He's got a horse... Wheel Horse of course!

Wheel Horse has the right garden tractor to handle those tough jobs. They're the four-season, all-purpose tractors. They take on all mowing jobs up to big commercial areas and leave them with the professional look. A complete line of attachments is available to meet your needs. Attachments for fertilizing lawns; removing snow, dozing snow or dirt; vacuuming or sweeping leaves and many others. Wheel Horse gets you on and off the big jobs fast with power and time to spare. And for you owner-operators, that means more profit.

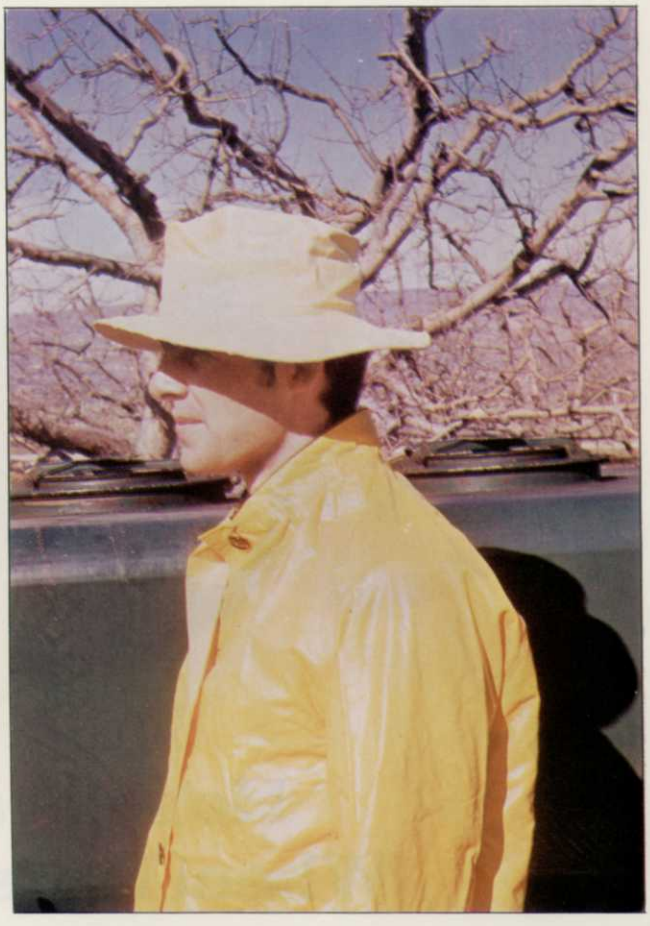
Need equipment for light construction or a landscaping job? Wheel Horse can help you! We have bucket loaders for back-filling, or dirt removal; dozer blades for leveling lawn beds and foundations; mid-mounted grader blades for landscaping and driveway leveling. These are just some of the 42 different allied attachments that are available from most authorized Wheel Horse dealers.

Wheel Horse offers you a choice of 11 garden tractor models, ranging from 8 to 18 HP for 1973...backed with 25 years of experienced craftsmanship. Wheel Horse offers six automatic and five standard transmission models. See your service-oriented Wheel Horse dealer today. He's listed in the Yellow Pages under "lawn mowers." Write for your free copy of our new 1973 catalog.

WHEEL HORSE
Lawn and Garden Tractors

Wheel-Horse Products, Inc., Dept. WTT, 515 West Ireland Road, South Bend, Indiana 46614

Rubber gloves should be worn, especially when handling concentrate pesticides. Leather shoes dry out and crack with repeated exposure to spray, allowing penetration by toxic materials.



Good protection from downward spray drift is afforded by wearing a waterproof wide-brimmed hat. Lighter-colored jackets reflect more heat than dark colors.

Workers Should Be Protected From Pesticide Exposure

By HOMER R. WOLFE
Chief, Wenatchee Research Station
Environmental Protection Agency
Wenatchee, Washington

EVEN THOUGH there has been some progress in recent years toward the development of pesticides that are not only low in toxicity to warm-blooded animals but also relatively nonpersistent in the environment, we should not expect such changes to be accomplished in a very short period of time.

