PM22 11220-22 1/33

FEB 4 1997

Tom Duafala, Ph.D.
Soils Chemicals Corporation
P.O. Box 782
Hollister, CA 95024

Dear Dr. Duafala:

Subject: Guide to Application
Trical Telone II Soil Fumigant
EPA Registration No. 11220-1
Tri-Form 40/60
EPA Registration No. 11220-15
Tri-Form 15
EPA Registration No. 11220-20
Tri-Form 30
EPA Registration No. 11220-21
Pic-Clor 35
EPA Registration No. 11220-22
Your Submissions Dated January 15, 1997

The amendment referred to above, submitted in connection with registration under the Federal Insecticide, Fungicide and Rodenticide Act (FIFRA), as amended is acceptable provided that you:

1. Make the labeling changes listed below before you release the product for shipment bearing the amended labeling:

- We note that the DowElanco name and logo appear in the Guide. Please note that since these products' labels refer to this supplemental labeling, this Guide must be distributed to the buyer whenever these products are sold.

2. Submit one (1) copy of your final printed labeling before you release the product for shipment.

A stamped copy of the labeling is enclosed for your records.

Sincerely yours,

/S/

Cynthia Giles-Parker
Product Manager (22)
Fungicide-Herbicide Branch
Registration Division (7505C)

Enclosure

cc: Nancy Zahedi
Special Review Branch
Special Review and Reregistration Branch (7508W)

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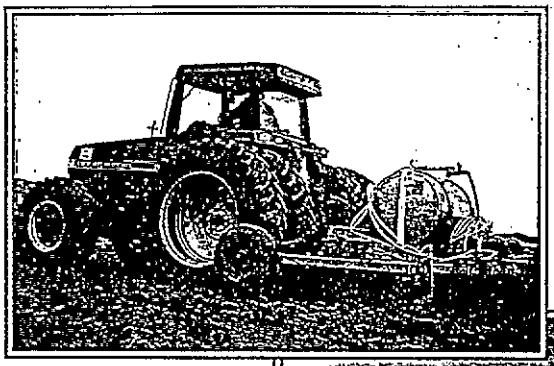

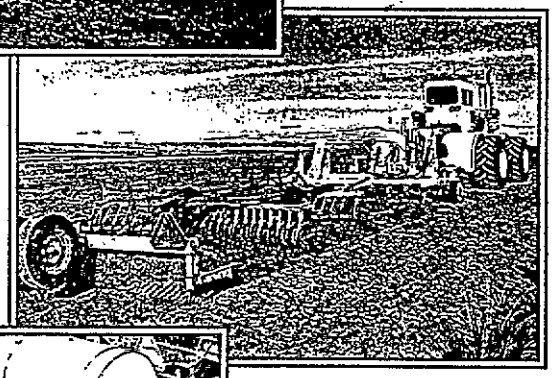

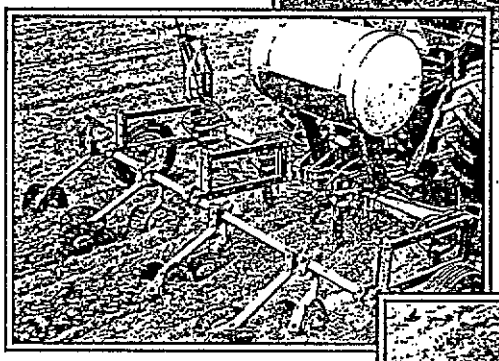

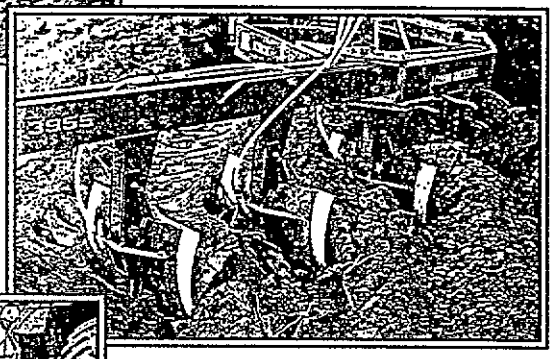

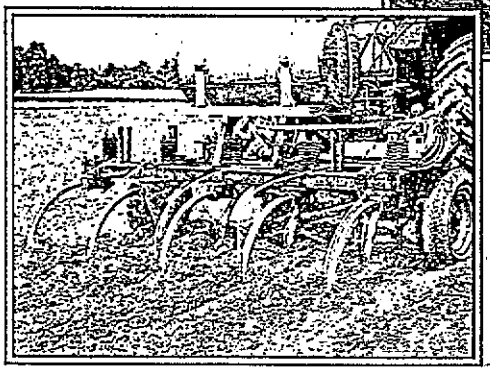

DowElanco

Telone*

Soil Fumigant

A Guide to Application

ACCEPTED
with COMMENTS
In EPA Letter Dated

FEB 4 1997

Under the Federal Insecticide, Fungicide, and Rodenticide Act as amended, for the pesticide registered under EPA Reg. No.

11220-1
11220-15
11220-20
11220-21
11220-22

*Trademark of DowElanco

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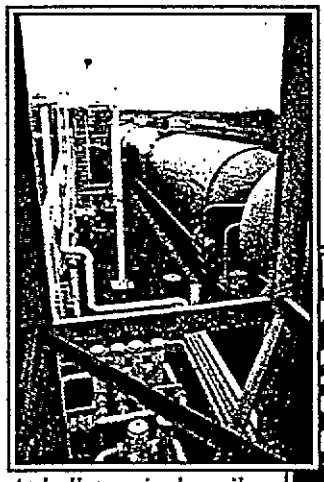
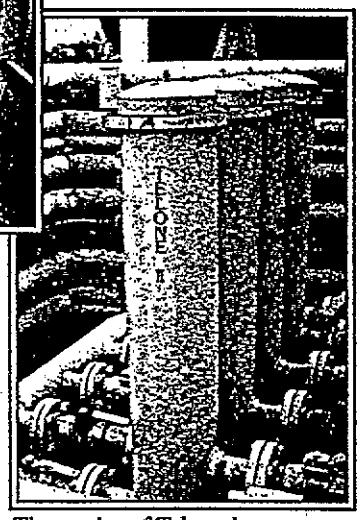
A Commitment to Quality and Stewardship.

DowElanco strives to be a good steward of Telone* soil fumigant, handling it responsibly and in a way that maintains product quality from manufacturing through distribution. At every point our goal is to handle Telone with care.

This Guide to Application is one more way of ensuring that users handle and apply Telone in a responsible way that provides maximum benefits.

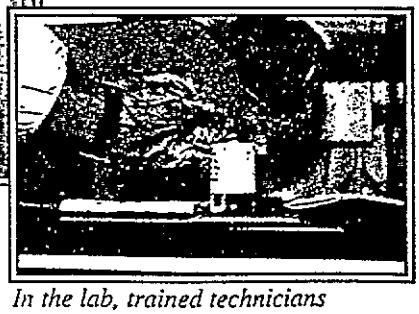


At bulk terminals, rail car loads of Telone are transferred with care and attention to quality.



The purity of Telone is maintained with large, in-line filters as it flows from rail cars into bulk storage tanks.

Samples of Telone are taken from each incoming load to test for product integrity.



In the lab, trained technicians conduct a series of tests to verify quality.

*Trademark of DowElanco

Telone is a Restricted Use Pesticide.

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Table of Contents.

Nematodes and Other Soilborne Pests

How They Damage Your Crop.

Damaging crop potential.

Plant parasitic nematodes live underground and reach a size of only ¼" to about ⅛" long. But these microscopic, threadlike roundworms can destroy crop potential and cause substantial losses in yield and quality.

Some 2,200 species of nematodes attack plants. Capable of multiplying at an alarming rate, one female nematode can lay 500 eggs every 30 days and multiply into 24 million nematodes in one season.

The nematode feeds by puncturing the plant cell with a hollow, needle-like stylet and injecting enzymes to pre-digest its contents. This dissolves the cell contents, leading to lesions surrounding the feeding site. Nematode feeding can also cause abnormal cell enlargement, gall formation, root distortion, root tip injury, excessive root branching and other forms of abnormal development.

Nematodes can stunt the plant by reducing its ability to take water and nutrients from the soil. This leads to nutrient deficiency and water stress symptoms above ground. Nematodes can also cause less visible disruptions of plant metabolism, reflected in reduced yields and crop quality.

Two basic types of root parasitic nematodes feed on crops:

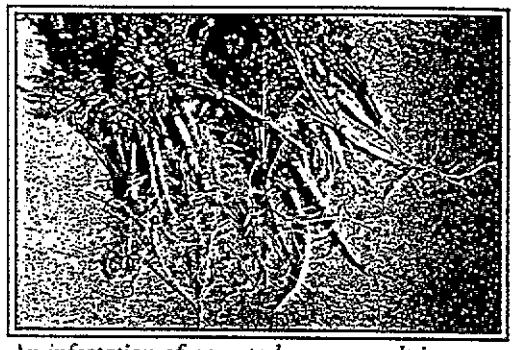
1) **Endoparasitic** nematodes enter and feed within the root system. Typical examples include the root knot, lesion and cyst nematodes.
2) **Ectoparasitic** nematodes feed exclusively from outside the root tissue. Typical examples include stunt, stubby root, sting and citrus nematodes.

Providing entry points for diseases.

Nematodes predispose plants to diseases by reducing plant vigor and providing entry points for other pathogens. Soilborne fungi and bacteria threaten a plant's life and can cause extensive damage and yield loss.

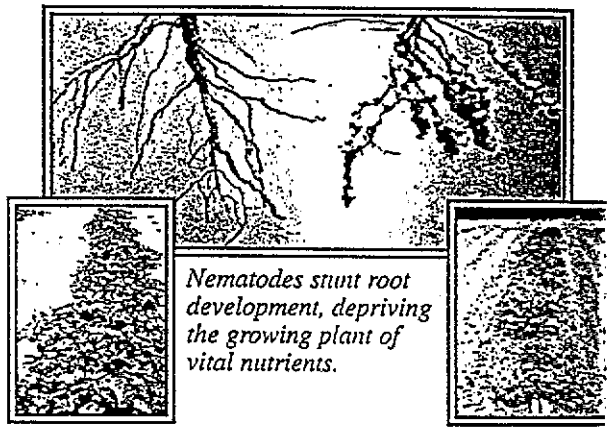
Insects can damage roots.

Symphylans (centipede-like insects) can be serious pests, feeding on roots and other below-ground parts of

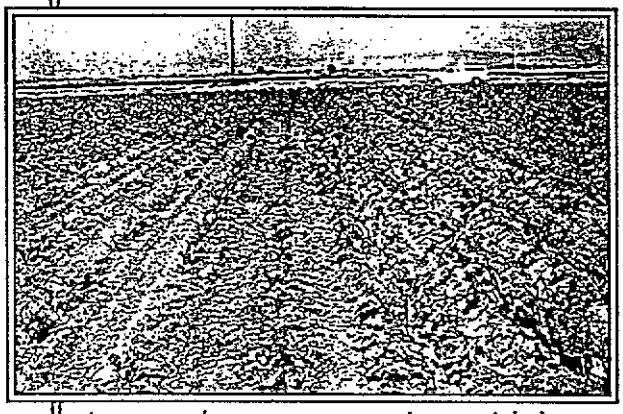


An infestation of nematodes can result in twisted, enlarged and deformed carrots.

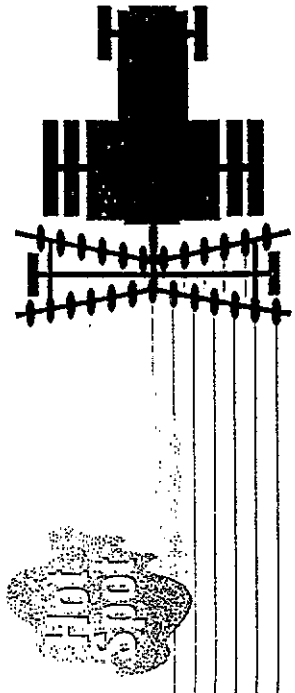
Nematodes can decrease the value of potatoes.



Nematodes stunt root development, depriving the growing plant of vital nutrients.



As nematodes eat away a crop's potential, they hamper growth and reduce plant height.

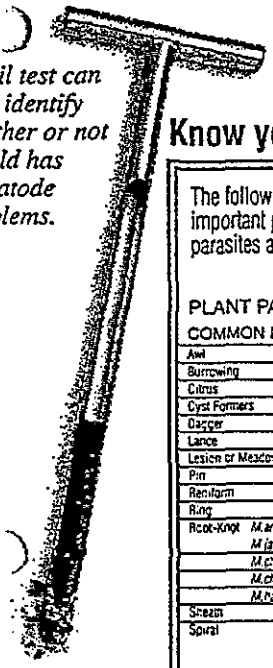


How Nematodes Spread

Nematodes thrive under continuous cropping and short rotations. Tillage tools spread nematodes throughout infested fields and even carry them into new fields. Nematodes also spread through irrigation water drawn from sources fed by the runoff of infested fields.

Microscopic root knot nematodes feed within a plant's root system, sapping the life from a once-healthy crop.

Reniform nematodes feed outside the root tissue and produce up to six generations in one growing season.



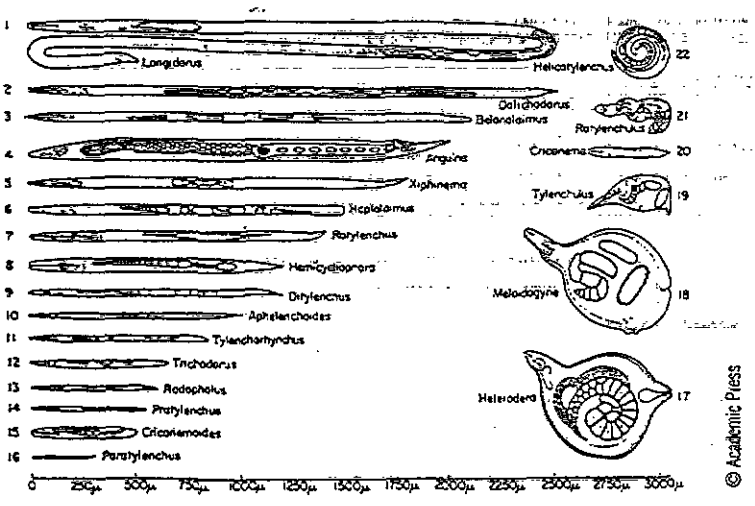
A soil test can help identify whether or not a field has nematode problems.

Know your nematode problem.

