

Spray-paint **TRE-HOLD**[®]

after your 1970 pruning

and cut trimming

costs in 1971!

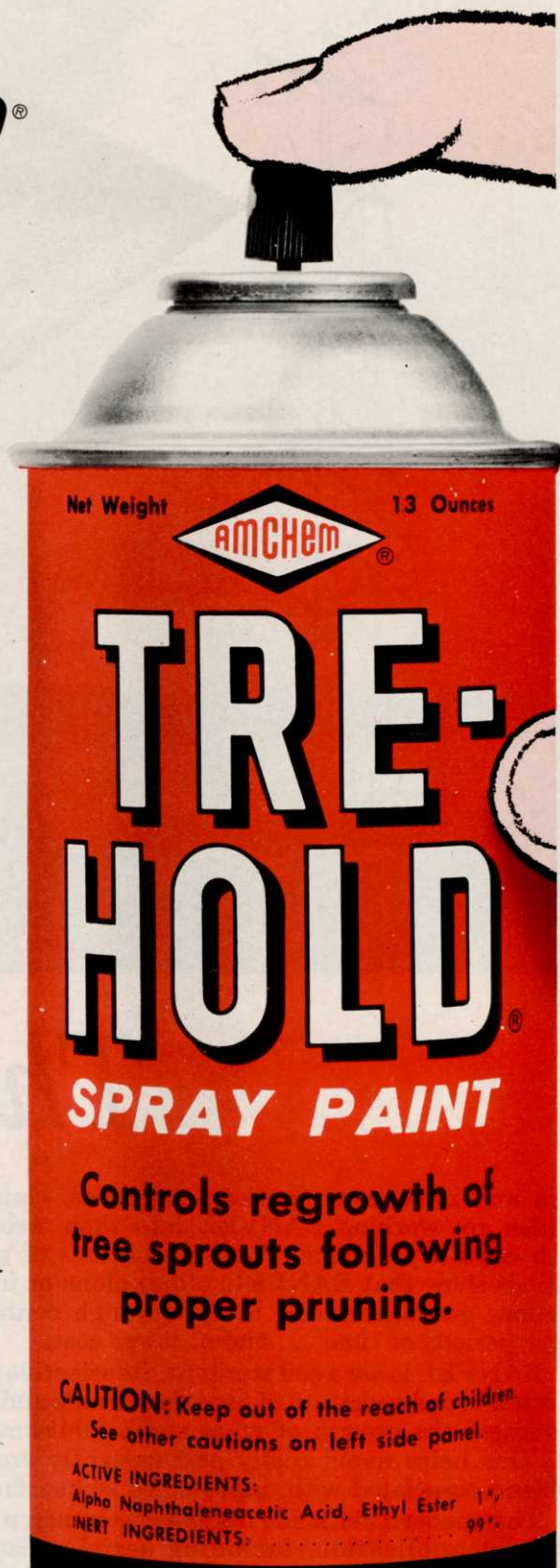
TRE-HOLD Spray Paint is really a money-saver. One utility reported that they saved \$200,000 on their annual trimming budget and another company estimated a \$60,000 savings. You simply spray it on the freshly cut wood.

TRE-HOLD is also available as a paint in gallon cans for application by brush ■ Ask your Amchem representative for further information.

First name in herbicide research.

amchem[®]

Amchem Products, Inc.
Ambler, Pennsylvania



Net Weight

13 Ounces

amchem[®]

TRE-HOLD[®]