Replacement of certain persistent so-called "hard pesticides" with compounds that are relatively nontoxic to all but the target pest is a difficult, costly, and time-consuming order. In fact, this may never be accomplished to the complete satisfaction of all concerned. Thus, for some time to come we may find it necessary to utilize compounds that are more acutely toxic to man and animals than we would eventually like to see developed.

A good example is the utilization of the more highly toxic methyl parathion as a DDT substitute in certain crop uses.

Also, a few of the new relatively nonpersistent compounds that have reached the point of registration during the last few years have acute oral LD_{50} values of less than 50, which indicates that they are highly toxic. With this in mind, we should not become lax in our concern about protection of the worker.

Even though experience has shown that more caution is warranted when working with highly toxic compounds, the need for protection from exposure to less toxic pesticides should not be ignored. Unless there is good evidence that a compound will not have any subtle adverse effects as a result of prolonged exposure, it does not seem wise to allow excess exposure even to pesticides that are considered relatively nonhazardous.

Much of the pesticide usage today involves insecticides, fungicides, and herbicides. The acute toxicity of the organophosphorus compounds that are used primarily as insecticides is, on the average, somewhat greater than that of most other types of pesticides. This class of compounds has caused many poisonings in pesticide applicators.

Most of the newer synthetic fungicides are less acutely toxic to man than other pest control compounds. However, certain fungicides may occasionally cause local irritations or

(continued on page 36)

Trees on the way: Be ready with the JD310

Here's a 6-ton machine built to handle your largest root-ball plantings from transporting to digging holes. And it handles topsoil, too, from stockpiling to final grade. For truck loading, you have a 10-foot loading clearance and 3,400 pounds of lifting power under control of a single lever.

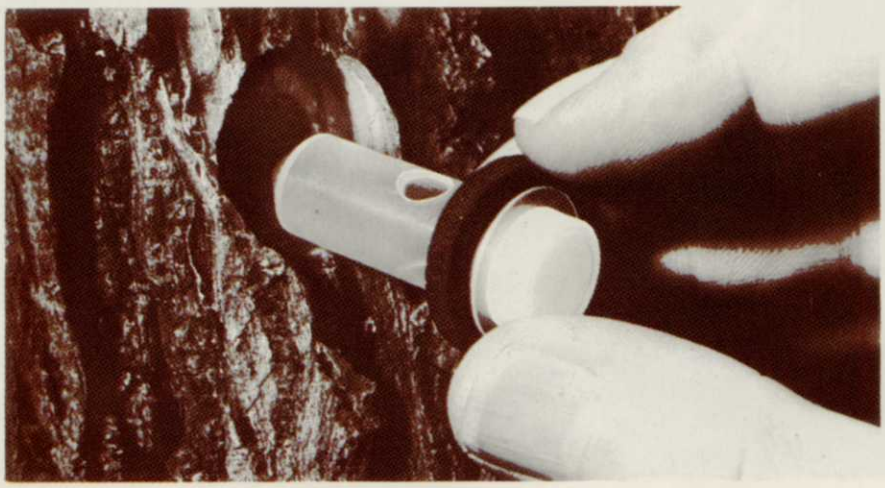
Fifteen feet of backhoe digging depth installs your deepest drainage tile—a long 17-foot reach buries your sprinkler system quickly with fewer moves. And for working in tight quarters, it will fit under an 8-foot overhang and its power steering gives you positive control in the softest soil.