The following table lists many important plant-damaging nematode parasites and their host crops:

PLANT PARASITIC NEMATODES

COMMON NAME	GENERIC NAME	Alfalfa	Bulb Crops	Citrus & Sub-Tropical Fruits	Cereal Grains	Clovers	Corn	Cotton	Floral Crops	Fruits Deciduous	Fruits Small	Grapes	Melons	Mint	Nurseries – Forest	Nurseries – Fruit	Nurseries – Ornamental	Nut Trees	Potatoes – Sweet	Potatoes – White	Rice	Strawberries	Sugar Beets	Sugar Cane	Turf	Vegetables – General
Awl	*Dolichodorus spp.*						•						•												•	•
Burrowing	*Radopholus spp*			•					•						•	•	•				•			•	•	
Citrus	*Tylenchulus sp.*			•									•													
Cyst Formers	*Heterodera spp*						•						•							•		•	•		•	•
Dagger	*Xiphinema spp*			•			•		•	•	•	•			•	•	•	•							•	•
Lance	*Hoplolaimus spp.*	•	•	•			•	•	•				•		•	•	•								•	•
Lesion or Meadow	*Pratylenchus spp*	•	•	•			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
Pin	*Paratylenchus spp.*			•						•		•	•		•	•	•	•								•
Reniform	*Rotylenchulus spp.*																									
Ring	*Criconemoides spp.*			•			•		•	•	•	•	•		•	•	•	•							•	•
Root-Knot *M.arenaria* *M.javanica*	*Meloidogyne spp.*	•	•	•			•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
M.chitwoodi (race 1)					•	•	•													•		•				
M.chitwoodi (race 2)		•																								
M.hapla		•				•							•							•		•	•			
Sheath	*Hemicycliophora spp.*			•			•						•		•		•			•					•	•
Spiral	*Helicotylenchus spp.* *Scutellonema spp.* *Rotylenchus spp.*			•						•	•		•	•				•	•		•			•	•	•
Stem, Bulb & Potato Rot	*Ditylenchus spp*	•	•				•						•							•	•	•				•
Stog	*Belonolaimus spp.*		•	•				•	•	•			•		•	•	•								•	•
Stubby Root	*Trichodorus spp*	•		•			•	•			•		•		•	•	•						•		•	•
Stylet	*Tylenchorhynchus spp.*	•					•		•		•		•				•			•	•	•			•	•



Relative sizes of nematodes. Plant parasitic species range in length from 1/64" to about 1/10".

many plants. Most commonly found in moist soils with high organic content, symphylans move up and down in the soil as temperatures and water levels fluctuate. They can be hard to detect.

Wireworms can also damage crops. Hard to detect, they move up and down in the soil similar to symphylans.

Testing for nematodes.

A soil test can help identify whether or not a field has nematode problems. With reniform nematodes in particular, there may not be any symptoms other than depressed yields. Soil testing helps identify specific nematode species and establish population levels on a field-by-field basis.

For best results, take soil samples when nematode populations peak, immediately following the susceptible crop. (Samples may also be taken prior to the growing season. But, then treatment decisions should be based on available threshold levels.)

One composite sample of 20 to 30 cores should be taken for each 10 to 20 acres in a field. Sample in a "W" pattern.

Most types of nematodes live in the top two feet of the soil, so sampling to a depth of 6"–18" will generally give a good idea of the overall population.

Obtaining accurate results from soil tests requires care in taking and handling soil samples. Common causes of error include:

- Not taking enough samples.
- Sampling in an inconsistent pattern.
- Improper storage and shipping.
- Not taking post-treatment and/or pre-harvest samples to determine the need for additional pest management practices.

Samples should be kept cool and promptly delivered to the laboratory since only live nematodes show up in soil tests.

Use a reputable laboratory and submit all samples to the same laboratory. If using different laboratories, evaluate results carefully, since reporting procedures vary.

Testing for other soil pests.

Wireworms and symphylans can be sampled using sifting screens (wireworms can also be baited). Take soil samples at the depth where a pest most likely lives at that time of year. Post-treatment and/or pre-harvest sampling is recommended to determine the need for additional pest management practices.

Fumigation

Effective Control with Telone soil fumigant.

The value of Telone.

Telone soil fumigant economically and effectively controls many types of nematodes, viruses, bacteria, soil insects and fungi. Applied as a pre-plant soil treatment, Telone protects valuable vegetable, field and nursery crops as well as planting sites for citrus trees, deciduous fruit trees, nut trees, berry bushes and vines. By reducing nematode populations, Telone gives plants time to establish a healthy root system that can support them throughout the growing season.

Telone will control pests in the soil treatment zone at the time of fumigation. **It will not control pests introduced into the soil treatment zone after fumigation from sources such as contaminated soil, equipment, irrigation water, planting material and nematodes that migrate up from below and from outside the fumigation zone.**

Telone made the difference between a damaged crop and a high-quality, high-yielding crop.

How fumigation works.

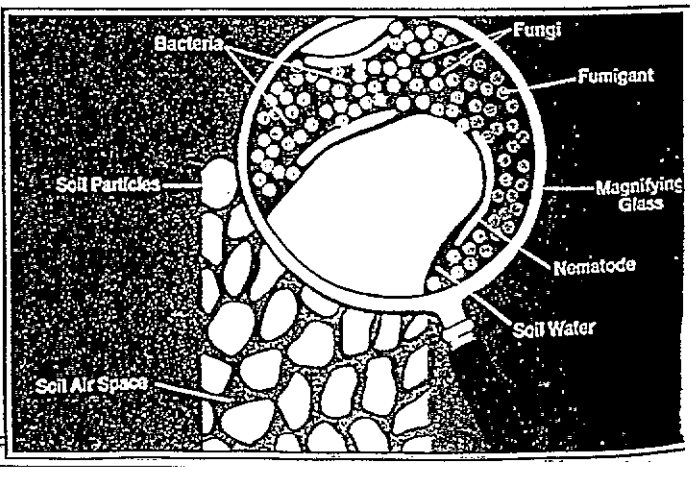
Nematodes live in the thin film of water that surrounds all soil particles. To control them, treatment must reach into their aqueous habitat and remain in contact with them at a strong enough concentration for an adequate length of time to deliver a lethal dose.

Injected into the soil as a liquid, Telone quickly volatilizes into a gas and permeates the soil mass. As a gas, it reaches nematodes and fungi by moving through air spaces in the soil mass and dissolving into the film of water that surrounds soil particles.

Effective pest control with Telone depends not only on its basic toxicity, but also on methods of application, rate of diffusion, degree of water solubility, adsorption and decomposition rate in the soil.

When to fumigate.

Many factors affect the decision to fumigate. It may be essential to fumigate as a regular practice when growing high-value cash crops (e.g., root cosmetic crops) due to the high risk of losing a precious stand and big investment in production costs. In other crops,



Telone reaches nematodes by moving through air spaces in the soil mass, dissolving into the film of water that surrounds soil particles.

Treated vs. untreated peanuts. On the left, broadcast-applied Telone. On the right, no treatment. Telone controls nematodes and helps keep peanuts healthy.

Results of cotton treated with Telone in-row (foreground) and untreated check (background).

Plant parasitic nematodes controlled by Telone.

- Awl *(Dolichodorus spp.)*
- Burrowing *(Radopholus spp.)*
- Citrus *(Tylenchulus sp.)*
- Cyst *(Heterodera spp.)* e.g., sugar beet, soybean, carrot and wheat
- Dagger *(Xiphinema spp.)*
- Lance *(Hoplolalmus spp.)*
- Pin *(Paratylenchus spp.)*
- Reniform *(Rotylenchulus spp.)*
- Ring *(Criconemoides spp.)*
- Root knot *(Meloidogyne spp.)* e.g., *M. arenaria, M. javanica, M. chitwoodi, M. hapla*
- Root lesion or meadow *(Pratylenchus spp.)*
- Needle *(Longidorus spp.)*
- Sheath *(Hemicycliphora spp.)*
- Spiral *(Hellocotylenchus spp., Scutellonema spp., Rotytlenchus spp.)*
- Sting *(Belonolalmus spp.)*
- Stubby root *(Trichodorus spp.)*
- Stylet *(Tylenchorhynchus spp.)*

Treated vs. untreated. On the left, healthy tobacco roots result from Telone application. On the right, roots from untreated tobacco suffer from severe nematode damage.

when pre-plant pest populations indicate levels likely to cause economic damage, treatment becomes a worthwhile investment — and possibly an economic necessity.

By combining information about pest species and populations, crop value, field history and yield expectations, a grower can make treatment decisions most likely to produce the maximum return on investment.

Fumigation vs. contact nematicides.

Fumigants reach nematodes by moving primarily through soil air spaces and dissolving in soil water — a very effective way to control nematodes. Contact nematicides must come in direct contact with nematodes. Their ease of application and flexibility may make them an attractive option. But contact nematicides may only prove effective under certain climate, field and economic conditions. For optimum nematode control, use Telone.

Telone C-17 soil fungicide and nematicide aids in control of these typical diseases.

- Soil rot (soil pox) of sweet potatoes
- Verticillium wilt of mint
- Pink root of onions
- Granville (bacterial) wilt, black root rot, and black shank diseases of tobacco
- Pod rot of peanuts

Examples of nematode/disease interactions that can be controlled with Telone II.

- Root-knot nematode/fusarium wilt of cotton
- Lesion nematode/verticillium wilt
- Stubby root/corky ringspot of potatoes
- Ring nematodes/bacterial canker of stone fruits

Root-damaging insects controlled by Telone.

- Symphylans
- Wireworms

Deep-rooted weeds.

At higher rates, Telone can effectively reduce populations of deep-rooted perennial weeds such as Canada thistle and bind weed.

Application

Proper Field Conditions for Fumigation.

Application timing.

Telone can be applied at any time of the year when soil conditions permit. Conditions that allow rapid diffusion of the fumigant as a gas through the soil normally give best results. Because Telone does not provide residual control of soil pests, it should be used as a preplant application before each crop.

Since nematodes won't repopulate a field without a host plant, you can apply Telone in the fall and effectively control nematodes for a spring-planted crop.

Soil temperature.

When you apply Telone, soil temperature must be between 40°F and 80°F at the depth of injection. When temperatures drop below 40°F, gas diffuses slower and applying Telone is not recommended.

Soil moisture.

The soil must be moist from 2" below the soil surface to at least 12" deep as determined by the feel method. The amount of moisture needed in this zone will vary according to soil type. The surface soil generally dries very rapidly and should not be considered in this determination.

If there is insufficient moisture at the 2" to 6" depth, the soil moisture must be adjusted before or during injection. If irrigation is not available and there is adequate soil moisture below 6", it may be brought to the surface by disking or plowing before or during the injection. To conserve existing soil moisture, pretreatment or treatment tillage practices should be done as close to the time of application as possible.

For fields with more than one soil texture, soil moisture content in the lightest textured (sandiest) areas must comply with this soil moisture requirement. Whenever possible, the field should be divided into areas of similar soil texture and the soil moisture of each area should be adjusted as needed.

Coarser textured soils can be fumigated under conditions of higher soil moisture than finer textured

Tips for early fumigation.

In crop areas where appropriate, apply Telone in fall or winter and beat the rush of spring field work. Tests show that under proper application conditions, early fumigation controls nematodes and diseases as effectively as spring application. Telone can be applied in row or broadcast.

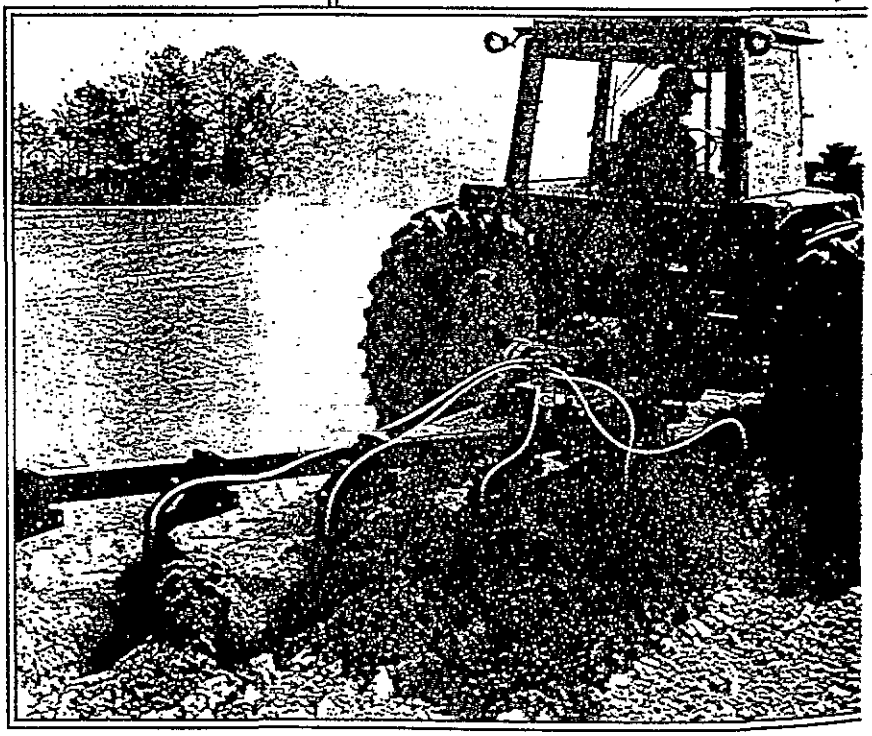
1) Broadcast for easier field management.

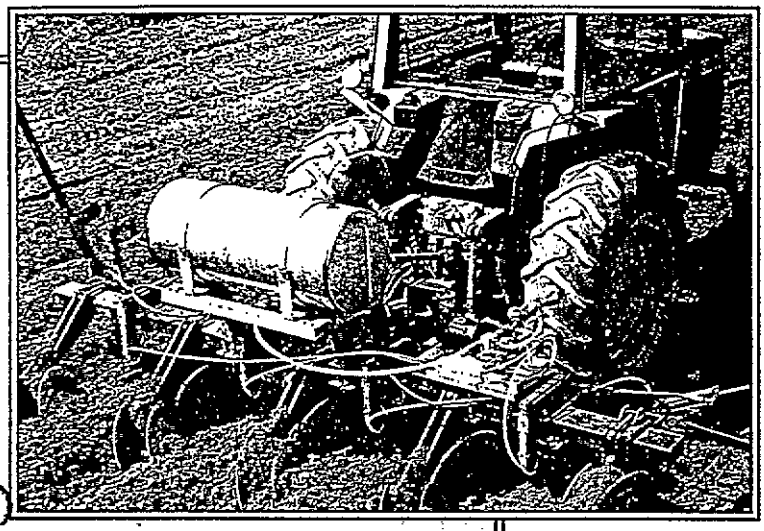
Broadcast fumigation gives you a jump on field work in the spring, without having to manage fall-formed beds. Broadcast-fumigated fields remain flat until just ahead of transplanting, giving you more equipment options to control winter flushes of weeds and incorporate PPI herbicides, insecticides and fungicides.

2) In-row application.

If you build beds early and apply Telone in the row, set your bedder to throw up a higher and wider bed than you would for spring fumigation. Heavy winter rains can erode early-formed beds, and this allows for possible bed settling.

Broadcast fumigation gives you a jump on field work in the spring, without having to manage fall-formed beds.





If you build beds early and apply Telone in the row, set your bedder to throw up a higher and wider bed than you would for spring fumigation.

3) Control winter weed flushes in the row.

Make sure weed flushes don't get out of control with in-row application. If weed root masses get too large, it may be difficult to destroy them (using chemicals, cultivation or both) without damaging bed structure or bringing contaminated soil into the planting zone. Some growers prefer a chemical burndown with Roundup™ herbicide before weeds get large and at least 30 days before transplanting to comply with label directions. A power tiller or rolling cultivator can be used to remove weed flushes on existing beds. However, be extremely careful not to contaminate the bed by pulling up untreated soil.