SPRAY PAINT

**Controls regrowth of
tree sprouts following
proper pruning.**

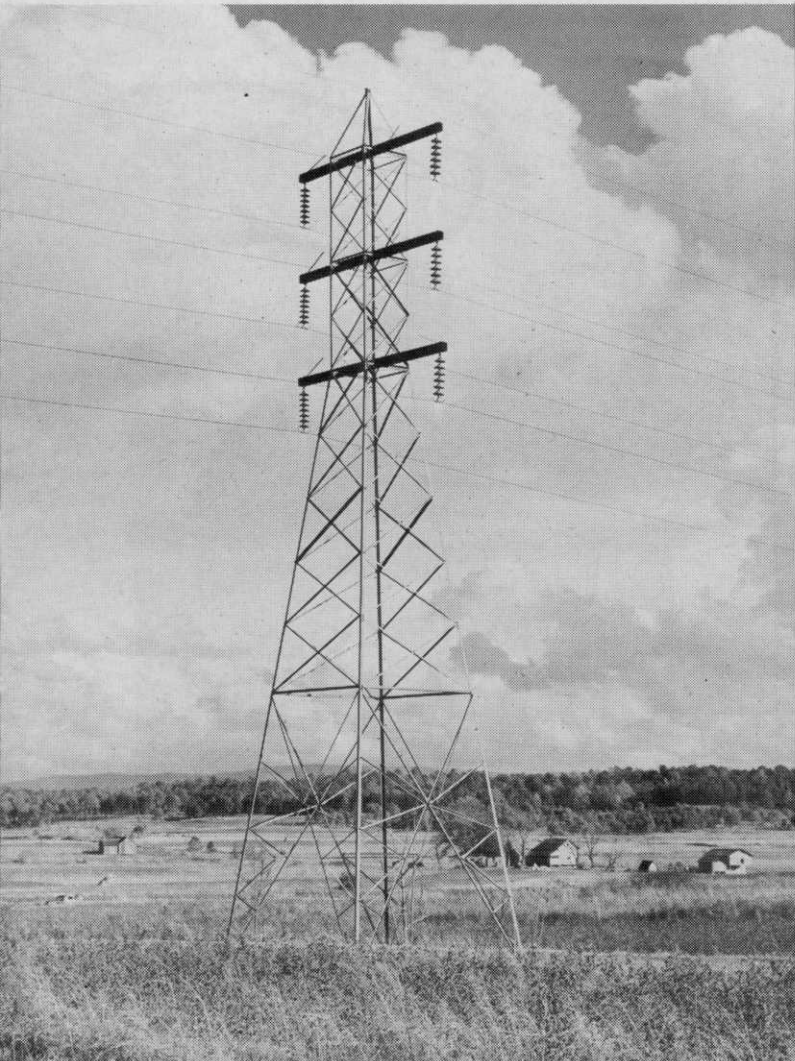
CAUTION: Keep out of the reach of children.
See other cautions on left side panel.

ACTIVE INGREDIENTS:

Alpha Naphthaleneacetic Acid, Ethyl Ester 1%

INERT INGREDIENTS: 99%

Is grass your heaven,



Think BANVEL[®]

More and more communities, companies, clubs and utilities are working BANVEL into their weed and brush control programs. Their evaluations of control methods show that BANVEL, either alone or in combination, produces wider, more thorough control for longer periods of time . . . and at lower cost.

BANVEL is *not* a soil sterilant. Its selective action against a broad spectrum of broadleaf weeds and brush encourages the growth of grass and establishment of sod. This helps avoid costly and unsightly erosional problems associated with unprotected soil surfaces.

This modern herbicide fits every common method of liquid application, including aerial, mist, and hydraulic. Its granular form is ideal for broadcast or

spot applications, particularly where older weed brush and weed trees have become established.

BANVEL translocates through leaves, stems and roots to kill many of the most stubborn and economically significant weed and brush pests. Under certain conditions BANVEL works beautifully with other herbicides to widen control and to lower costs.

We are ready to work with you to determine exact rates and most effective and economical methods of application *for your specific conditions*.

Write or call collect, the regional office (listed below) most convenient to you. You will receive immediate cooperation.

weeds your...hell?



Partial list of broadleaf weeds, weed brush, weed trees controlled by BANVEL, BANVEL/combinations

Ash	Mouse-ear Chickweed	Mesquite
Aspen	Oak	Cottonwood
Basswood	Persimmon	Stinging nettle
Cedar	Pine	Smartweed
Cherry	Poplar	Dog fennels
Clover	Sassafras	Corn cockle
Common chickweed	Service berry	Cow cockle
Curly dock	Sheep (red) sorrel	Knawel
Dog fennel (mayweed)	Sourwood	Fiddleneck
Elm	Sumac	Canada thistle
Hickory	Sycamore	Field bindweed
Hornbeam	Thorn apple	Pepperweed
Knotweed	Thornberry	Tansy ragwort
Locust	Willow	Purslane
	Witch hazel	Sunflower
	Yaupon	Careless weed

Velsicol Regional Offices

Midwest Region, 341 East Ohio St., Chicago, Illinois 60611, (312) 467-5700, Ext. 235, TWX 910-221-5032, VELVICORP—Chicago • **Northeastern Region**, 341 East Ohio St., Chicago, Illinois 60611, (312) 467-5700, Ext. 323, TWX 910-221-3109, VELVICORP—Chicago • **Southern Region**, 3701 Kirby Bldg., Suite 1286, Houston, Texas 77006, (713) JA-4-2906, TWX 910-881-3709, VELVICORP—HOUSTON • **Southeastern Region**, Scott Hudgens Bldg., Suite 279, P. O. Box 20909, Atlanta, Georgia 30320, (404) 762-1457, TWX 810-751-8538, VELVICORP—ATLA. • **Western Region**, Disneyland Plaza Hotel, Suite 2, Anaheim, California 92802, (714) 635-3741, 635-3742, TWX 910-591-1180, VELVICORP—ANAHM.