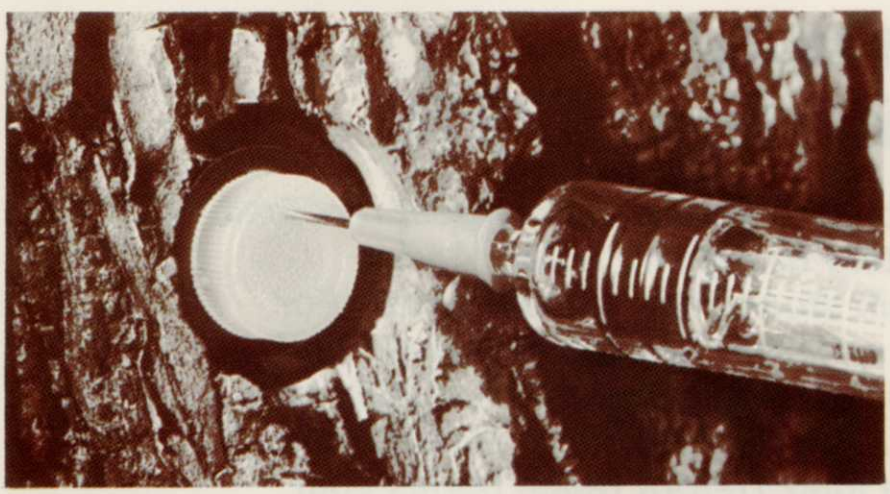
Hydraulic direction reverser and 2-lever backhoe control are some of the other features you should know about. For the facts on how this unit can add versatility and bidding power to your operation, plus the service, parts, and financing that are available... see your John Deere dealer listed in the Yellow Pages. John Deere, Moline, Illinois.

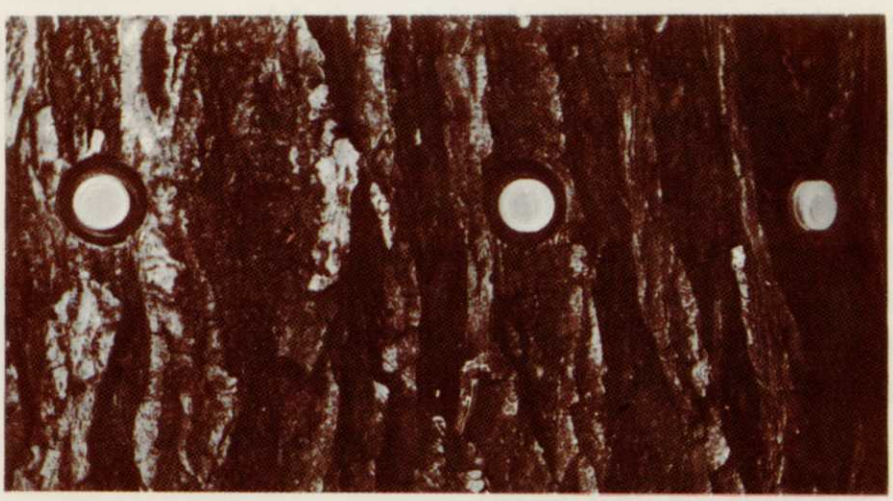
JOHN DEERE

Tractors • Mowers • Maintenance Equipment

For More Details Circle (110) on Reply Card







Tree

Sophistication in tree injection systems is becoming more evident as scientists continue to probe for ways to control Dutch Elm Disease.

Presently, at least a half-dozen systems are being tested or are in commercial use across the country. Each is a variation on the general theme that medication (chemicals) placed within the tree has a better chance of controlling the disease than foliar sprays, sump, collar or other methods of chemical application.

One of the newest techniques to be introduced to arborists is SIReservoir, manufactured by Systemic Implant Reservoir Corporation of Madison, Wisc. It was developed by John Reynolds, Ray Carroll and Dale Norris whose interest in tree care and DED span a total of 80 years of combined experience. All three have worked on chemical treatments, sanitation, rootgraft control and combination measures for suppressing DED.

SIReservoir is described as simple, effective, refillable and economical. Handy is another word, because injectors to treat six to ten trees can be carried easily around in a jacket pocket. Moreover, although a certain degree of care must be exterted, an unskilled arborist quickly becomes skilled after injecting two or three trees.