4) Freshen fall/winter beds.

Set your power tiller or rolling cultivator to freshen early-fumigated row ridges without damaging the shape of the bed, and without bringing contaminated soil into the planting zone.

5) Apply PPI pesticides.

With early in-row fumigation, PPI herbicides, fungicides and insecticides must be incorporated into the bed — a process you can do when freshening early-fumigated row ridges. With broadcast fumigation, you can broadcast-incorporate chemicals with a finishing disk or power tiller. Or, you can row-incorporate into formed ridges. Be sure to follow all label directions.

soils; however, if the soil moisture is too high, fumigant movement will be retarded and effectiveness of the treatment will be reduced. Previous and/or local experience with the soil to be treated or the crop to be planted can often serve as a guide to conditions that will be acceptable. If you do not know how to determine the soil moisture content of the area to be treated, consult your local extension service or soil conservation service specialist or pest control adviser (ag consultant) for assistance.

In general, no irrigation should immediately precede subsoiling or fumigation; however, when irrigation is available and surface soil moisture conditions are not likely to provide an adequate seal against fumigant loss, a very light sprinkler irrigation to wet the top 1" to 2" of soil may be used to bring soil moisture content to the desired level.

The following descriptions will aid in determining acceptable soil moisture conditions by the "feel method." For coarse soils (sand and loamy sand), there must be enough moisture to allow formation of a weak ball when compressed in the hand. Due to soil texture, this ball is easily broken with little disturbance. In loamy, moderately coarse, or medium textured soils (coarse sandy loam, sandy loam, and fine sandy loam), a soil sample with the proper moisture content can be formed into a ball which holds together with moderate disturbance, but does not stick between the thumb and forefinger. Fine textured soils (clay loam, silty clay loam, candy clay, silty clay, sandy clay loam and clay), should be pliable and not crumbly, but should not form a ribbon when compressed between the thumb and forefinger.

The amount of soil moisture directly influences the movement of Telone through the soil air space. This affects the volume of soil treated and potentially the rate of reinfestation. In coarse-textured soil, such as sand, the maximum moisture level may be slightly higher due to larger soil air space. The opposite is true for fine-textured soils.

Keeping fumigant in soil water (where nematodes live) increases efficacy and reduces the chance for vapor to leave the soil and enter the atmosphere causing unwanted air emissions.

Application

Proper Field Conditions and Timing for Fumigation.

Soil preparation.

Telone works best in seedbed-ready soils free of clods and undecomposed plant material. Since Telone is drawn to organic matter, excess plant material is likely to impair the effectiveness of your fumigation. Excess debris in soil also can clog fumigation chisels and may harbor pests that will not be controlled by fumigation. Little or no crop residue should be present on the soil surface for effective fumigation.

In soils where compaction occurs in the treatment zone, till deeper than the plow pan for good fumigant penetration. This can be done as a pre-treatment operation or during application.

Soil type and texture.

To be effective, Telone must be able to move unrestricted through a continuous series of air spaces. Lack of air space severely limits movement of fumigant, resulting in less than satisfactory control of soil pests.

Coarse-textured soils, such as sand or sandy loams, tend to contain larger pore spaces than do fine-textured soils such as clays or peat soils. In fine-textured soils, the small pore space can restrict the diffusion of the fumigant. Fine-textured soils may also require a longer pre-plant interval.

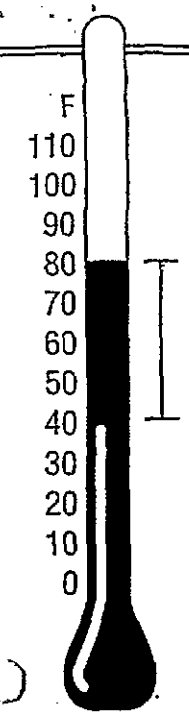
Fumigant placement.

Inject Telone at least 12"-20" below the final soil surface (measured from the bottom of the outlet tube). Deeper placement is recommended when fumigated soil is to be planted to deep-rooted plants, such as perennial fruit and nut crops, or to control deeply distributed pests. After fumigation, all soils should be thoroughly sealed.

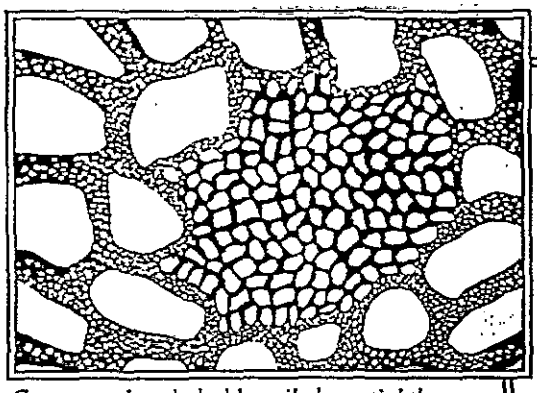
Take precautions against reinfestation.

As a pre-plant treatment, fumigants can only be expected to control the populations that are present in the zone of fumigation at the time of treatment. Care

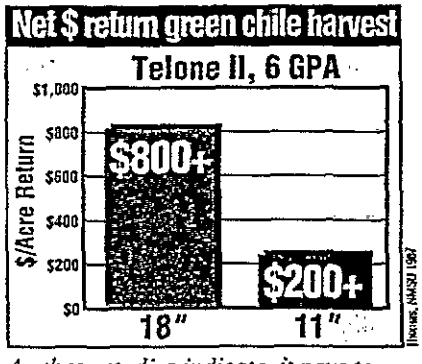
To reach nematodes where they live, inject Telone at least 12"-20" below the final soil surface (measured from the bottom of the outlet tube). Deeper placement is recommended when fumigating soil is to be planted to deep-rooted plants, such as perennial fruit and nut crops, or to control deeply distributed pests.



When you apply Telone, soil temperature must be between 40°-80°F at the depth of injection.

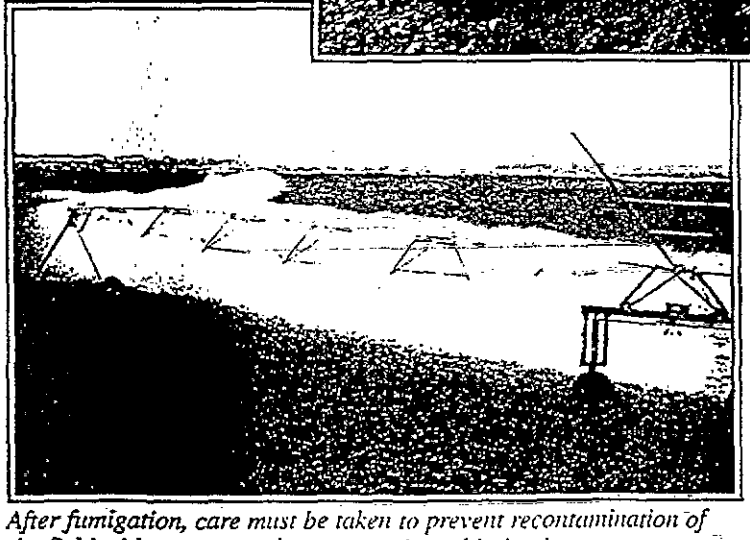


Compacted and cloddy soils have tightly compressed particles that hinder the movement and effectiveness of Telone.



As these studies indicate, it pays to inject Telone deep enough to be effective against your nematode pressure.

Telone works best in seedbed-ready soils free of clods and undecomposed plant material.



After fumigation, care must be taken to prevent recontamination of the field with sources such as contaminated irrigation water.

must be taken to prevent recontamination of the field. Growers should beware of contamination sources such as movement of equipment, spreading of contaminated manure or use of infected seed. Another common problem to control is moving soil from untreated areas into a treated area.

Other possible sources of contamination include irrigation water, wind-blown soil and deep nematode or insect populations outside the effective zone of fumigation.

Soil fumigation interval.

Leave the soil undisturbed at least 7 days after application of the fumigant. A longer interval is required if soil becomes cold or wet and for deep-rooted tree, shrub and vine planting sites.

After the fumigation interval, to prevent phytotoxicity (potentially killing plants due to undissipated fumigant), allow the fumigant to dissipate completely before planting the crop. Under optimum soil conditions for dissipation, wait 1 week for each 10 gallons/acre. To hasten dissipation, especially if heavy rains or low temperatures occur during the treatment period, till the soil to the depth of fumigant application. Use a knife-like chisel without turning the soil to reduce the possibility of recontaminating the treated soil. Dissipation is usually complete when the odor of Telone is no longer evident at the application depth. Seed may be used as a bioassay to determine if Telone is present in the soil at concentrations sufficient to cause plant injury. Do not plant if the odor of Telone is present within the zone of fumigation.

Application rates.

Your rate of Telone will vary according to variables that include:

- Rotational pattern with a non-host crop.
- Field history and nematode levels.
- Yield potential.
- Broadcast or row treatment.

Consult the appropriate label and your DowElanco Specialist for more details on the proper rate of Telone for your specific crop and conditions.

Restricted entry interval.

Only the following handler tasks may be performed in the treated area within 5 days after the application is complete:

- Assessing/adjusting the soil seal.
- Assessing pest control, application technique or application efficacy.
- Sampling air or soil for Telone.

Equipment

To Get the Most from Fumigation.

Applicator tank.

Application tanks should be stainless steel, mild steel, or polyethylene. Metal tanks will corrode if Telone residues remain in the tank in the off-season. Flush the tank with diesel fuel or other petroleum-based liquid after use. Polyethylene tanks must be less than 6 years old and exhibit no signs of cracking or other deterioration. Polyethylene is not acceptable as a storage vessel. All Telone transfers to and from the tank must use dry-disconnects on all transfer hoses.

Bottom filling of tanks is preferred. Top filling may be used only if an internal dip tube extends from the fill port to within 6 inches of the tank bottom. The tube must be grounded with the tank exterior and mounting frame.

Plumbing attached to the tank below the fluid level must have manual shutoff valves in addition to dry-disconnects. External sight gauges should be equipped with shutoff valves so that pipes to the sight gauge can be shut off in case of a break or leak.

Delivery and metering systems.

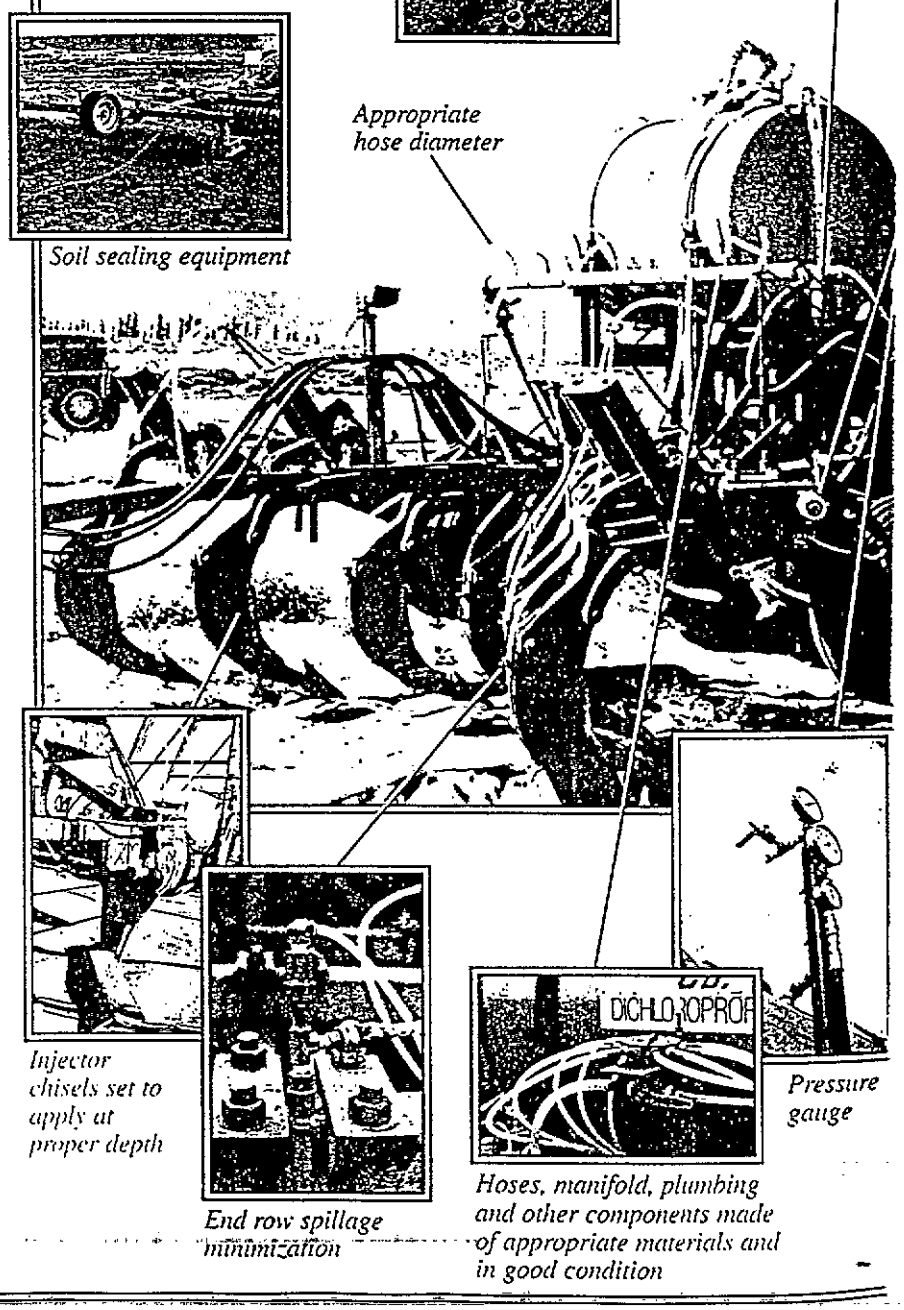
The pumping system can be driven by ground, hydraulics, PTO or electric. Systems which use inert gases to pressure transfer the fluid are possible but require special attention to tank, valves and other components. Consult with DowElanco if such a system is desired.

Metering can be accomplished by use of fixed orifices, positive displacement pumps, or variable control systems as long as they provide consistent, accurate application. This includes the ability to provide an even distribution across the implement as well as the correct total volume per acre.

Keep operating pressures as low as possible (preferably less than 30 psig) to minimize the potential for leaks or broken hoses. Operating pressure should take into account pressure drops caused by valves, lines and orifices.

The most basic delivery and metering system will include fixed orifices, a pressure regulator to control flow by adjusting the line pressure, and a pressure gauge

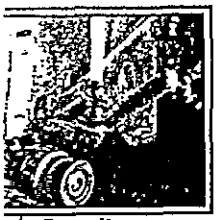
Minimum equipment requirements for field applicators.



visible from the tractor seat during application.

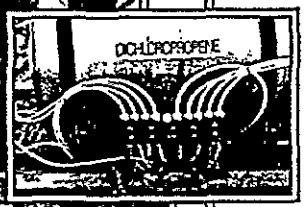
The best systems will self-adjust for speed variations and provide indications to the driver of any flow problems in individual shanks. Individual shank monitoring can be accomplished with variable flow indicators such as Redball® from Custom Ag Products. Some systems utilize speed-sensing and self-adjusting flow valves to keep application constant and provide useful information such as rate per acre, total gallons applied, speed, flow rate or acres treated. Vendors of such systems include Raven Industries, Micro-Trak and Dickey-John.