Velsicol  **Banvel**

Velsicol Chemical Corporation, 341 E. Ohio St.
Chicago, Illinois 60611

Minimum Installation Specifications for Turf

EDITOR'S NOTE: This issue emphasizes irrigation. It seemed appropriate, therefore, that we publish a guide of things to watch for when installing a system. One of the best check lists we've seen has been compiled by the national Sprinkler Irrigation Association, Washington, D.C. We publish it with special permission from SIA. Note that this guide is for installation only; a design and material specification should also be prepared.

1. Scope of Work

The work under this specification includes all labor, materials, taxes, tools and equipment necessary to furnish and install a sprinkler irrigation system as specified and shown on the drawings for the named location.

2. Plans and Contract Documents

The Contract Documents shall consist of Plan # _____ Dated _____ Prepared by _____ and Specification, Pages _____ Dated _____ together with the properly executed contract.

3. Time of Completion

The Contractor shall commence work within fifteen calendar days of receipt of written notice to proceed and shall complete the work within _____ working days, weather permitting. The intended starting date of this work is _____.

4. Bonds

Labor, material and performance bonds shall be furnished to the Owner by the Contractor, when requested by the Owner. The Owner shall reimburse the Contractor for the cost of the bonds.

5. Codes and Permits

The Contractor shall apply and pay for all necessary permits and fees required in the pursuit of his work as required by the governing codes. The Owner shall furnish and install the utilities necessary according to plan, at no cost to the Contractor, unless otherwise specified. All further site connections for Contractor's use shall be made by Contractor.

6. Insurance

The Contractor shall furnish to the Owner certificates of insurance in an "admitted carrier," evidencing coverage of:

- 1) Workmen's compensation and employer's liability insurance, and
- 2) Comprehensive General Liability and Comprehensive Auto Liability Insurance, (XCU exclusion not to apply). Minimum limits of liability shall be \$100M/300M Bodily Injury Liability and \$25M—each accident—Property Damage Liability.

These minimum limits should be raised when greater exposure to loss exists.

7. Errors or Conflicts in Drawings and Specifications

The Contractor shall immediately notify the Owner's representative should he find any errors or conflicts in the drawings and/or specifications. The Owner's representative will render his interpretation or instructions on the items submitted as soon as practicable.

8. Substitution of Material

The Contractor shall use materials as specified. Materials other than that specified will be permitted only after written application by the Contractor and written approval by the Owner.

9. Protection of Utilities and Other Work

Any and all damage to utilities, or other properties, caused by the Contractor shall be immediately repaired by the Contractor, at no addition to

the contract price. The Owner shall make available to the Contractor the location of existing utilities.

10. Working Area

The Contractor shall confine his operations to the areas to be improved, and to the areas allotted to him by the Owner for his operation, and for material and equipment storage.

11. Supervision by Contractor and Owner

The Contractor shall maintain continuously a competent superintendent satisfactory to the Owner, on the work during progress, with authority to act for him in all matters pertaining to the work. The Owner shall designate a representative with authority to act for him in all matters pertaining to the work.

12. Subletting and Assignment

The Contractor shall not assign or sublet any portion of this work without written approval of the Owner of the specific sub-contractor.

13. Payments, Partial and Final

On or about the first of each calendar month, a payment equal to ninety (90) percent of the work performed during the previous calendar month will be made to the Contractor. Payment of the ten (10) percent withheld from these monthly payments will be made to the Contractor upon completion and acceptance by the Owner, of all work called for under the original contract, regardless of any addition to the contract or any extension of completion time.

14. Claims for Extra Work

No claim by the Contractor for increased compensation for alterations or additions, except when done in pursuance of a written authorization from the Owner, will be considered unless written notice of claim is made to the Owner before the commencement of such work.

15. Layout of Work

The Owner shall furnish all surveys covering property lines and easements. The Contractor shall lay out all sprinkler work and be responsible for its location.

16. Progress of Work

The work shall be carried to completion with utmost speed, since time is of the essence.

17. Overtime

Overtime work will be at the Contractor's option unless required, in writing by the Owner, in which case the overtime premium will be paid by the Owner.

18. Sod Lifting and Replacing

Where piping is to be installed in areas containing established turf, the sod shall be removed from the trench line in the necessary width and to a suitable depth. The backfill shall be brought to grade by tamping before replacing the sod. Only light tamping will be permitted on the sod. The trench area shall then be cleared of all deleterious matter. The Contractor shall be responsible for maintaining removed sod and shall furnish replacement sod if existing sod fails to survive. As soon as the replacement sod has "knitted" the Contractor's responsibility for sod maintenance will terminate.

