successfully remove paint from synthetic surfaces?

Schattinger: First, apply the paint with an airless sprayer at around 900-1,000 psi. If the pressure is too high, the paint is blown into the infill which makes removal more difficult. Using low pressure machines can allow the paint to drip down the blade into the infill making removal more difficult. Apply the least amount of paint necessary to get the desired look.

Apply a liberal amount of remover solution using a pump up sprayer or equivalent. Agitate. Rinse with water. Repeat as necessary. When the field surface exceeds 100 degrees, the remover solution may evaporate very quickly which makes removal significantly harder. We strongly recommend removing during the coolest part of the day. During the summer in the South, we find that we need to remove before 9 in the morning or after 4 in the afternoon. When rinsing, do not allow the water to puddle if you can see any pigment or paint residue in the water.

ST: Are there field hardness/Gmax issues with failure to remove paint regularly or successfully?

Schattinger: Grass paints, wall paints and other non-removable paints will flake off and remain in the infill. These flakes are too small to be removed with synthetic turf groomers and sweepers. Over time, these flakes will clog up the infill which will increase compaction, reduce drainage and can significantly raise Gmax. If contaminated sufficiently, the only recourse is to replace the infill.

Removable synthetic turf paints, if not thoroughly rinsed through the infill can re-set once the remover solution evaporates. This process can effectively glue infill together hurting drainage and raising G-max. However, the removable paint will re-dissolve when treated again with the remover solution which would allow for a field manager to thoroughly rinse the paint through the field. In facilities that require regular painting and removal cycles and have little to no drainage, the customer may need to use water extraction equipment to remove residual paint. This is especially important for indoor facilities with regular field conversions.

VAIL EXPERIMENT

Tony Giroux, sports field manager for the Vail (CO) Recreation District, recently used LinkedIn to ask for advice on removing paint from synthetic turf. We asked him about the response. "I found the LinkedIn responses very helpful. Most of the responses suggested that the mechanical brush is best to use to remove synthetic turf paint; manually brushing the paint with a push broom is another budget beater method. Unfortunately I have yet to try these methods out on a large scale. You see, I manage all natural turf fields here in Vail. A quick drive down the road from us is the Vail Mountain School. VMS maintains a well maintained synthetic soccer field and our plan for the summer was to use this field in a "rain-out" situation where we may be hosting a lacrosse tournament and our natural fields are too wet to play on. Our thoughts were to use the synthetic erasable paint to quickly paint a field on VMS property and continue the tournament during inclement weather. Since the season is still relatively young, I haven't had the opportunity to try out our removing skills with the exception of a "test strip" measuring about 3 feet long.

"I purchased GameLine aerosol removable marking paint with Blitz remover solution. We performed a quick removing test on the test strip. The removing results were nearly instantaneous. After letting the paint dry, we sprayed Blitz directly onto the dried paint. Then we agitated the paint and solution together using a stiff bristled push broom while washing away with water poured from a 5-gallon bucket. This test was done in late April; current irrigation systems were not yet charged hence the bucket of water used instead of a watering hose. However, we were very surprised with what little water pressure was needed to remove the paint once Blitz solution and agitation were applied. While continuingly pouring water from a 5-gallon bucket to remove paint from an entire field is not only unsuitable but highly inefficient, it worked unbelievably well for our small test strip." ■

Safe sports fields built through understanding irrigation's best practices

A safe, pristine sports field can only be developed by implementing an irrigation system that consists of high quality components that are designed with sports fields in mind. In order to determine the right irrigation products for a particular field, the Turf Manager has to focus on a few key points including player safety, aesthetics, and cost.

Finding the right combination of components can only be accomplished by thoroughly understanding efficient irrigation practices. One of the most important factors the manager must consider is how the field is used and how often. The manager must also need to have a firm grasp on basic irrigation hydraulics, plant/soil/water relationships, and irrigation terminology. Not only does the manager need to be personally educated, they need to keep their entire staff educated as well. The basic steps that need to be considered for either a new or renovated field are the same for any field across the country, and are imperative to field success.

DESIGN

The design of an irrigation system is the "roadmap" for the contractor who is installing the system. There are professional irrigation designers who specialize in this process and understand the hydraulics required for an efficient system. It is generally best to contract one of these seasoned professionals, especially for a new build. They can identify many of the technical specifics involved with planning such as the point of connection, water supply, elevation changes, available water pressure, and so on. These items must be reviewed before a design can take place. The project also needs to meet local codes for backflow devices, meters, and electrical configurations. Most importantly, a professional designer can match the right irrigation and maintenance equipment needed for a specific site.

AUTOMATIC VALVES

The "heart" of an irrigation system consists of the electric or battery operated valves, which can be arranged into various configurations depending on water pressure and zone sizes. Valve size is important, especially for larger zones of sprinklers. Generally 1.5 or 2-inch valves are used. The valve needs to have slow closure to ensure no "water hammering" takes place. Pressure regulation devices are often installed on the valve to optimize the sprinkler's dynamic, working pressure. Captive parts are imperative when someone might need to work on the valve after installation. Quick coupler valves offer easy access to pressurized water in isolated areas. The more quick couplers that are included in the design, the better. They are usually installed on the mainline, which makes it easy to hit hot spots quickly and effectively.

AUTOMATIC CONTROLLER

The irrigation controller is the "brain" of the system, as its scheduled run times are what activate and deactivate field watering. Versatile scheduling capabilities within the controller allow the manager to implement a customized set of run-times that provide the ideal amount of water to each zone of the system. To ensure irrigation doesn't occur in conjunction with natural precipitation, most professional-grade controllers are equipped with rain sensors that temporarily cancel irrigation. There are also "solar sensors" that track daily weather patterns and automatically adjust runtimes to the optimal irrigation level. These sensors not only save the health of the field, they save water and money as well. Flow sensors are another add-on device designed to save water and protect landscape health. In the event of a pipe or component breakage, a flow sensor will not allow the zone to receive irrigation. With many system designs, more than one zone will often need to operate at the same time, so it is important to select a controller that features multiple programs and run-times.

ROTORS

There are a few key features that should be considered when selecting the rotors that will be irrigating the field. The rotors must have a small exposed diameter on top and an attached rubber cover to ensure player safety. A strong spring within the sprinkler will provide positive retraction and ensure that sprinkler caps do not stick up above the grade level of the field. Manufacturers spend a tremendous amount of time creating nozzles that provide an even distribution of water over the turf area. Without these features and specialized nozzles in the rotors, brown "doughnuts" can occur, which looks bad and can become a player safety issue. An increasingly large number of managers are also responsible for synthetic turf surfaces these days, which need

NETWORKING

There are many knowledgeable people in the irrigation industry that can assist with the education and consulting of an irrigation system. The following links offer different educational opportunities and networking for someone who might not be aware of basic irrigation needs:

www.stma.org (STMA)

http://wwwdpla.water.ca.gov/urban/conservation/landscape/wucols/index.html (WUCOLS)

www.irrigation.org (Irrigation Association)

http://www.atinet.org/cati/cit/ (Center for Irrigation Technology, Fresno)

http://www.asic.org (American Society of Irrigation Consultants)

http://www.landcarenetwork.org/ (PLANET – Professional Landcare Network)