Here's how the system works. Using a ¾-inch spade bit, a counter sink hole is drilled to the level of smooth bark surface. This forms an outer lip which the visable part of the injector casing fits snugly. A ½-inch bit finishes the job. Bit is in-

A ¾ inch spade bit is used to counter sink hole thru bark (top left). Hole into xylem tissue is made with ½-inch bit. SIReservoir injector is inserted into tree (2nd from top). Using hypodermic, chemical is placed into injector (2nd from bottom). Completed application (bottom left) show injectors spaced at 5 inch intervals.

Injection Systems

Modern Clinical Method To Healthier Trees

serted into the first hole and drilled to a two inch depth. Hole is then cleaned of shavings.

The next step is to place a SIReservoir injector cartridge into the hole. The bullet-shaped cartridge of plastic construction has release holes on two sides and these should be always in a vertical attitude. Sap moving in the xylem tissue enters from the bottom hole and exits out the top.

Once the injector is in place the last step is filling it with chemical. Each injector holds up to four milliliters (ml) of liquid per filling and can be refilled as often as needed. A standard syringe with a 19-gauge hypodermic needle is used as the injector.

Corporation officials advise that SIReservoir should be spaced at five inch intervals on the trunk circumference.

Last year several thousand elms were subjected to this new system. Data from laymen and profesionals confirmed the practical effectiveness of the system when used as instructed.

Like other systems reported in WEEDS TREES AND TURF, SI-Reservoir logically and scientifically has all the necessary apparatus to work. While it may be said that some arborists are not in favor of small tree wounds (drilling) research conducted by the Illinois Natural History Survey indicates that the inflicted damage is minimal and the tree quickly develops callus tissue in this area. (See WTT, Aug. 1972, p. 16 for related story)

Additionally, a tree 30 inches in circumference would require six injector units. The tree tissue removed by drilling one hole is about 3½ square inches. Multiplying this by six gives a total of about 21 square inches of removed tissue. In comparison to the total volume of the tree, this is not much more than a needle pricking a man's arms.

To date, Benlate benomyl fungicide is the only product with Federal registration to "aid in the control of Dutch Elm Disease caused by the fungus *Ceratocystis Ulmi*." Depending on who is speaking, researchers around the country are talking both hot and cold on the effectiveness of this material. Generally, all point to

(continued on page 50)

Interna

Our 2400A Lo-Boy:

Built for mowing— from the grass up.

And just what is a *mowing* tractor?

A good one is squat and compact, clings to slopes without slipping. It's nimble. Brakes, turns on its own axis and steers like a sports car.

It's geared for every speed from creep-mowing next to fences and obstacles up to nearly 20 mph highway transport. It's versatile—works with a rotary mower, ganged reels, or flail in the rear, and at the same time can handle a cutterbar with its side PTO.

And because grass just won't wait, it's built with the power and strength to get big mowing done in a hurry. Without breakdowns. With a minimum of maintenance.

That's a *mowing* tractor. That's our 46 hp 2400A Lo-Boy.

Your International dealer has all the exact specs, including 9 ft. turning radius; hydrostatic power steering; 8-4 synchromesh shift-on-the-go transmission with Hi-Lo range and straight-line shifting; independent rear PTO, side shaft optional; big 11-inch Dyna-Life® clutch; wet disc hydraulic brakes—a package no other mowing tractor on the market can match.

Phone your dealer soon and let him prove it on your own turf.

We keep getting better at our business to get more of your business. And keep it.