19. Excavation

The Contractor shall do all necessary excavation for the proper installation of his work. Over-excavation shall be backfilled and hand tamped prior to installing pipe. Any pumping, shoring or bracing will be done by the Contractor. If the Owner suspects rock conditions and/or the Con-

Sprinkler Irrigation Systems

tractor and Owner shall negotiate the extra compensation to be paid the Contractor. The Contractor shall barricade and/or light the excavation to prevent undue hazard to the public.

20. Pipe Installation

In general, when a manufacturer's specification exists covering installation of its material underground, it shall be followed. This shall apply to thrust blocking, handling, storage, minimum depth of cover, cathodic protection, coating protection and testing.

Underground lines up to 2" inclusive shall have a minimum horizontal clearance of four inches of each other. All other lines shall have a minimum horizontal clearance of 12" of each other. All lines shall have a minimum horizontal clearance of 12" from the lines of other trades. This requirement does not apply to lines crossing one another at angles of 45 to 90 degrees. A minimum 1" vertical clearance shall be maintained between lines which cross between these angles. Minimum depth of cover over piping 1¼" and smaller shall be 10"; 1½" to 2" inclusive shall be 14"; and 2½" and larger shall be 18", or at a sufficient depth to accommodate valves and other equipment, whichever is greater. When pipe laying is not in progress, or at the end of each day, the pipe ends shall be closed by means of a tight plug, or cap. All work shall be performed in accordance with good practices prevailing in the piping trades.

21. Drainage

When the piping system is installed in a freezing climate, it shall be equipped with automatic ball check drains on the zone lines and manual drain valves on the main lines. These shall be installed a suitable porous material sump. Minimum pitch at the low points of the system and discharged into of piping to drains shall be 3" per 100 ft.

22. Backfill

The Contractor shall do all necessary backfilling and compaction required for complete installation of the system. Compaction shall be such that the original density of the material is obtained. Backfill material shall be free from rock, large stones or other unsuitable substances. In the spring following the year of installation, this Contractor shall repair any settlement of the trenches by bringing them to grade with topsoil and seeding. Watering and maintenance of the repaired areas shall be the Owner's responsibility. Backfilling of trenches containing plastic pipe and copper pipe shall be done when the pipe is cool to avoid excessive contraction in cold weather.

23. Sprinklers and Quick Coupling Valves

Sprinklers and quick coupling valves shall be set plumb and level with the turf at locations called for on the drawings. Heads in lawn or turf areas, where grass has not been established, shall be installed on temporary risers extending at least 3" above grade.

After the lawn or turf is established and the ground has settled, the Contractor shall, within ten (10) days of notification, lower heads to finish grade. Where heads are installed along walk, roads, etc., they shall be permanently positioned. Sprinkler piping shall be thoroughly flushed before the installation of the sprinkler heads.

Elevation of the sprinkler heads and quick coupling valves is critical and the Contractor shall exercise care and set them exactly at or slightly above grade.

24. Manual Valves

Manually operated control valves shall be installed in locations as shown on plans and shall be ac-

cessible for proper use. Valves shall be installed with enough clearance for proper maintenance. Valves shall be installed with a minimum of 4" cover from finish grade, and shall be provided with a proper valve sleeve and cover extending from grade to the body of the valve.

25. Automatic Valves

Automatic control valves shall be installed at sufficient depth to provide not less than 4" cover from the very top of the valve to finish grade. Valves shall be installed in a plumb position with enough clearance from other equipment for proper maintenance. Valves shall be provided with a valve sleeve and cover extending from grade to the body of the valves. Where an automatic valve is installed under each sprinkler head, the valve box and cover may be omitted.

26. Pipe Sleeves, Augering and Boring

Where pipes are installed under roads or walks by jacking, augering, boring or open cut, the excavated material shall be replaced around the pipe to provide original density so no settlement will result. Where possible, sleeves should be installed around the pipe line. Where control wires or tubing pass beneath planting beds, sidewalks, roads or drives, they shall be installed in their own suitable sleeve. At other locations they shall be installed in the pipe trench and protected by the pipe where possible.

27. Control Wire or Control Tube

Control lines shall be at least the minimum size recommended by the Automatic Equipment Manufacturer and shall be a product approved for underground direct burial use. The connections at joints shall be by an approved method for underground use. Allowance shall be made for thermal contraction of the control lines. Control tubing shall be flushed prior to connection to the valve and/or controller. Control wire shall have an 18" loop at the valve to facilitate servicing.

28. Automatic Controller

The automatic controller shall be mounted in a manner recommended by the manufacturer and at the location called for on the plans and approved by the Owner. The Owner will provide electrical power to the controller location in accordance with the manufacturer's specifications unless noted otherwise on the plans.