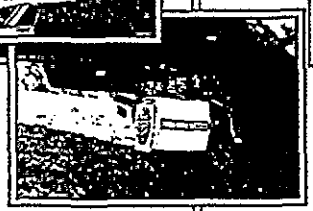
Electrical components on metering and monitoring must adhere to the following guidelines: Motors must meet Class I, Division 2 standards of the National Electrical Code #70. Meters and control valves may be standard design if they are non-arc producing and are sealed. Electrical junctions may be in standard enclosures if the enclosure is sealed. Enclosures are not required for connections which are soldered and sealed in shrink coverings, or have mated connections which seal the connection from exposure to vapor and are designed to prevent unintentional disengagement. Twisted wire connections are not allowed. Wiring must be "Extra Hard Usage" as defined by NEC #70, or as an alternative, may be standard wiring if sheathing or other protection is provided against abrasion, pinching or other abuse.



Dry-disconnects

etering device





Flow monitoring devices

Injection knives/chisel shanks.

The most common injection system is a metal tube welded to the trailing edge of a forward swept knife. The outlet of the tube must be slightly higher than the bottom of the knife.

Minimizing end row spillage.

Product spillage at the end of rows should be minimized. A flow shutoff device must be placed at, or as near as practical, to the discharge point of the fluid to limit spillage which may occur when the knife is raised from the ground. This may include a ball, poppet, or diaphragm check valve, or a full flow shutoff device such as an electric or pneumatically-actuated valve. Check valves placed above the orifice may improve their performance. An alternative to shutoff devices is a purge system which clears the line of all liquid.

Shank check valve performance may also be improved by:

1) Isolating the upstream pressure by placement of a main line shutoff or bypass valve prior to the manifold.
2) Limiting lines from the manifold to the shank shutoff device to ¼" or less.

The volume of fluid in the tube below the shank shutoff device should be minimized by using the smallest diameter tubing which can accommodate the expected range of application rates. Tubing from the manifold to the discharge point cannot exceed ¼" in diameter. In most cases a ⅛" or less inside diameter tube below the shank shutoff device is sufficient.

Tubing and hoses must be high-density or cross-linked polyethylene, nylon, Teflon, or polypropylene.

Tool bar and sealing device.

A V-type tool bar with chisel shanks is the most common implement. Limit the tool bar size and number of shanks to maintain the desired depth with the horsepower available.

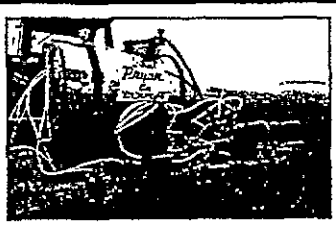
All application rigs must utilize a sealing device to maintain the Telone in the target soil area (see pages 14-15 for more details).

Selecting the proper hose diameter.

Distance from shutoff to shank exit (in.)	Hose interior diameter (in.)	Volume per shank (oz.)	Volume per 7 shank applicator (oz.)
18	¼	0.49	3.40
18	⅛	0.13	0.86
18	1/16	0.03	0.21
30	¼	1.00	7.00
30	⅛	0.13	0.86
30	1/16	0.03	0.21

Note: Small shank diameters will decrease the volume of liquid below the check valve that can drip from the shank. Actual drip volume is much smaller than shown because much will exit the shank below the soil while the implement is still being raised out of the ground.

In California:



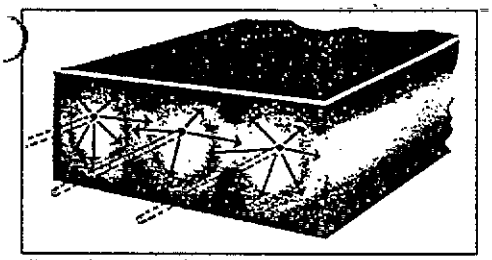
Application systems must also be nitrogen padded and must include a vapor recovery system, vacuum relief and pressure relief valve on tank, liquid level sensor or tape, or sight gauge with self-closing shut-off valve, system purge and shank purge.

Equipment

Choosing Row or Broadcast.

Broadcast.

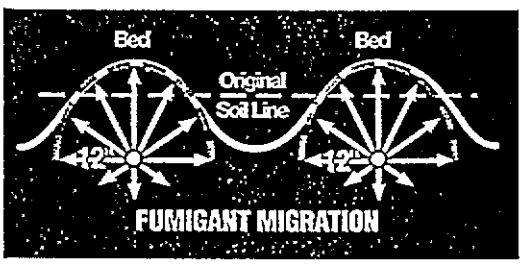
Fumigation of the entire application zone. Commonly applied with a bottom plow, flip plow, switch plow or chisel plow with ripper-type, forward-sweep shanks spaced at 12-24". The outlet spacing should generally be equal to the application depth.



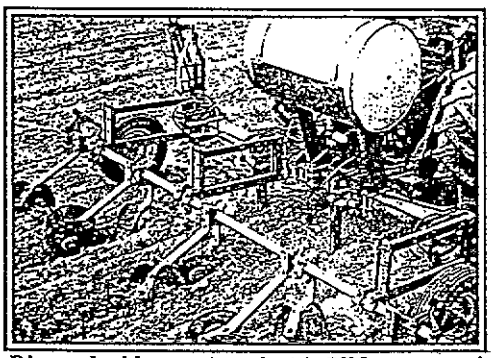
Broadcast application

Row.

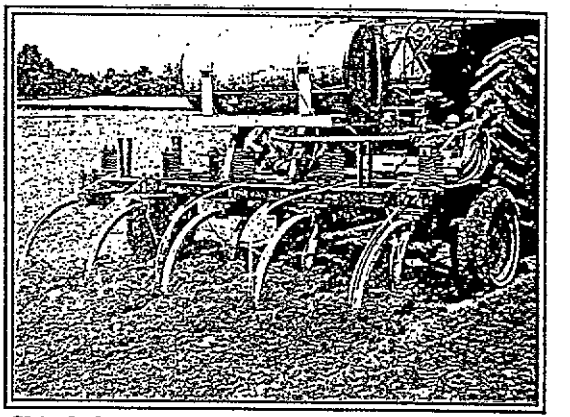
Fumigation of only the band of soil in the row where the crop will be planted. Commonly applied with a ripper-bedder. Plant the seed about 4" to one side of the chisel furrow when using one chisel per row. The fumigant must be placed at least 12" from the nearest soil/air interface.



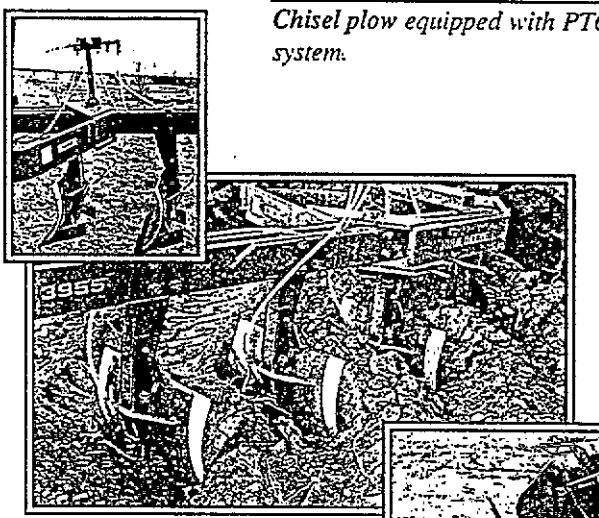
Row treatment



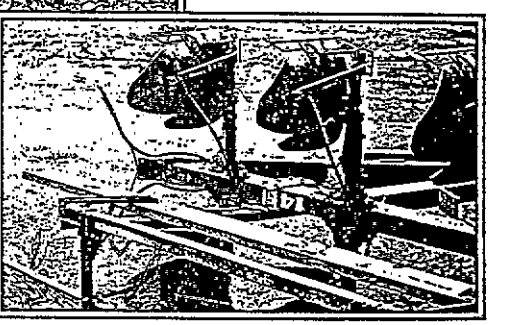
Ripper bedder equipped with PTO pump and metering system. Tank can be mounted on the implement.



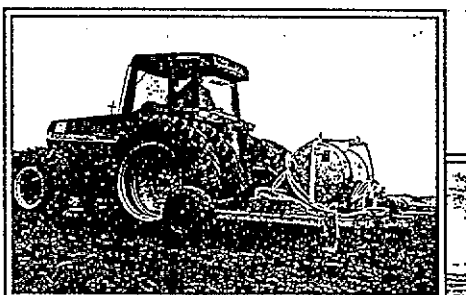
Chisel plow equipped with PTO pump and metering system.

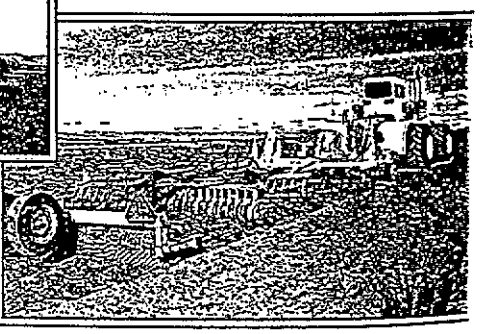


Switch plow equipped with PTO pump and metering system. From the manifold, hoses drop down behind bottoms.

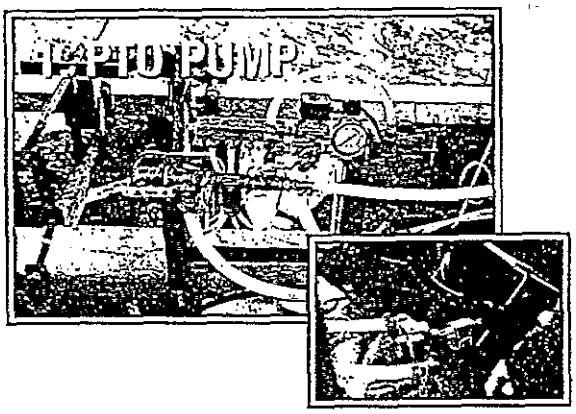


Flip plow with application hoses routed behind the moldboards. A "T" assembly allows the Telone to drop to the opposite set of moldboards when the plow flips over.





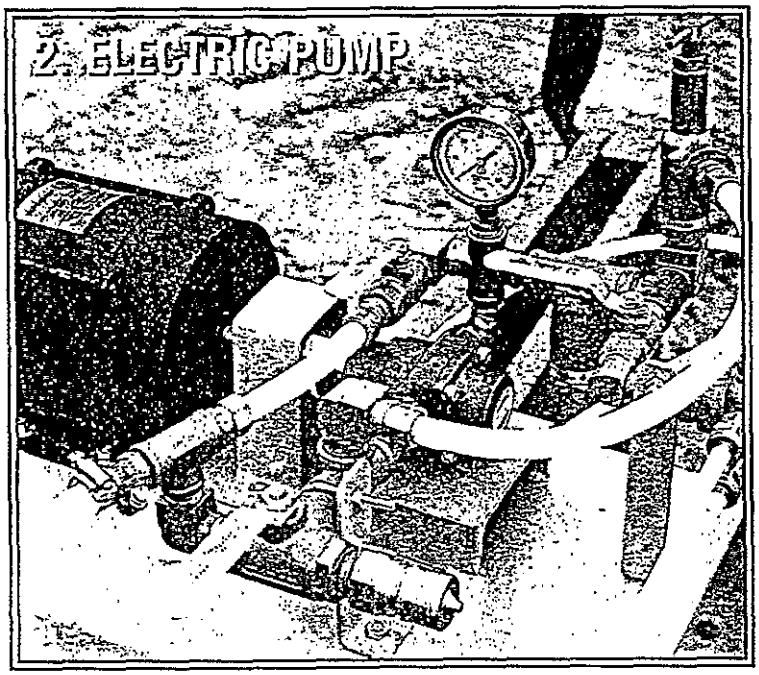
Rippers equipped with ground-driven pumps.



Pump Systems.

1) PTO pump (roller-type).

- Power takeoff-driven.
- Simple construction, simple maintenance and moderate cost.
- Provides wide choice of application rates by varying pressure and metering discs.
- Can be plumbed to refill applicator tank.
- Calibration adjusts by changing orifice plates.
- Must travel at known and constant speed.



2) Electric pump.

- Driven by tractor electrical system.
- Flexibility in pump location and hook-up.
- Frees PTO for other jobs.
- Motor and electrical components must be manufactured and assembled to meet the 1993 National Electrical Code governing requirements for transfer and application of flammable products.

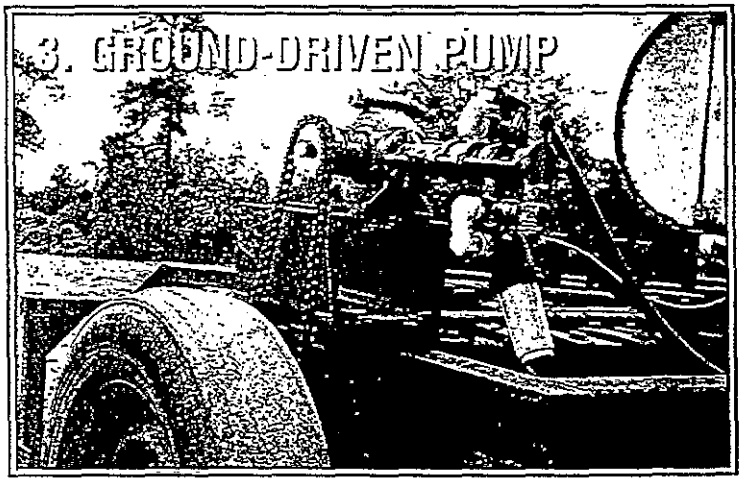
3) Ground-driven pump.

- Positive-displacement pump powered by a chain-driven drive wheel.
- Allows moderate speed variation without affecting your application rates.
- Easy to change calibration.
- Requires external pump to refill application tank.

Pump Suppliers

Reddick Fumigants
HWY 64 West
P.O. Box 391
Williamston, NC 27892
919-792-1613

Coastal Chemical Corp.
P.O. Box 856
Evans Street Exit
Greenville, NC 27835-0856
1-800-635-1388
919-756-1126



Soil Sealing

To Keep the Fumigant in the Ground Where it Controls Pests.

Since Telone turns into a gas when injected, it must be properly sealed into the soil to maintain an effective dose to control nematodes or other pests. (Dose relates to the concentration of Telone in the soil and the length of time the concentration is maintained.)

Telone is injected into soil by chisels. As these chisels move through the soil, they leave a chisel "trace" or weak area in the soil. The chisel trace usually fills with soil and is not visible. However, the trace behind the chisel can contain more air space than the soil between chisels, providing a path of least resistance for the gas to move up and out of the soil.

If fumigant moves up and out of the soil too fast, the dose in the soil between chisels can be reduced. As a result, a smaller volume of soil is actually treated, allowing faster reinfestation of pests into the treated zone.

The most important step in keeping fumigant in the ground is to seal the soil by eliminating the chisel trace and compacting the soil surface which helps minimize emission of 1,3-D into the atmosphere.