INTERNATIONAL HARVESTER

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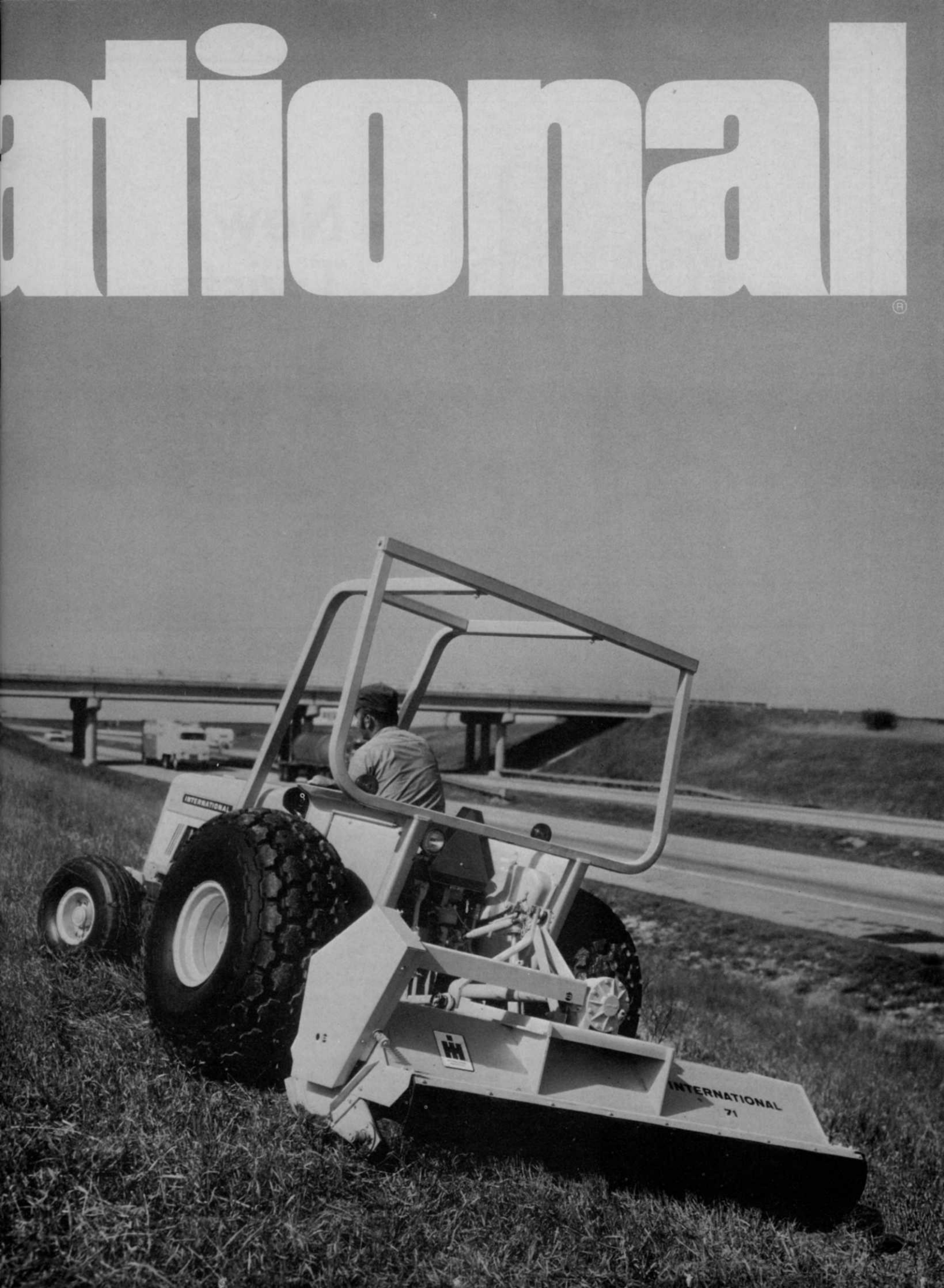
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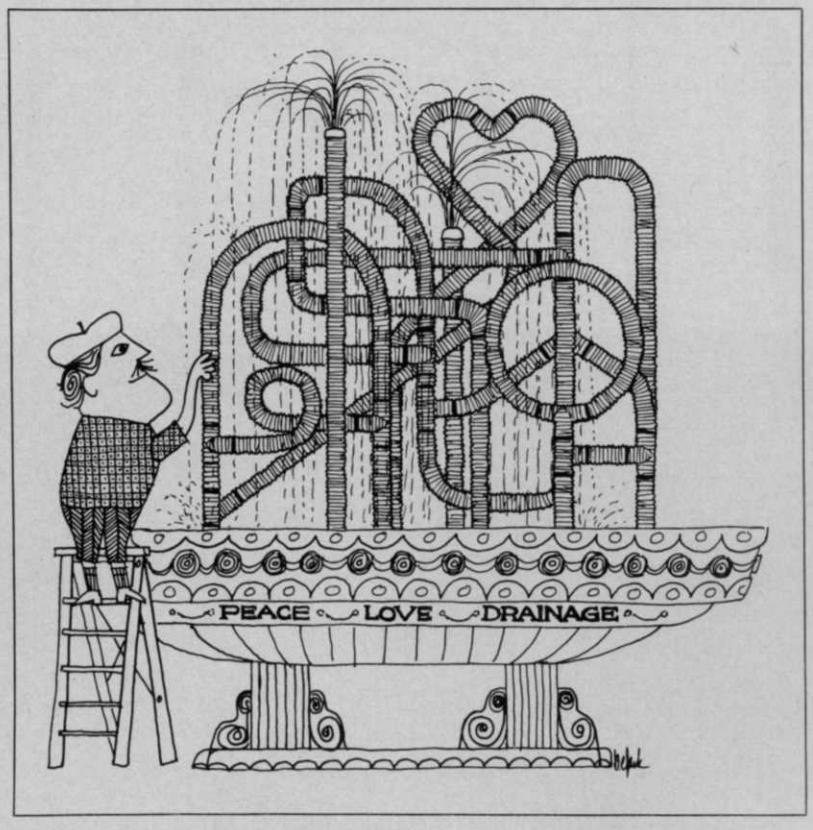