29. Pumping Plant and Pump House

Motors, pumps, piping and all mechanical work shall be installed by this Contractor for a complete and operating pumping plant. Pump house, floor and footings will be installed by this Contractor unless noted otherwise on plans.

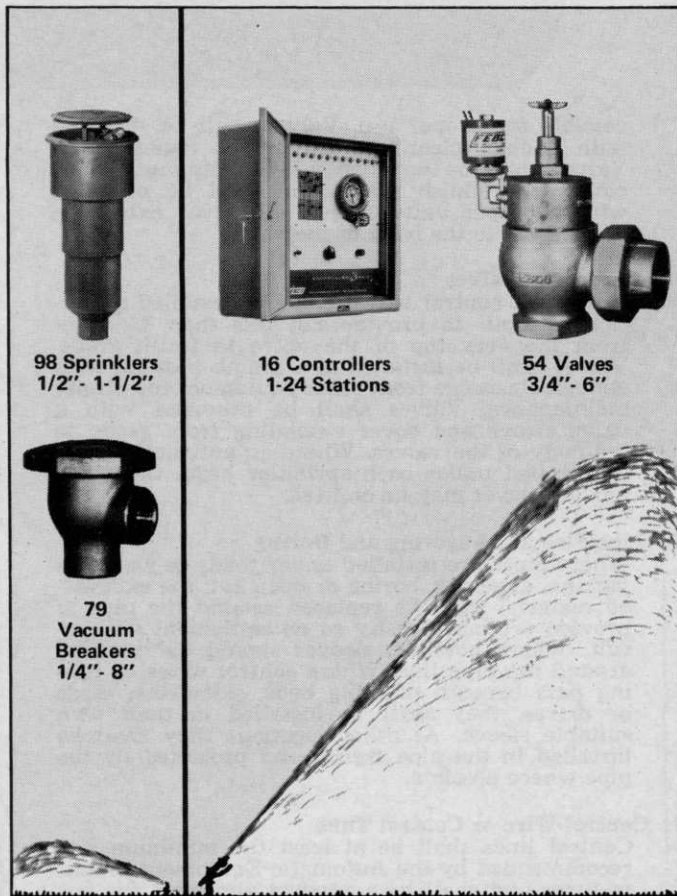
The electrical service to the pumping plant shall be provided by the Owner. All other electrical wiring and equipment shall be provided by the Contractor.

30. Backflow Prevention and Connection to Main

Where applicable, the connection to the main shall be made by this Contractor and will include a master control valve. An Approved backflow prevention assembly shall be provided and, unless the governing code specifies otherwise, shall consist of a line size check valve downstream of the master control valve.

31. Electrical Wiring and Controls

All electrical equipment and wiring shall comply with local and state codes and be installed by those skilled and licensed in the trade. Unless the governing code specifies otherwise, low voltage control wire may be installed by the Sprinkler Irrigation Contractor.



98 Sprinklers
1/2" - 1-1/2"

16 Controllers
1-24 Stations

54 Valves
3/4" - 6"

79
Vacuum
Breakers
1/4" - 8"

UP TIGHT OR WAY OUT

TURN ON WITH FEBCO

For in-close, small areas or large open turf areas — lawns, flowers, shrubs, bulbs — Febco has the right head models.

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32. Concrete and Asphalt Repair

Any concrete or asphalt pavement cut or damaged by the Contractor will be repaired by the Contractor. Where pipes are installed through walls below grade, the repaired wall shall be suitably waterproofed.

33. Clean Up of Area

The entire area shall be left clean and in the condition that the Contractor received the area.

34. Testing and Flushing

All main lines and lines having continuously applied pressure shall be tested at a pressure of 100 p.s.i. or at the rated pressure of the pipe, whichever is lower, and upon visual inspection of the ground, should any leak be found, it shall be repaired. The line shall then be retested until satisfactory.

Zone lines shall be tested at the operating pressure of the zone and, should any leak be found, it shall be repaired and the zone retested. After testing, the system shall be thoroughly flushed with a minimum of 150% of the operating flow passing through each pipe, beginning with the larger mains and continuing through the smaller mains in sequence. When the testing and flushing is complete, the Contractor, in the presence of the Owner, will demonstrate the sprinkling system with particular attention to coverage and method of operation.

35. Adjusting of System

Adjustment of the sprinkler heads and automatic equipment will be done by the Contractor, upon completion of installation, to provide optimum performance. Minor adjustments during the guarantee period will be made by the Owner.

36. Loose Equipment to Furnish

Loose sprinkling equipment, operating keys and spare parts will be furnished by the Contractor in quantities shown on the plans.