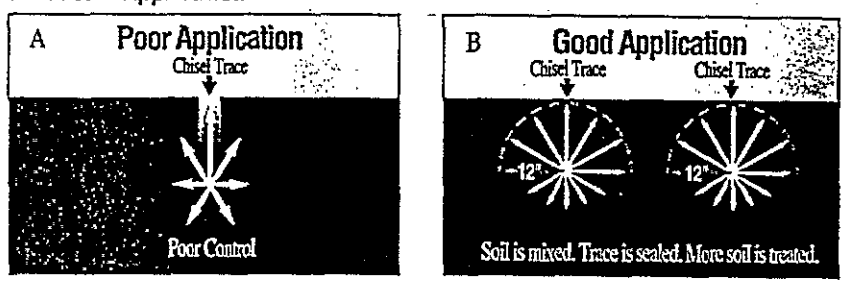
Immediately after application, use a disk or similar device to disrupt the chisel trace and then follow with a compression device such as a ring-roller or culti-packer.

Even when applications utilize tarping to aid in the sealing operation, it is critical to eliminate the chisel trace between the depth of placement and tarp. If this is not done, the fumigant will move very quickly to the surface where the tarp restricts its movement. While the soil surface may be effectively treated, the total volume of soil treated below the tarp will be reduced.

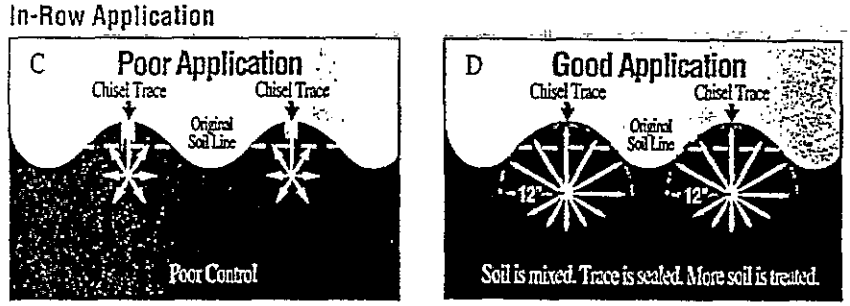
To check your field for proper sealing, try to force a shovel handle or probe into the soil in a attempt to find the chisel trace. If it easily presses in more than a couple of

The value of eliminating the chisel trace.

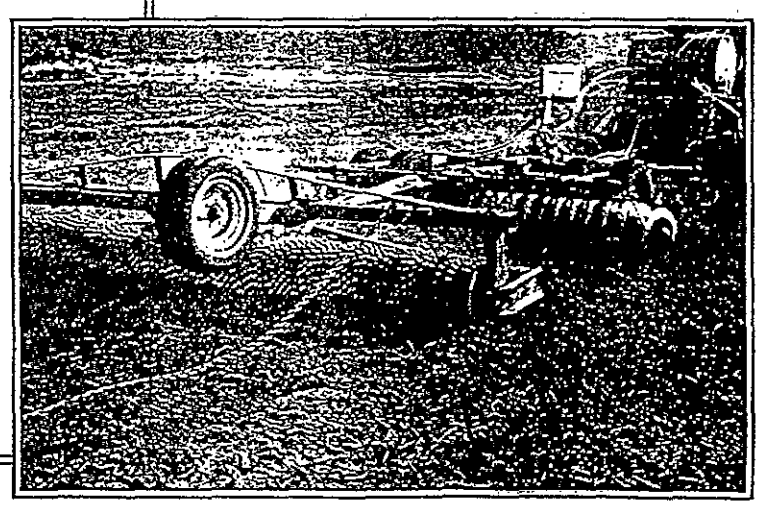
Broadcast Application



In-Row Application



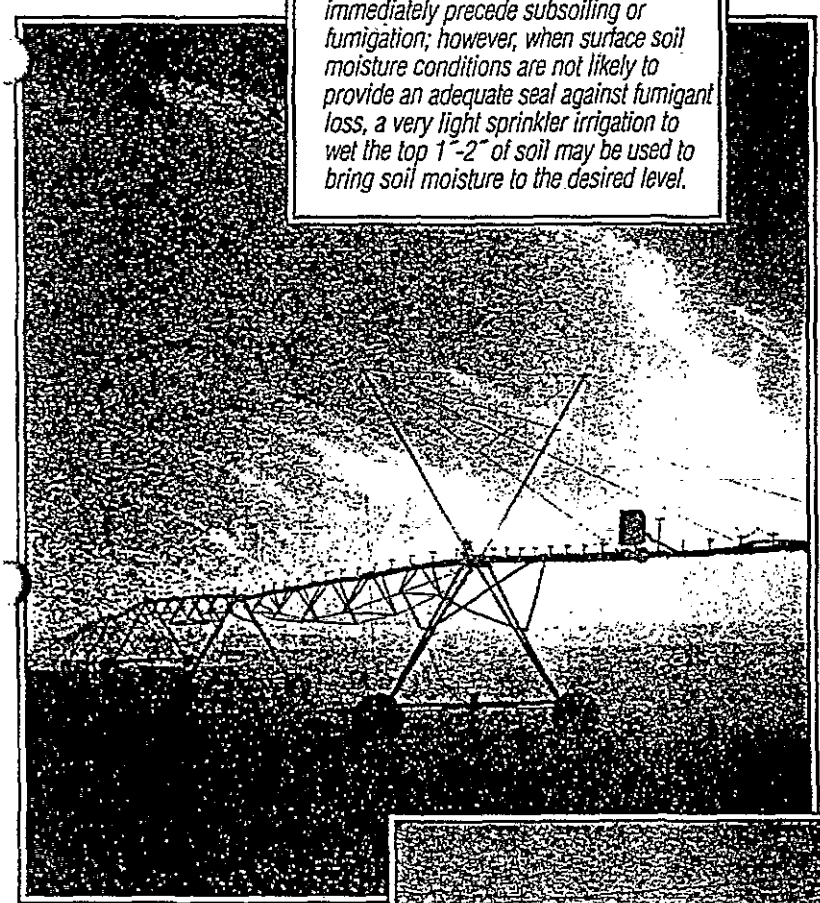
If Telone moves up and out of the soil too fast, as shown in figures A and C, the dose achieved in the soil between the chisels is reduced. Figures B and D illustrate the impact of good placement and sealing practices on soil fumigation.



Since Telone turns into a gas when injected into the ground, it needs to be properly sealed into the soil. Make sure you completely eliminate your shank trace. Immediately after application, use a disk or similar device to disrupt the chisel trace and then follow with a compression device such as a ring-roller or culti-packer.

Tips for better soil sealing.

1. *Apply Telone under proper soil conditions. Telone works best in seedbed-ready soils free of clods and crop residue. Applying Telone under too wet conditions can prevent the knife trace from sealing, allowing fumigant to escape. Wet soils also reduce lateral diffusion, causing a higher concentration of fumigant in the knife trace.*
2. *Inject Telone 12"-20" below the final soil surface.*
3. *Use the appropriate implement or application equipment to ensure the best possible elimination of the chisel trace and compaction of the soil surface.*
4. *In general, no irrigation should immediately precede subsoiling or fumigation; however, when surface soil moisture conditions are not likely to provide an adequate seal against fumigant loss, a very light sprinkler irrigation to wet the top 1"-2" of soil may be used to bring soil moisture to the desired level.*



When surface soil moisture conditions are not likely to provide an adequate seal against fumigant loss, a very light sprinkler irrigation to wet the top 1"-2" of soil may be used to bring soil moisture to the desired level.

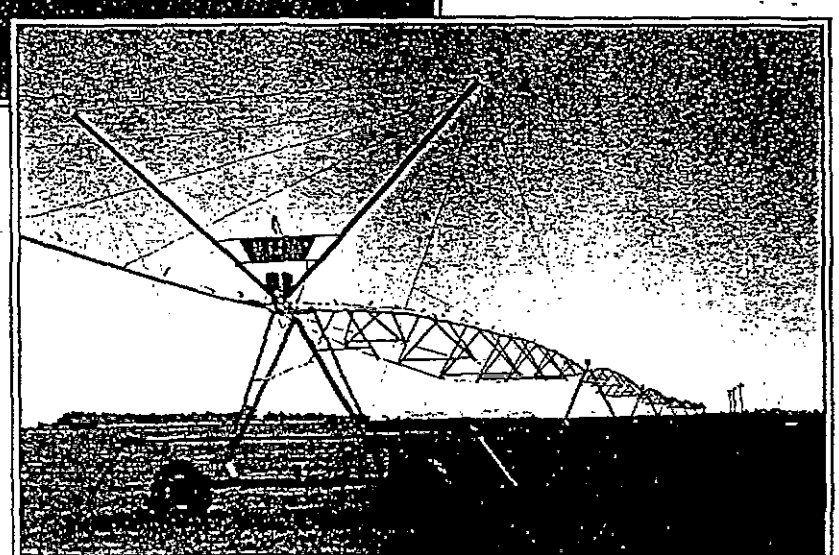
inches, the application may benefit by another sealing operation.

Managing erosion with an overwinter cover crop.

Fall soil fumigation requires the same soil preparation as other times of the year (i.e., seedbed-ready soil free of clods and undecomposed plant material). It also requires proper soil sealing.

If you plan to plant a cover crop (i.e., cereal grains, grasses) to reduce erosion over winter in fumigated fields, read the label on Telone and follow the proper soil fumigation interval. Leave soil undisturbed at least 7 days after application of the fumigant. A longer undisturbed interval is required if the soil becomes cold or wet, and for deep-rooted tree, shrub and vine planting sites.

After the fumigation interval, to prevent phytotoxicity, allow the fumigant to dissipate completely before planting the crop. Under optimum soil conditions for dissipation, 1 week for each 10 gallons/acre is recommended. To hasten dissipation, especially if heavy rains or low temperatures occur during the treatment period, till the soil to the depth of fumigant application. Use a knife-like chisel without turning the soil to reduce the possibility of recontaminating the treated soil. Dissipation is usually complete when the odor of Telone is no longer evident at the application depth. Seed may be used as a bioassay to determine if Telone is present in the soil at concentrations sufficient to cause plant injury. Do not plant if the odor of Telone is present within the zone of fumigation.



If you plan to plant a cover crop (e.g., cereal grains, grasses) to reduce erosion over winter in fumigated fields, read the label for Telone and follow the proper soil fumigation interval.

Calibration

Adjusting Your Fumigation Equipment to Apply the Proper Rate.

Calibration overview.

Equipment must be calibrated. This section presents one method, but any method which accurately and safely ensures proper application rate is acceptable. The method must minimize Telone exposure to atmosphere (i.e., open calibration with Telone into catch containers is unacceptable).

Application involves applying the right total amount and dividing it equally to each shank. We recommend using an in-line flow rate monitor (e.g., Raven, Dickey-John, Flow-Trak) combined with the Redball® distribution monitor.

Factors affecting calibration depend on the metering system being used. Shank spacing, orifice size, delivery pressure and tractor speed affect all systems, although some systems account for these automatically. For instance, ground driven pumps account for tractor speed.

After setting up your system, confirm calibration with one of these methods:

- Measuring the amount applied over a known area by observing tank level.
- Measuring amount applied over a known area by using a small volumetric container with sight tube mounted on the applicator. (This essentially substitutes a small container for the applicator tank, making small volumes easier to read.)
- Determining flow rate by dispensing an alternate fluid such as water or diesel fuel into collection cups, then using measured field speed to calculate actual application rate.

It is best to calibrate with Telone. Water has different physical properties. You must use conversion charts if water is used, or your application rate will be wrong. Also, water in the system must be flushed completely from the system or corrosion may occur quickly.

Table 1

Time Required to travel 100 feet.

MPH	Foot per min.	Min.	Sec.
3	264	0	23
4	352	0	17
5	440	0	14
10	880	0	7

Selecting an orifice for systems which use orifices and pressure to meter product.

Step	Your Number	Example	Comment
1) Determine application rate (gpa)		10 gpa	Based on product label.
2) Determine shank spacing (inches)		18"	Select equipment based on label.
3) Determine tractor speed a. Measure 100-foot track in field b. Measure time to travel 100 feet c. Read MPH from Table 1		 23 seconds 3 MPH	Determine speed in the field, with knives in ground at working depth and tank half full. Do not use tachometer or speedometer because wheel slippage makes these inaccurate for measuring true speed.
4) Use Table 2 to determine flow rate per outlet needed at 1 MPH		3.9 oz/min	Find your application rate (1). Read across to your row spacing. The example, 10 gpa and 18", requires calculation between the 12" and 24" spacing (i.e. 18" is halfway between 12" and 24", so the rate is halfway between 5.2 and 2.6, or 3.9).
5) Calculate flow rate per outlet		11.70 Oz/min	Multiply (4) x (3c). Example: 3.9 x 3. To calculate gal/min., divide ounces by 128.
6) Select working pressure		20 psig	This is the pressure at the orifice. Select it based on your equipment. Use the lowest working pressure that still allows efficient operation of the check valves and provides needed flow rates. 20 psig will allow positive opening of 10 psig check valves. Pressure at the pump will be higher.
7) Use Table 3 to select an orifice		#4916-33	Look in Table 3 under 20 psig. Move down until you find the flow rate (5) you need. Example: 11.7 oz/min. is between 11.055 (#32) and 12.102 (#34).

Table 2

Ounces per outlet per minute at 1 mph.

Number of ounces of Telone per outlet per minute for various row spacings at speed of one mile per hour.

	Row spacing in inches											
GPA	10	12	24	30	32	34	36	38	40	42	44	48
½	.1	.1	.3	.3	.3	.3	.4	.4	.4	.5	.5	.5
¾	.2	.2	.4	.5	.5	.5	.6	.6	.6	.7	.7	.8
1	.2	.3	.5	.7	.7	.7	.8	.8	.9	.9	1.0	1.0
2	.4	.5	1.1	1.3	1.4	1.5	1.6	1.7	1.7	1.8	1.9	2.0
3	.6	.8	1.6	1.9	2.1	2.2	2.3	2.5	2.6	2.7	2.8	3.0
4	.9	1.0	2.1	2.5	2.8	2.9	3.1	3.5	3.5	3.6	3.8	4.1
5	1.1	1.3	2.6	3.2	3.4	3.7	3.9	4.1	4.3	4.5	4.7	5.2
6	1.3	1.5	3.1	3.9	4.1	4.4	4.7	5.0	5.2	5.4	5.7	6.2
7	1.5	1.8	3.6	4.5	4.7	4.9	5.5	5.8	6.1	6.4	6.6	7.2
8	1.7	2.1	4.2	5.2	5.5	5.8	6.2	6.6	6.9	7.3	7.5	8.2
9	1.9	2.3	4.7	5.8	6.2	6.5	7.0	7.4	7.8	8.3	8.6	9.3
10	2.2	2.6	5.2	6.5	6.9	7.3	7.7	8.3	8.6	9.1	9.5	10.3
11	2.4	2.8	5.7	7.1	7.6	8.0	8.5	9.1	9.5	10.0	10.4	11.3
12	2.6	3.1	6.2	7.8	8.3	8.7	9.3	9.9	10.4	10.9	11.4	12.4
13	2.8	3.4	6.7	8.4	9.0	9.5	10.1	10.7	11.2	11.8	12.3	13.4
14	3.0	3.6	7.3	9.1	9.7	10.2	10.9	11.5	12.1	12.8	13.3	14.5
15	3.2	3.9	7.8	9.7	10.4	10.9	11.6	12.6	13.0	13.6	14.2	15.5
16	3.5	4.1	8.3	10.1	11.1	11.6	12.4	13.1	13.8	14.6	15.2	16.5
17	3.6	4.4	8.8	10.9	11.5	12.4	13.2	13.9	14.6	15.4	15.9	17.5
18	3.9	4.7	9.3	11.8	12.4	13.1	13.9	14.8	15.5	16.5	17.1	18.6
19	4.1	4.9	9.8	12.3	13.1	13.8	15.0	15.6	16.4	17.6	18.0	19.6
20	4.3	5.2	10.4	12.9	13.8	15.1	16.1	16.4	17.2	18.2	19.0	21.4

Calibrating positive-displacement ground-driven pumps.