New Twists In Drainage

By EUGENE M. WITTER
Hancor, Inc.
Findlay, Ohio

AFTER several years of testing in different types of applications, turfgrass research centers in universities across the country have realized that the old standard of a four inch diameter in drainage tubing may no longer be necessary.

The possibility of using two inch laterals for football fields, golf course drainage, baseball diamonds, tennis courts and other recreational and outdoor activity areas has been extensively evaluated. Drainage tubing manufacturers like Hancor, Inc. began to take note of these developments and started to study the type of tubing needed to make two inch installations practical for general use (excepting agricultural drainage where four inch is the primary size used).

The Purr-Wick golf course green construction design and the PAT System football field drainage design were made using two inch drainage material. However, during the inception of these two designs, nothing was available on the market that did not require a specific filtering device wrapped around the pipe to prevent silt buildup.

Then too, on golf courses where traps and other sandy areas are encountered, it was necessary to wrap the pipe with a sand filter (fiberglass, tar paper, etc.) to avoid a buildup in the drain lines.

In 1970, Hancor helped eliminate these drawbacks by developing a sand filter slot design for two inch corrugated tubing, as well as a wide slot design for use under heavy soil conditions.

Today, two-inch tubing means easier installation for dozens of projects, partly because of its light weight (approximately 72 lbs. per 500-ft. roll). Installation costs are further reduced because a three-inch trench will accommodate the 2⅜ inch outside diameter of the tubing. Previously, installations with larger diameters (specifically 4 inch) required a trench at least six to eight inches in width. Therefore, if the job was done on existing landscaping, it meant considerably more displacement of soil in digging and installation than with two-inch tubing in its narrower trench.

In many of these drainage applications stone or gravel backfill is called for. The amount required to backfill a three-inch trench with two-inch tubing in the bottom is, of course, half or less the quantity needed for the four-inch pipe's deeper, wider trenches.

GOLF COURSE LABOR SAVER

Two-inch tubing is being used in original golf course drainage for laterals within a herringbone design. With four inch as the main line, the two inch can be safely and effectively used in lengths of up to several hundred feet in place of the larger tubing. Golf course greens, sand traps and fairways that undergo repair drainage can utilize two-inch tubing with less disturbance to the existing landscape, thereby making the course playable more rapidly after construction is completed.

In regard to golf course applications in general, it is most important to remember that irrigation lines and drainage lines need to be planned together; an irrigation system can only be as functional as the drainage system adjoining it. The entire design must interact, not only to make the best use of irrigation water, but also to drain excessive water after heavy rainfalls and facilitate faster dry-up so that players may enter the course without delay.