37. Instructions and Record Drawings

After completion of the piping installation, the Contractor shall furnish an "as-built" drawing showing all sprinkler heads, valves, drains and pipelines to scale with dimensions where required. Instruction sheets and parts lists covering all operating equipment will be bound into a folder and furnished to the Owner in two copies.

38. Owner's Acceptance

Within ten days of the Contractor's notification that the installation is complete, the Owner will inspect the installation and, if final acceptance is not given, will prepare a "punch list" which, upon completion by the Contractor, will signify final acceptance by the Owner.

39. Guarantee

For a period of one year from date of final acceptance of the Contract, the Contractor shall promptly furnish and install, without cost to the Owner, any and all parts which prove defective in material or workmanship. Draining of the system to prevent freezing in the fall following installation will be the Contractor's responsibility.

40. Owner's Responsibility for Maintenance

It will be the Owner's responsibility to maintain the system in working order during the guarantee period, performing necessary minor maintenance, keeping grass from obstructing the sprinkler heads, protecting against vandalism and preventing damage during the landscape maintenance operation.

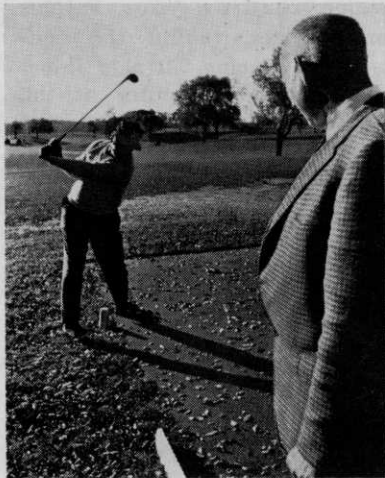
41. Service by Contractor

The Contractor shall service the system at the Owner's request during the guarantee period and shall be paid for work performed which is not covered by the guarantee. If requested by the Owner, the Contractor will furnish the Owner with a schedule of service fees.

42. Addenda

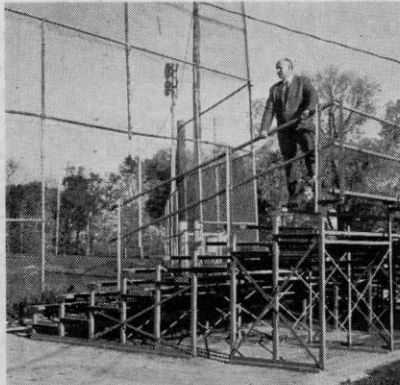


"Those Wheel Horse tractors really work hard keeping the fair grounds in shape for sulky racing and a nine-day county fair."



McCoy puns: "Wheel Horse even helps our golf course stay out of the 'red' by keeping the fairways green."

McCoy added four new Wheel Horse tractors to his stable this year. Here he accepts delivery on a new GT-14 from John Newby, of Implement Service, Inc., in Anderson.



McCoy's park department maintains 38 little league baseball diamonds. Anderson hosted the Babe Ruth League World Series in 1965.



How one city manicures its fair grounds, golf course and 38 parks

"I was put in office to keep our city well-groomed," says Ralph McCoy, Anderson, Indiana, park superintendent. "If my equipment breaks down, I've had it." McCoy depends on his Wheel Horse garden tractors to get the job done eight hours a day, April through November. "I have to get good service out of them because my job depends on it."

McCoy first heard about Wheel Horse from his brother, who had a dealership in Fort Wayne, Indiana. Now he uses six Wheel Horse tractors and a summer staff of ninety men to manicure 700 acres of parks, lawns and golf course. During the winter a Wheel Horse snow thrower attachment keeps the city skating rink clear of snow. "I can't afford equipment that winds up sitting all the time; I know for a fact that Wheel Horse is dependable."

McCoy also has charge of the grounds around the new city hall, the Center Services Building, and the million-dollar Eisenhower Memorial Bridge. "Our garden tractors play a major role in maintaining Anderson's image to the public," he concludes. If the lawns you look after are in the public eye, look to Wheel Horse for top professional help. It's the pick of the pros. Write: Professional Services, Wheel-Horse Products, Inc., 515 West Ireland Road, South Bend, Indiana 46614.



Tractors/Mowers/Snow Throwers/Snowmobiles

ANOTHER WHEEL HORSE PROFESSIONAL

For More Details Circle (109) on Reply Card

By TED WOEHRLE, Superintendent
Oakland Hills Country Club
Birmingham, Mich.

Irrigation by Computer?

IT IS ESTIMATED that 90% of all irrigation engineers and golf course superintendents who ever lived are now alive. New ideas and inventions come nearly every day. By combining all that we know, we could create a "supermachine" of any kind within a given field.

The computer is an example of a supermachine. Look what it has done for the space program and for medicine.