These pumps do not use orifices. Flow rate is determined by sprocket size on the drive wheel and pump, drive wheel tire size, application width and piston stroke length. Refer to the manufacturer's instructions to set the target flow rate. Then check actual flow rate and distribution as mentioned.

Note: *Read from Table 2 ounces per minute at one mile per hour for your gallonage and row spacing. Multiply this figure by your tractor speed, and you get your number of ounces per minute of fumigant per outlet. To adjust for flow rate difference between Telone and water, multiply ounces per minute flow per outlet indicated in Table 2 by 1.1 to get oz./min./outlet water.*

Table 3

Flow rates for various diameter 4916 orifice plates.

Plt # 4916-	Pressure in PSI	Oz/Min Water	Oz/Min Telone	Plt # 4916-	Pressure in PSI	Oz/Min Water	Oz/Min Telone	Plt # 4916-	Pressure in PSI	Oz/Min Water	Oz/Min Telone	Plt # 4916-	Pressure in PSI	Oz/Min Water	Oz/Min Telone	Plt # 4916-	Pressure in PSI	Oz/Min Water	Oz/Min Telone
8	5	0.384	0.349	28	5	4.480	4.073	46	5	12.160	11.055	67	5	25.083	22.807	93	5	49.536	45.033
	10	0.512	0.465		10	6.272	5.702		10	17.280	15.709		10	35.584	32.349		10	70.016	63.651
	20	0.768	0.698		20	8.832	8.029		20	24.448	22.225		20	50.304	45.731		20	99.072	90.065
	30	0.896	0.815		30	10.880	9.891		30	29.824	27.113		30	61.568	55.971		30	121.344	110.313
10	5	0.640	0.582	29	5	4.864	4.422	47	5	12.416	11.287	68	5	25.856	23.505	95	5	51.712	47.011
	10	0.896	0.815		10	6.912	6.284		10	17.536	15.942		10	36.608	33.280		10	73.216	66.560
	20	1.152	1.047		20	9.728	8.844		20	24.832	22.575		20	51.840	47.127		20	103.424	94.022
	30	1.408	1.280		30	11.904	10.822		30	30.464	27.695		30	63.488	57.716		30	126.720	115.200
12	5	0.896	0.815	30	5	5.120	4.655	48	5	12.928	11.753	70	5	27.648	25.135	98	5	56.576	51.433
	10	1.152	1.047		10	7.296	6.633		10	18.304	16.640		10	39.168	35.607		10	80.000	72.727
	20	1.664	1.513		20	10.368	9.425		20	25.856	23.505		20	55.296	50.269		20	113.024	102.749
	30	2.048	1.862		30	12.672	11.520		30	31.616	28.742		30	67.840	61.673		30	138.240	125.673
	5	1.152	1.047	31	5	5.504	5.004	49	5	13.312	12.102	72	5	28.928	26.298	103	5	59.136	53.760
	10	1.664	1.513		10	7.808	7.098		10	18.816	17.105		10	40.960	37.236		10	83.584	75.985
	20	2.304	2.095		20	11.136	10.124		20	26.624	24.204		20	57.984	52.713		20	118.400	107.636
	30	2.816	2.560		30	13.568	12.335		30	32.640	29.673		30	70.912	64.465		30	144.640	131.491
15	5	1.280	1.164	32	5	6.144	5.585	51	5	14.848	13.498	73	5	29.824	27.113	107	5	66.560	60.509
	10	1.792	1.629		10	8.576	7.796		10	21.120	19.200		10	42.240	38.400		10	94.080	85.527
	20	2.560	2.327		20	12.160	11.055		20	29.824	27.113		20	59.648	54.225		20	133.120	121.018
	30	3.200	2.909		30	14.976	13.615		30	36.480	33.164		30	73.088	66.444		30	162.560	147.782
16	5	1.536	1.396	34	5	6.656	6.051	52	5	15.104	13.731	75	5	31.360	28.509	110	5	70.144	63.767
	10	2.048	1.862		10	9.344	8.495		10	21.376	19.433		10	44.416	40.378		10	99.328	90.298
	20	2.944	2.676		20	13.312	12.102		20	30.336	27.578		20	62.848	57.135		20	140.800	128.000
	30	3.584	3.258		30	16.256	14.778		30	37.120	33.745		30	76.928	69.935		30	171.520	155.927
18	5	1.920	1.745	35	5	7.040	6.400	54	5	16.256	14.778	78	5	34.816	31.651	115	5	77.568	70.516
	10	2.688	2.444		10	9.984	9.076		10	23.040	20.945		10	49.280	44.800		10	109.696	99.724
	20	3.712	3.375		20	14.208	12.916		20	32.640	29.673		20	69.632	63.302		20	154.880	140.800
	30	4.608	4.189		30	17.408	15.825		30	39.936	36.305		30	85.376	77.615		30	190.720	173.382
20	5	2.304	2.095	37	5	7.808	7.098	55	5	17.024	15.476	80	5	35.840	32.582	120	5	80.896	73.542
	10	3.328	3.025		10	11.008	10.007		10	24.064	21.876		10	50.688	46.080		10	114.432	104.029
	20	4.736	4.305		20	15.488	14.080		20	34.048	30.953		20	71.808	65.280		20	161.280	146.618
	30	5.760	5.236		30	18.944	17.222		30	41.728	37.935		30	87.936	79.942		30	198.400	180.364
22	5	2.816	2.560	39	5	8.576	7.796	57	5	18.048	16.407	81	5	37.376	33.978	125	5	88.704	80.640
	10	3.968	3.607		10	12.160	11.055		10	25.600	23.273		10	52.736	47.942		10	125.440	114.036
	20	5.504	5.004		20	17.280	15.709		20	36.224	32.931		20	74.624	67.840		20	177.920	161.745
	30	6.784	6.167		30	21.120	19.200		30	44.288	40.262		30	91.392	83.084		30	217.600	197.818
24	5	3.328	3.025	40	5	9.216	8.378	59	5	19.584	17.804	83	5	40.704	37.004	128	5	92.416	84.015
	10	4.736	4.305		10	13.056	11.869		10	27.648	25.135		10	57.472	52.247		10	130.560	118.691
	20	6.784	6.167		20	18.432	16.756		20	39.168	35.607		20	81.280	73.891		20	184.320	167.564
	30	8.192	7.447		30	22.656	20.596		30	48.000	43.636		30	99.584	90.531		30	226.560	205.964
25	5	3.584	3.258	41	5	9.472	8.611	61	5	21.120	19.200	86	5	42.496	38.633	132	5	99.072	90.065
	10	5.120	4.655		10	13.440	12.218		10	29.824	27.113		10	60.032	54.575		10	139.520	126.836
	20	7.168	6.516		20	19.072	17.338		20	42.112	38.284		20	84.992	77.265		20	198.400	180.364
	30	8.832	8.029		30	23.296	21.178		30	51.584	46.895		30	104.064	94.604		30	243.200	221.091
26	5	3.840	3.491	43	5	10.368	9.425	63	5	22.144	20.131	89	5	44.288	40.262	136	5	107.520	97.745
	10	5.504	5.004		10	14.720	13.382		10	31.360	28.509		10	62.720	57.018		10	152.320	138.473
	20	7.808	7.098		20	20.864	18.967		20	44.288	40.262		20	88.704	80.640		20	215.040	195.491
	30	9.472	8.611		30	25.472	23.156		30	54.272	49.338		30	108.672	98.793		30	263.680	239.709
27	5	4.096	3.724	45	5	11.264	10.240	65	5	23.552	21.411	91	5	47.360	43.055	140	5	114.560	104.145
	10	5.760	5.236		10	16.000	14.545		10	33.408	30.371		10	66.944	60.853		10	162.560	147.782
	20	8.192	7.447		20	22.656	20.596		20	47.232	42.938		20	94.592	85.993		20	229.120	208.291
	30	9.984	9.076		30	27.648	25.135		30	57.856	52.596		30	115.840	105.309		30	280.320	254.836

Transferring Telone

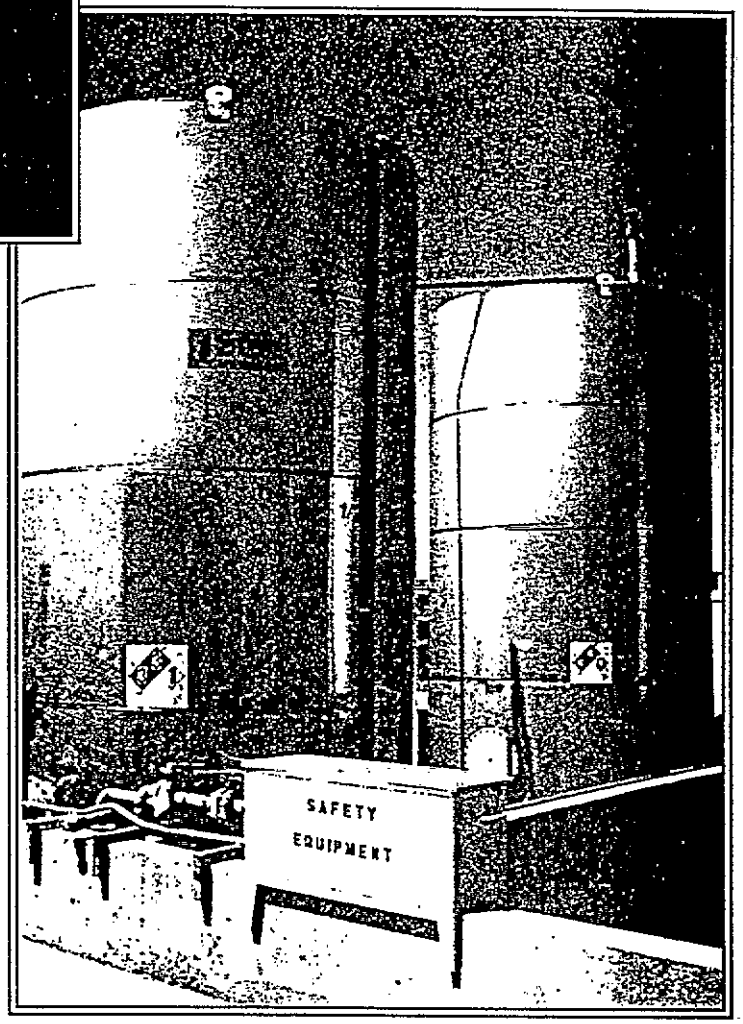
For Proper and Safe Handling.

General practices.

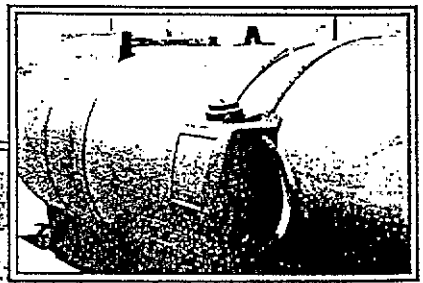
When transferring Telone, follow these procedures, rules and precautions:

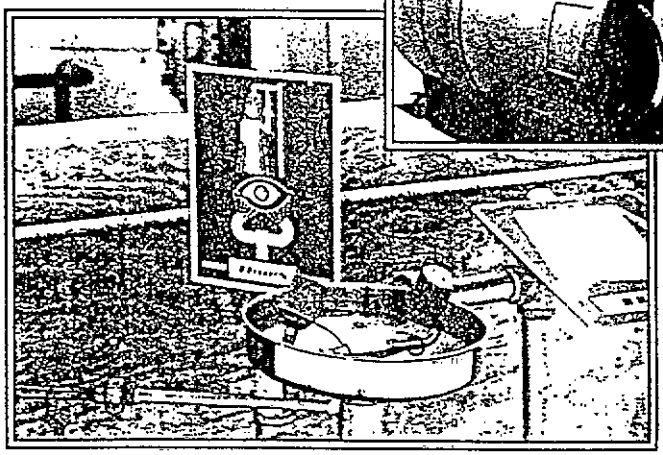
- All federal, state, and local rules or regulations must be observed. Because Telone has a flash point of 83°F (28°C) and therefore is classified as a "flammable liquid" and is used in locations where "flammable liquids are handled, processed, or used, but in which the vapors will normally be confined within the closed systems...and can escape only in case of accidental rupture..." storage and handling of Telone must conform to certain requirements of the following:
  - National Electrical Code (Class 1, Division 2)
  - National Fire Protection Association (NFPA) Code
  - Uniform Fire Code (UFC)
  - Occupational Safety and Health Administration (OSHA) requirements
  - Environmental Protection Agency (EPA) requirements

  In part, these regulations require:
  - Bottom outlet valves on tanks
  - Emergency relief valves on tanks
  - Fire resistance of valves
- Sources of ignition must be eliminated. Unnecessary engines must be shut down, smoking in the area suspended, and bonding cables attached between the involved vehicles.
- Personnel necessary to the transfer operation must be provided with approved personal protective equipment (see "PPE Requirements" pg. 25).
- Tractor tanks must be of steel or stainless steel. Any tanks used to transport bulk products on public roads shall meet all federal, state and local transportation requirements. Non-code tanks can only be transported if completely empty.
- During transfer of Telone to the tractor tank, the vehicles must be parked in a manner that minimizes any chance of movement, provides a neat hose arrangement without coils or sharp bends, and allows either good visibility of the tractor tank gauges from the pumping control point or easy, sure communication between an observer and the operator.
- Emergency wash water, soap and towel must be easily available, and eye wash bottles must be placed in a readily available position just outside the immediate work area.
- The transfer operation must be performed in daylight or in a well-lit area at night. Good general illumination is necessary so that all elements of the operation may be visually monitored. Hand-held lanterns or flashlights do not provide suitable lighting.



Requirements for storage and handling of Telone include tanks with bottom outlet valves and emergency relief valves. Valves should be fire resistant.