DRAINAGE FOR SPORTS FIELDS

Modern day football fields with synthetic turfs have been the target of some controversy. One factor often brought out is the tendency for heat to radiate from the surface of artificial grass. Other characteristics include artificial turf's solid base compaction and inherent drainage difficulties. Consequently, a great deal of work has been directed toward improving artificial turf's practicality with respect to these various situations.

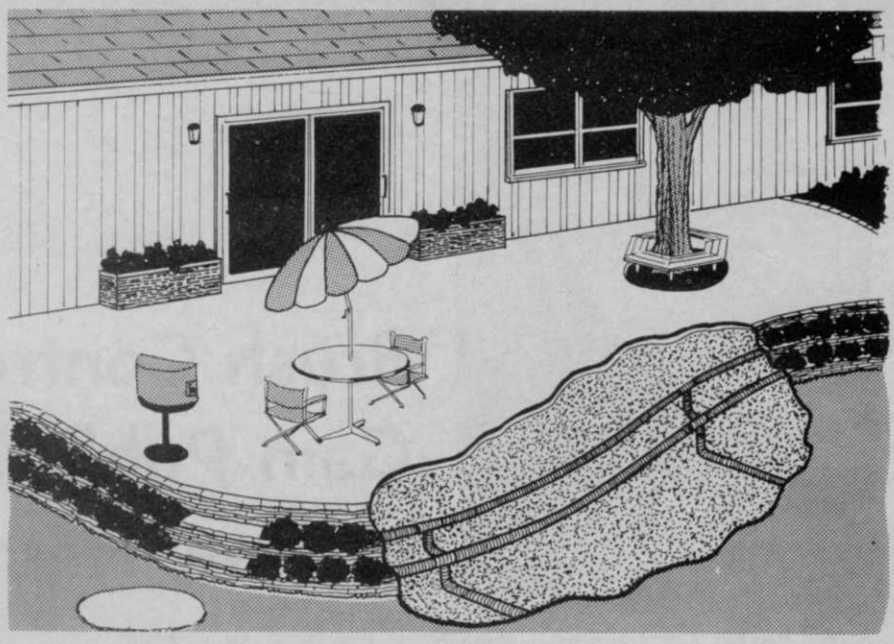
The development of the "Pat System" by the Purdue University Agronomy Department has shown that it is possible to construct a live turf athletic field utilizing a sand base, with proper drainage and subirrigation provided through a pump system that removes heavy rainfalls through the soils.

In dry seasons or during playing times, water may be pumped back into the sub-surface soils. Under frozen conditions, the system can be used to warm the ground from underneath, providing players with consistent footing on a flat, live turf field. Just think of the possibilities for changing existing sports facilities in high school, colleges and professional arenas.

Many modern techniques and equipment involving mowing, aeration and turf maintenance are being employed today. To be truly effective, all of these new methods require a good base—and that base is efficient drainage. Two-inch Turfflow Tubing is being used in commercial and residential landscape plantings, as well as in lawn drainage, tree plantings and any other areas of potential application where it is capable of handling the water present at heaviest rainfall.

University studies undertaken throughout the United States whereever four-inch tubing had been used in recreational, athletic and general landscaped areas have shown that four-inch tubing generally does not run full, even during the heaviest rainfalls. These studies would clearly indicate that two-inch tubing, while running full, can serve the same purpose with lower installation costs, easier handling and less disturbance to the existing landscape.

We should note that good drainage systems are essential not only for heavily saturated areas, but for limited rainfall zones as well. Underground drainage tubing offers an excellent means of controlling local water tables and carrying off any excessive moisture.



OTHER USES

Foundation plantings also require good drainage. Generally we have found that none is installed specifically for the purpose of taking care of the plants. Usually, the foundation drainage system itself, three to four feet underground, is required to take care of subsurface drainage only. In many such cases, there may also be compacted clay soils present to slow the water movement. One easy method of giving life to these plantings starts with digging a small trench twelve to eighteen inches deep. Place wide slot two-inch tubing in the trench and backfill with gravel to near surface level so that water leaches into the gravel quickly instead of ponding around plants to cause shallow root growth and plant deterioration.