In medicine, the computer aids in diagnosing what ails a patient. Why can't we use the computer to help us diagnose factors affecting our patient—the turf?

At present, we are our own computers. We are always taking into consideration the variables of the day or hour to determine what, when and how much to water, spray or fertilize.

We take into consideration the present weather conditions and tomorrow's forecast—temperature, humidity, wind velocity and direction, light intensity, cloudy or clear, chance of precipitation.

What is the long-range forecast? Weather forecasting at its best is weak, but improving. ESSA satellites help a great deal. Perhaps our own weather recording devices or stations would be an improvement.

Soil conditions have to be considered—soil temperature, moisture, compaction (which changes during the summer), and soil porosity.

We look at the turf. What is the height of cut, root depth, grass temperature, rate of growth (fertility and health are related to rate of growth), when was it last mowed,

and when will it be mowed again?

One sensing device we could use to better judge soil and turf is the tensiometer. It determines evapotranspiration, the loss of water from the soil by evaporation and by transpiration from the plants growing from it.

Infrared photography, used to measure the heat or temperature released by the plant, could predict grass that is about to wilt.

Agriculture is using this machine, called a spectrometer or a spectrophotometer, for detecting varying temperatures between healthy and diseased plants. Many times this can be done before noticeable damage is observed by the human eye. The information is then transferred to a thermograph and then read from a color picture.

A wilt-warning device could provide computer data by recording conditions when wilt last occurred. A computer programmed with this information and linked with the sensing device could then warn when these conditions, even though made up of different variables, was about to reoccur.

Some predetermined constants must be considered. These concern soil, turf and the physical layout and design of the system. Soil porosity can be determined mechanically in the laboratory. Percolation rate can be determined in the field, with variances noted between areas.

All USGA greens built with the same set of specifications should be similar enough to get by with the use of one tensiometer for the greens. Most courses would need

more. The effect of diseases on the plant would have a direct bearing on the needs of irrigation. Now, the tendency is to over-water. A computer would lessen this tendency.

Some of the limiting factors such as amount of water, pipe and pump sizes, money available could be handled more efficiently by a computer.

Another variable to know is whether the soil can absorb the water as fast as it is being applied. Should we split or repeat our application, in other words recycle?

The more variables we encounter the more difficult it will be to program a computer.

Imagine reading your various sensing devices, taking the constants, then placing all this information into the computer at the day's end to obtain in a few seconds your instructions for watering that night. It may say something like this:

Water Numbers 9, 1 and 18 greens 1½ hours in three split applications. The approach and the tee end of Number 5 needs an extra 20 minutes. The remainder of the greens and fairways need 45 minutes. One constant application will do. Start the program on the greens at 7:40 p.m. Do the fairway program after the greens. The tees should be started by 3:15 a.m. because you have a shotgun start at 6:30 tomorrow morning. This will still give you enough time to syringe all areas by 5:30 and begin mowing greens and fairways. Have a good night's sleep.

Until all this happens, we can cut a program on a card or tape and place it into the controller for the nights program which you would have to make up from information from our own computer (our head).

If the housewife can have 14 different selections on her modern washing machine, why can't we have a similar dial or programmer built into our controllers? Maybe one setting would be for tees and greens, another for just fairways, or another for greens and half the fairways.

Turf irrigation is full of magical things patiently waiting for someone to discover and apply them. We as superintendents must keep on top of the equipment available and apply them as we see fit. We and we alone can tell the designers and the installers what we need and what we want. They are capable of doing just about anything.

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Tandex can give you a more economical ground maintenance program.

Tandex is a soil sterilant. And it's proven its weed-killing power for use around industrial plant sites, storage areas, lumberyards, tank farms and the like. Broadleaf weeds, grasses,

even woody species die when Tandex is applied. And its power persists for a season or longer.

Spray wettable Tandex powder (WP 80) or use the granular form. The handy five-pound plastic container is especially convenient. Tandex can be combined

with fortified oils and other herbicides for special control situations.

Write to Department A, Niagara Chemical Division, FMC Corporation, Middleport, N.Y. 14105.

Tandex[®]



Industrial Chemicals, Niagara Chemical Division, Middleport, New York 14105

By AUSTIN J. MILLER, President
Miller Sprinkling Systems
Royal Oak, Mich.

EVERYONE these days is looking back at the 60s and reviewing the accomplishments in a particular field. Let's see how far we've come and what we have learned about golf course irrigation.

While industrial plants and home lawns were watered automatically in almost every instance, the spring of 1960 found the golf courses watering with quick coupling sprinklers if they had an up-to-date system and others using hundreds of feet of hose.

Cost of installation was of only relative importance. The real reason for so few automatics in the early 60s was the reluctance of the superintendent to trust his watering to anyone but faithful old Joe, the night watering man.