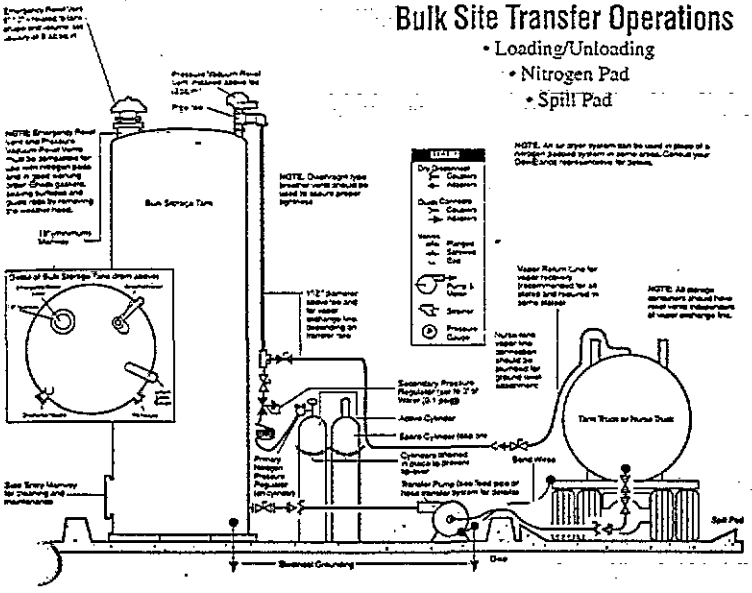




When transferring Telone, emergency wash water, soap and towel must be easily available.

Bulk Site Transfer Operations

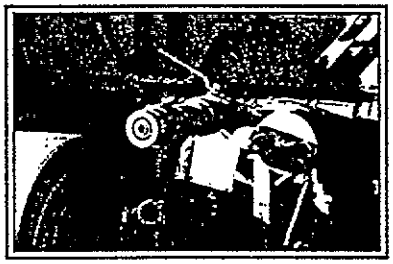
- Loading/Unloading
- Nitrogen Pad
- Spill Pad



Before loading Telone, put on all required personal protective equipment.

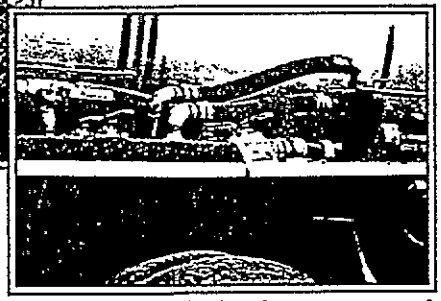
Attach electrical bonding cables before connecting liquid transfer line.

Securely connect liquid transfer lines, making sure there are no leaks.



The truck loading connection must be provided with a dry-disconnect adapter and cap (Kamvalok or equivalent).

Be sure trucks and tanks are properly labeled for Telone soil fumigant and placarded to meet DOT rules.



Pumps, hoses and other fittings on a truck used to transfer Telone should be in good operating condition.

General loading requirements for DOT equipment.

- Put on all required personal protective equipment and make connections in the following order:
  a. Electrical bonding cable.
  b. Liquid transfer line.
- The tanks are clean. For example, they should not contain residues of other chemicals or solid matter. Tanks must be absolutely dry. Small amounts of water could initiate a corrosive condition.
- The tanks are properly labeled for Telone and placarded meeting DOT rules.
- The pumps, hoses, and other fittings on the truck are in good operating condition.

Note: Hoses must have dry-disconnects.

- There is no aluminum, magnesium, zinc, cadmium, or alloy containing aluminum or magnesium in any part of the system that will contact Telone.

Note: Galvanized materials must not be used.

- The tanks must be provided with a bottom connection for loading and unloading. Top loading of flammable liquids is not recommended, but if top loading is used, a dip tube must extend to the bottom of the tank (maximum 3 to 5 inches above) to prevent free-fall of the liquid. To avoid static buildup, the initial filling rate must be low until the inlet is covered.
- The loading connection must be provided with a dry-disconnect adapter and cap (Kamvalok or equivalent).
- The tanks must have a "working" vent (other than a pressure/vacuum relief) shielded within the roll-over protection.
- The pump must be a centrifugal pump of steel, stainless steel, cast iron, brass, or ductile iron. The shaft seal should be a rotary mechanical seal (Durametallic, John Crane or equivalent). The pump shaft shall be steel or stainless steel. Positive displacement pumps are not to be used.
- The pump discharge must be fitted with a gate, ball or globe valve between the pump and the transfer hose.
- The truck must be provided with a hose for transfers, the discharge end to be fitted with a dry-disconnect coupler.
- The transfer pumps may be PTO-driven or gasoline-driven (in remote locations where electricity is not available).
- If a gasoline engine is used, it must be provided with a spark-arresting intake and exhaust. The exhaust must be placed so that there will be no heating or impinging of any parts of the transfer system. Regulations also call for other safety measures with regard to the ignition system, spill shielding and prevention of vapor intake. Further, the exhaust gases or the exhaust system shall not interfere with the operator making the transfer.
- IN CALIFORNIA, loading requirements for DOT equipment includes use of a vapor exchange system.

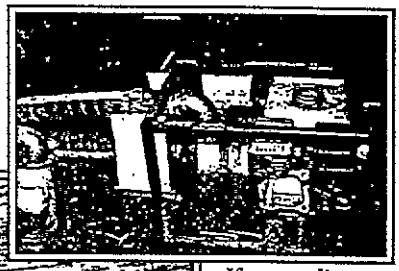
Transferring Telone

Requirements for Loading.

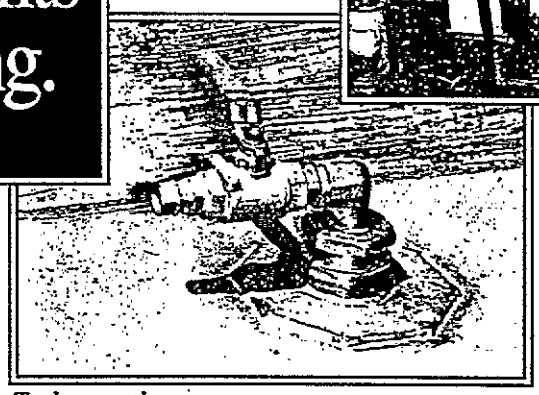
Requirements for loading a field nurse tank.

1) Put on all required personal protective equipment and make connections in the following order:
   a. Electrical bonding cable.
   b. Liquid transfer line — Connect the load line from the pump onto the loading connection.
2) Set the meter, if used, for the delivery quantity. Align the valves in the pump station for delivery. Open the main valve from the bulk storage tank.
3) Start the pump. Watch for leaks. Start delivery by activating the quick-acting valve or meter mechanism. If leaks are detected, shut down the entire operation for repairs. Constant attention to nurse tank level is essential. Do not overfill the nurse tank.
4) When filling is complete, shut off the flow at the dry-disconnect or at the meter before shutting off the pump.
5) Close the truck tank valve and the quick-acting valve. If it is desired to drain the hose, realign the pumping valves to take a suction on the hose, and restart the pump.
6) Disconnect the hose at the truck, and elevate the hose while opening the dry-disconnect. When the hose is empty, close the dry-disconnect and shut off the pump.
7) Align the pumping system valves to "off." Shut off the bulk storage tank valve. Close the vent valve.
8) Read and record the gauge readings. Close the gauge valves.
9) Using approved personal protective equipment (see "PPE Requirements" pg. 25), disconnect hoses and plug or cap all openings.

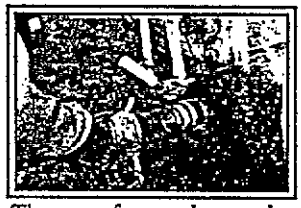
NOTE: IN CALIFORNIA, when loading a field nurse tank, you must connect the vent to venting line leading back to the source tank.



If a gasoline engine is used for transfer, it must be provided with a spark-arresting intake and exhaust.

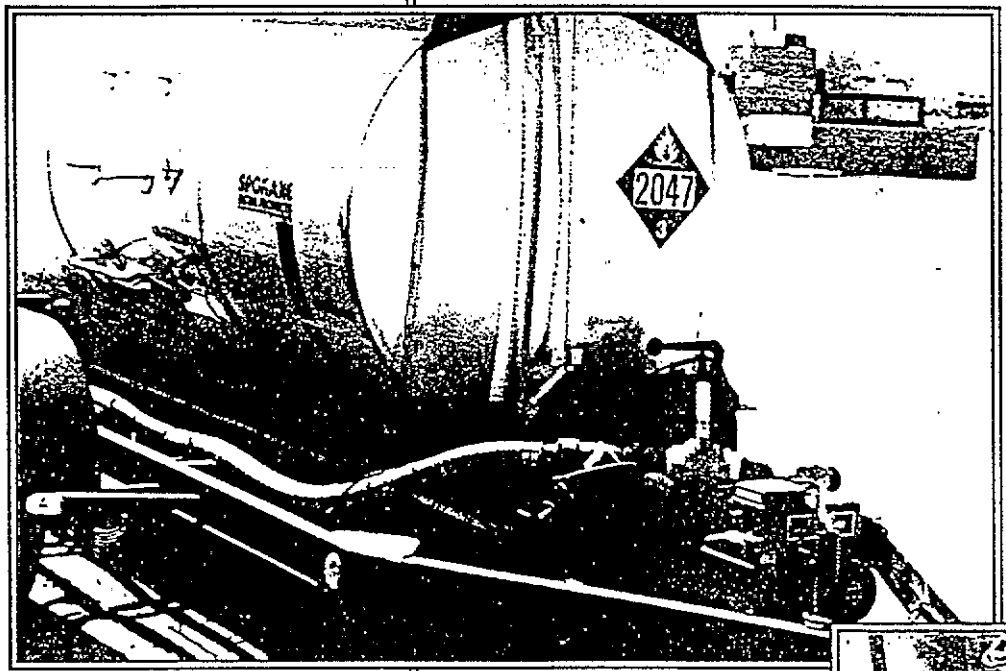


Tanks must have a "working" vent (other than a pressure/vacuum relief) shielded within the roll-over protection.

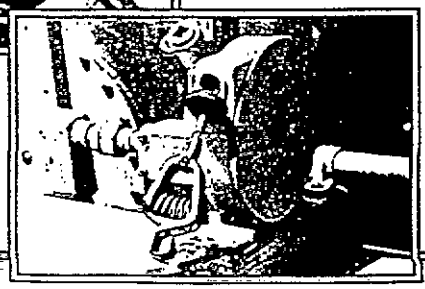


The transfer truck must be provided with a hose for transfer, the discharge end to be fitted with a dry-disconnect coupler.

Before making field transfers, put on all required personal protective equipment.



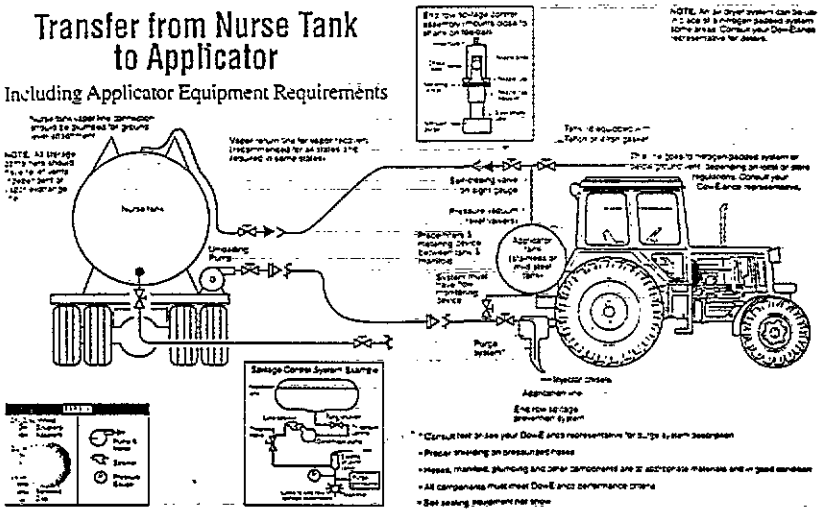
Field nurse tanks should be appropriately placarded and equipped.



Connect electrical bonding cable before attaching liquid transfer line.

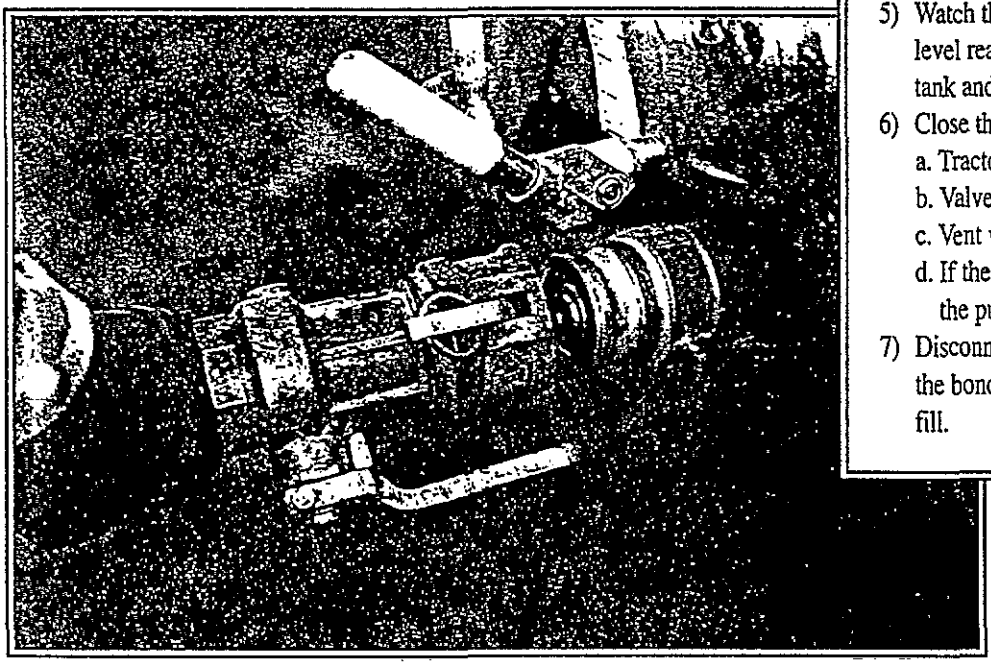
Transfer from Nurse Tank to Applicator

Including Applicator Equipment Requirements

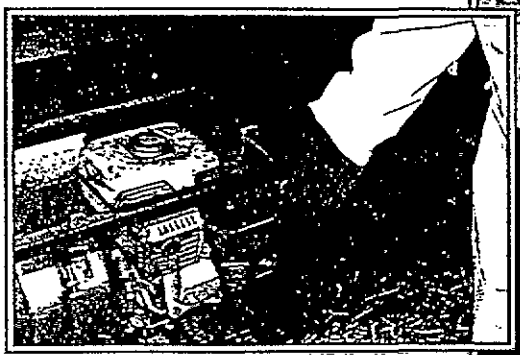


Requirements for transfers from nurse tank to tractor tank.

1) Put on all required personal protective equipment and make connections in the following order:
   a. Electrical bonding cable;
   b. Liquid transfer line.
2) Open the valves in the following order:
   a. Vent valves (both units);
   b. Tractor tank filling valve. (12-volt DC valves should not be used unless they meet hazardous area use codes);
   c. Dry-disconnect transfer hose;
   d. Nurse tank valve to pump suction.
3) Start the pump. The pump must have a spark arresting intake and exhaust. (Hydraulic-driven or PTO-driven pumps are preferred.)
4) Start the flow by opening the valve on the pump discharge.
5) Watch the tractor tank level through the sight gauge. As the level reaches "full," close the dry-disconnect at the tractor tank and stop the pump. Do not leave the system unattended.
6) Close the valves in the following order:
   a. Tractor tank filling valve;
   b. Valve at pump discharge;
   c. Vent valves used during filling;
   d. If the operations are finished, close the nurse tank valve to the pump suction.
7) Disconnect the tractor end of the hose, and then disconnect the bonding cable. The nurse tank is now ready for the next fill.