Commercial parking areas with landscaped islands are a constant worry to the landscaper who plants them and must guarantee them for at least one year. Often no provisions have been made during the construction to drain these areas

(coninued on page 39)

Capsule History of Drainage

The first instances of planned drainage systems are obscured in antiquity, but we do know that water embankment and irrigation systems were built by the ancient Egyptians and Babylonians many centuries before the birth of Christ.

Drainage as we know it in round tile form came to this country from Scotland in about 1838. The original tile was actually a horseshoe-shaped tile from which many different patterns and variations evolved over the next 100 years.

During that period, it is said that much of the tile used in the eastern and northeastern U.S. was made in diameters of from one to two inches for laterals and four inches for mains. In the late 1880's, the four inch diameter was adopted as the standard size for laterals, due to its ease of manufacture with the machinery available at the time.

Tile proceeded to be manufactured in four inch diameter for many years from clay and other similar materials. Concrete tile was introduced in the 1900's, followed some years later by the development of long, rigid plastic-type pipes. These basic drainage materials have been used throughout the U.S. in subsurface applications for agriculture and athletic facilities.

In the mid-1960's corrugated plastic drainage tubing, flexible and lightweight, was beginning to show its influence on the U.S. drainage market. Research conducted with the new tubing showed it to be satisfactory as a replacement for other types of materials. And by the late 1960's, corrugated tubing's light weight, flexibility and ease of handling had won ready acceptance.

Author inspects Christmas trees along right-of-way. Tree management program practically eliminates maintenance and produces profit for easement landowners.

Brush Control Programs Gain Public Support In New Hampshire

By S. N. MACRIGEANIS
Public Service Co. of New Hampshire
Forester

MANAGERS' 10-SECOND SUMMARY: *Switching from fuel oil to bromacil brush killer is one of four ways PSNH gains public support for vegetation maintenance program on transmission rights-of-way.*

PEOPLE readily accepting a transmission right-of-way sounds about as far fetched as linemen enjoying an ice storm. But, it's happening in New Hampshire. And, it's happening to Public Service Co. of New Hampshire with virtually all rights-of-way on easement land. Not only have environmental outcrys fallen off considerably, but people in general are beginning to appreciate the extra values of carefully maintained rights-of-way.

This turnabout in public opinion didn't happen overnight. It took a great deal of planning and hard work on four major fronts:

First, we had to develop chemical brush control programs that not only solved our maintenance problem, but increased wildlife populations in the bargain.

Second, we had to come up with a way of keeping our foliage spray treatments out of the public's view.

Third, we had to find a better way to control resprouting stumps. Fuel oil had to go because every use brought on a rash of complaints. The availability of a new chemical brush control compound — Hyvar XL bromacil weed killer — provided the answer here.

Finally, we had to discover ways of encouraging the public and our easement neighbors to take advantage of our rights-of-way.

Basal application of Hyvar XL bromacil is made in the fall by "Bucky" Edmondson of Bartlett Tree Co. Forester Macrigeanis checks the technique. Only 7 to 10 ounces of bromacil and water is needed to control 2-inch stem of most brush.

TOO MUCH OF A GOOD THING

Contrary to what many people believe, New Hampshire's greatest need is for more open areas, *not* more trees. It's true. There are nearly three times as many forests and woodlands today as there were in the early 1800's. Back then, land in our state was mostly cultivated. New Hampshire was a major grain producer with less than 35 percent of its land in trees. Now the State is nearly 90 percent forests and woodlands, and this has caused a major reduction in wildlife because of a loss of open areas for food, forage and nesting.

So, our goal of increasing wildlife along our 22,000 acres of rights-of-way first began with a change in our land clearing practices. Instead of cutting and burning brush and trees,

(continued on page 30)