Well, old Joe is gone, wages are up, people don't want to work at night, so now the superintendent asks, "maybe I should look into automatic control of my watering program." In addition to replacing old Joe, he'll get variable timing over the whole course, multiple light waterings for the hard to penetrate areas, automatic or manual syringe cycles, automatic rain cut off and no more chance to blame some loss of turf on a poor irrigation system.

So, to sum up the 60s we have had some advances in the hardware of automatic control. The sprinklers have been improved, automatic valves are better, automatic controllers are so reliable that you can almost forget about maintenance. Engineering designs are really ahead of the equipment available. The end of the 60s saw central programming designed into almost every new installation. From the superintendent's office, he can handle the irrigation of the entire course. Really, what we accomplished in the 60s was the realization that a golf course can be watered using an automatic, easily adjusted program.

What lies ahead for the 70s? Plenty of research. We still don't know how often to water and how much to apply. Most superintendents are watering by using their judgment, based on experience and not supported by any technical input. Here we have \$150,000 worth of sophisticated equipment and the superintendent still has to look at the turf, look at the sky and guess "it looks like 30 minutes per station would do the trick tonight."

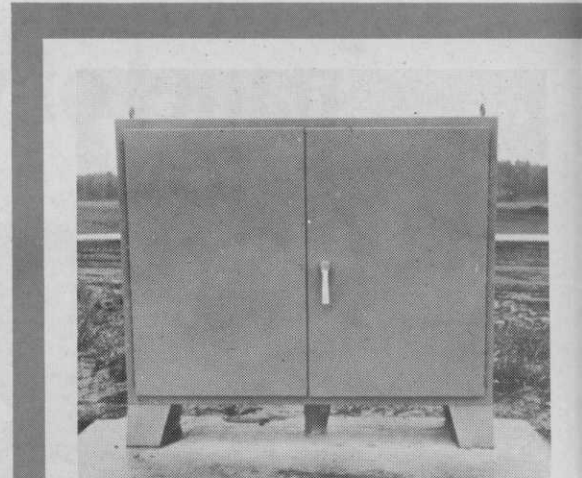
Among other things, for any given course the amount and frequency of water required depends on soil mois-

ture level, rate of evap-transpiration, wind speed and direction, length of day, amount of sunlight or cloud cover, relative humidity, soil and air temperature and weather forecast for next 24 hours.

Each time the superintendent decides to water, he has to evaluate all of these factors. Most superintendents are very capable but to analyze eight or more variables and remember the relationship of each variable to the water required for his grass, is too much to ask of anyone.

Why not have a digital computer receive the input of the various sensing instruments and then control the watering time based on the analysis of all variable factors. These computers are now leased by some clubs and, if not, are available on a time-sharing basis in most larger metropolitan centers.

Again, our hardware is ahead of

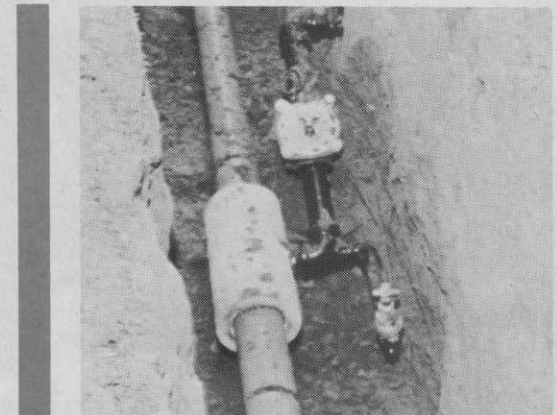


This National Electrical Manufacturers Association specification cabinet provides an attractive as well as functional housing for irrigation controller units. It gives weather and vandalism protection. It's equipped with a ground rod.

Golf Course Irrigation: **GOOD IDEAS**

our software, or program. Even if we know that the soil moisture is at the 47% level, wind 6 mph from s.w., 14 hours daylight with 60% sun, average 51% relative humidity, average temperature 76 degrees and forecast for tomorrow to be same with 10% chance of rain, the superintendent still can't say exactly how much water to apply, knowing his grass and soil type and management level desired.

For those superintendents who are the serious leaders, I suggest you start recording some or all of the data listed above and then record the response of your turf, together with the amount of water applied. You'll be assembling valuable data for later design of your automatic watering program, and in the meantime, will be giving your head a good workout while using it as a low-cost computer.



PVC pipe installed in 80-90 degree weather in a 400-yd fairway may shrink 24 inches when the temperature drops to freezing. A rubber ring joint accommodates expansion or contraction, relieving stress that could cause line rupture and repair costs multiple times above the coupler price.