After attaching the electrical bonding cable, connect liquid transfer line with dry-disconnect coupler.



Once all connections are secure, start the pump.

While loading, watch the tractor tank level through the sight gauge.

Transferring Telone

Mini-Bulk Totes.

Understand your mini-bulk tote.

The 250 gallon mini-bulk tote used for delivering Telone weighs approximately 3,000 lbs. when fully loaded. It can be forklifted from front, back or side. It arrives at your farm with tamper-evident wire seals that must be cut before opening the outlet valve. With dry-lock couplings, this mini-bulk tote allows you to transfer Telone through a closed system. Anyone involved in the transfer operation must wear proper protective clothing and have proper safety equipment at the transfer site.

1) Pull cotter key and remove cover from male dry-lock coupler at bottom of tank.

2) Cut seal and open outlet valve.

Before you connect the supply hose to the outlet coupling, cut the outlet's tamper-evident seal and open the ball valve.

3) Connect supply hose to mini-bulk outlet.

Your applicator supply hose should be equipped with a female dry-lock coupler. Position it face-to-face with the outlet's male dry-lock coupler and press it firmly into place. Be sure the locking ring locks into place.

4) Connect transfer hose to application system.

5) Start pump and complete transfer.

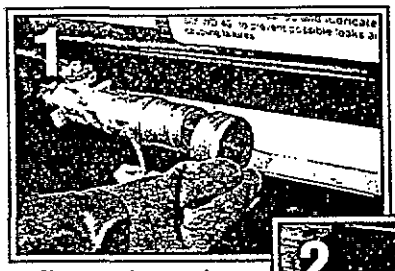
You can transfer with the pump on your applicator if you have a PTO or electric metering system. With gravity flow and ground-driven systems, you must use an external pump. Once you complete transfer, stop the pump.

6) Disconnect supply hose.

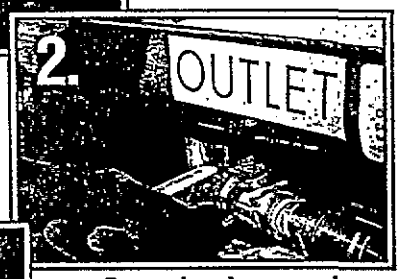
Grip the lock ring on the supply hose coupling and firmly pull back for a clean disconnect.

7) Return mini-bulk when empty.

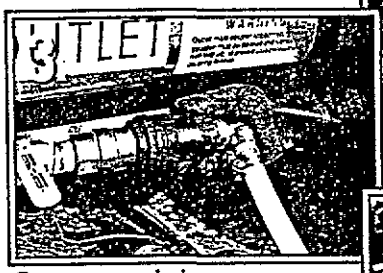
Never attempt to put any other product into a mini-bulk tote.



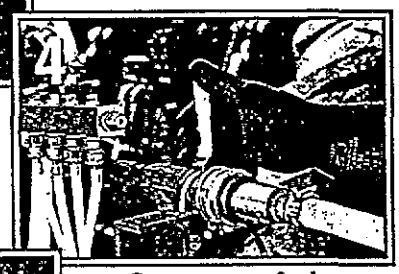
Pull cotter key and remove cover from male dry-lock coupler at bottom of tank.



Cut seal and open outlet valve.



Connect supply hose to mini-bulk outlet.

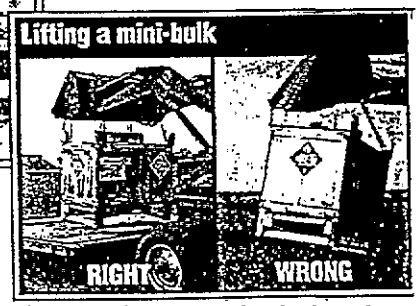


Connect transfer hose to application system.

Flammable symbol. This label reminds you that since Telone is a flammable product, no one should smoke within 50 ft. of the mini-bulk tote.

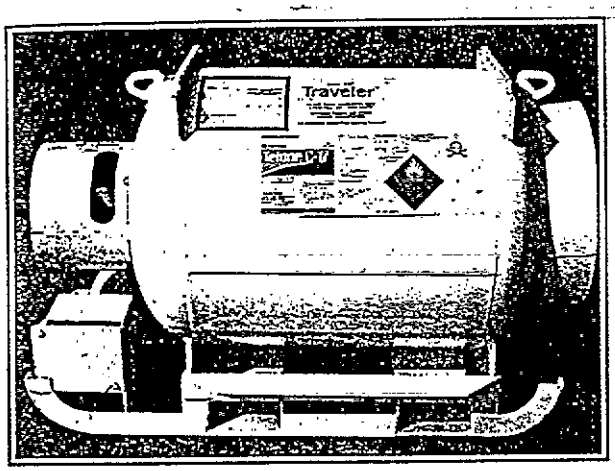
Outlet valve. Your applicator supply hose (equipped with a female dry-lock coupler) connects here to a male dry-lock coupler. Once the outlet ball valve is opened, couplings can be connected.

Label for Telone. See the product label for complete details on personal protection, product use and handling emergencies.



Chains must be perpendicular when lifting. DO NOT draw chains into a central point when lifting.

Mini-Bulk Cylinders.



With dry-disconnect couplings, this 110 gallon mini-bulk cylinder allows you to transfer Telone through a closed system.

Understand your mini-bulk cylinder.

The 110 gallon mini-bulk cylinder used for delivering Telone weighs approximately 1,600 lbs. when fully loaded. It can be forklifted from front, back or side. It arrives to your farm with tamper-evident wire seals that must be cut before removing the cover plate. With dry-disconnect couplings, this mini-bulk cylinder allows you to transfer Telone through a closed system. Anyone involved in the transfer operation must wear proper protective clothing and have proper safety equipment at the transfer site.

Before unloading.

1) Check for broken or tampered seals.
2) Check container for leaks or other defects.
3) If any indication of tampering or defects are found, do not use this cylinder and contact your Dealer or local DowElanco representative.

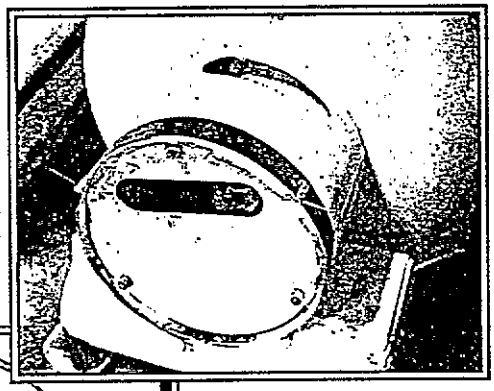
Unloading procedures.

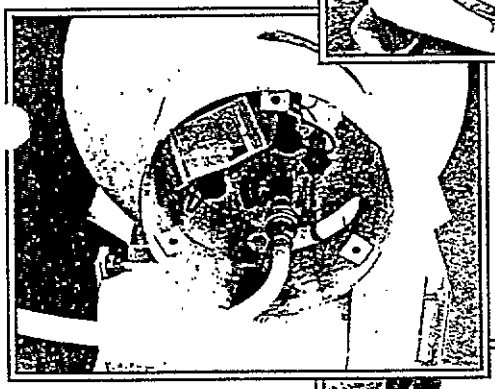
1) Read and follow label directions for product use and personal protective equipment requirements.
2) Do not open any fittings or valves other than the *Nitrogen Cylinder Valve, Nitrogen Inlet Valve* and *Outlet Valve.*
3) Connect product transfer hose to *Outlet Valve* and transfer pump. Open *Outlet Valve* on cylinder.
4) Lift protective plate on *Nitrogen Cylinder Box* and open *Nitrogen Cylinder Valve.* Do not tamper with regulator and hose assembly.
5) Open *Nitrogen Inlet Valve* and check for leaks. If leaks are found, shut off all valves immediately. If no leaks are found, the cylinder is ready for transfer. Engage transfer pump in transfer mode according to pump operating procedures.
6) When transfer is done, close *Outlet Valve* on cylinder before disengaging pump.
7) Close *Nitrogen Cylinder Valve* in *Nitrogen Cylinder Box,* then close *Nitrogen Inlet Valve* on the cylinder.
8) Disconnect transfer hose from transfer pump and *Outlet Valve.*

Before returning the container.

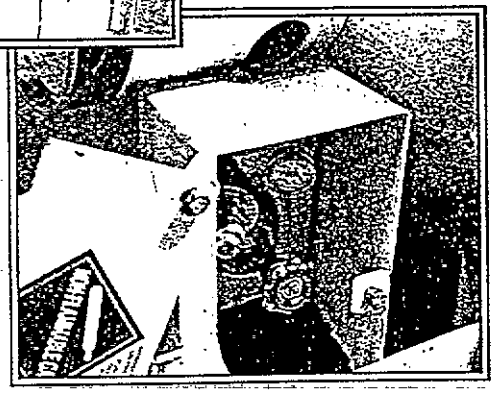
Refer to the *Operating Procedures* posted on the Telone cylinder for complete details on returning the container.

Check for broken or tampered seals. Check container for leaks or other defects. If any indication of tampering or defects are found, do not use this cylinder and contact your Dealer or local DowElanco representative.





Connect product transfer hose to Outlet Valve and transfer pump. Do not tamper with regulator and hose assembly.



Lift protective plate on Nitrogen Cylinder Box *and open* Nitrogen Cylinder Valve. *Do not tamper with regulator and hose assembly. Open* Nitrogen Inlet Valve *and check for leaks. If leaks are found, shut off all valves immediately. If no leaks are found, the cylinder is ready for transfer. Engage transfer pump in transfer mode according to pump operating procedures. When transfer is done, close* Outlet Valve *on cylinder before disengaging pump. Close* Nitrogen Cylinder Valve *in* Nitrogen Cylinder Box, *then close* Nitrogen Inlet Valve *on the cylinder. Disconnect transfer hose from transfer pump and* Outlet Valve.

Safety Precautions

Responsible Stewardship of Telone.

Read and follow safety and handling precautions.

For your well-being, it is essential that you read and follow all safety and handling precautions. For complete details, refer to the label on Telone and the "Telone User's Guide."

Personal protective equipment (PPE) requirements.

The label for Telone requires you wear appropriate clothing and equipment when carrying out any operations that involve direct contact with Telone. They include:

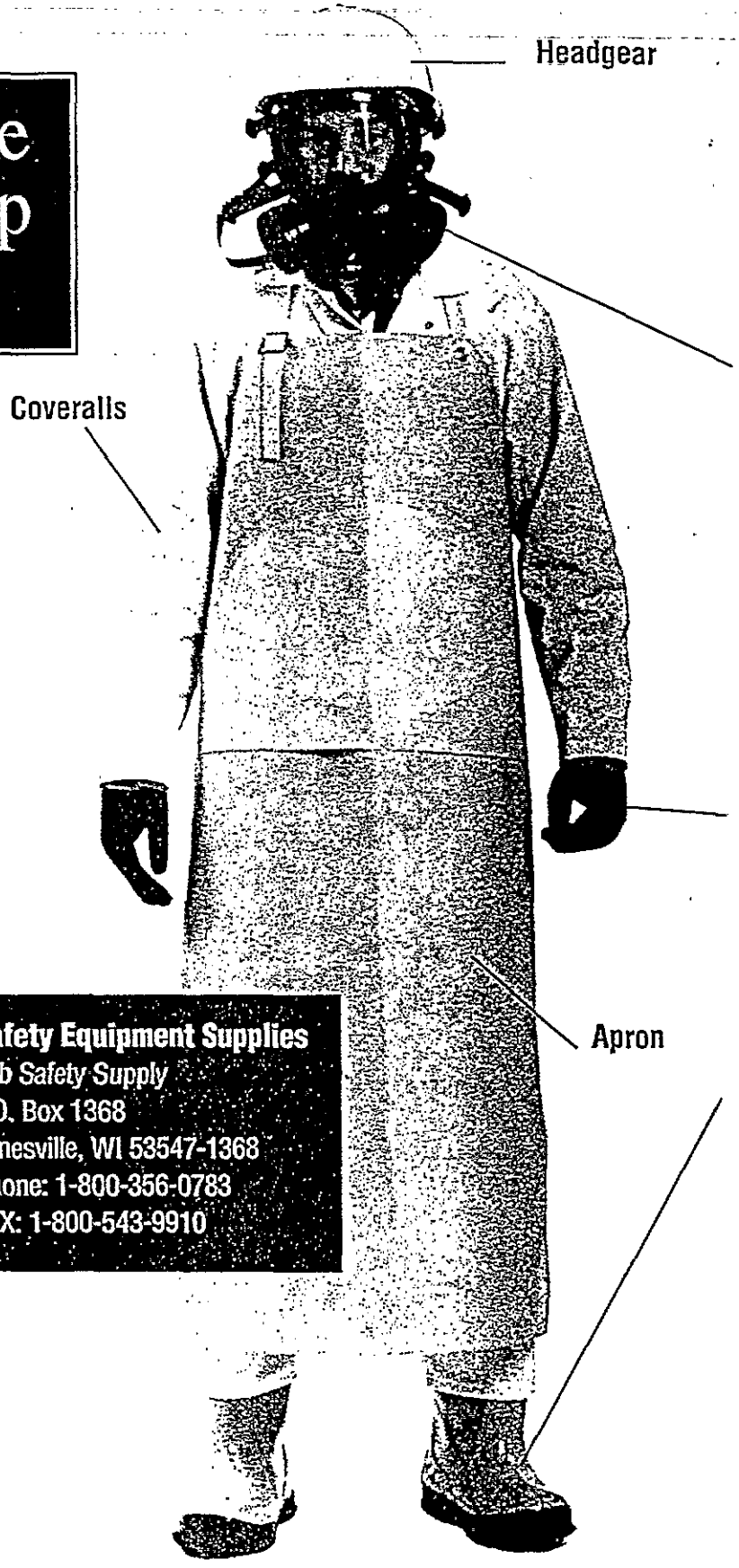
- Equipment calibration or adjustment
- Equipment clean-up and repair
- Product sampling
- Any activity less than 6 feet from an unshielded pressurized hose containing Telone
- Removal of tarp or plastic film
- Rinsate disposal
- Fumigant transfer
- Clean-up of small spills
- Preparing containers for aeration

Handle with care.

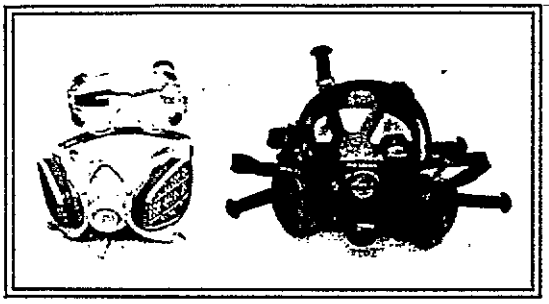
Telone is classified as toxic and flammable. Do not inhale vapors. Do not get on skin. Do not get in eyes. Do not swallow. Immediately wash hands, arms and face thoroughly with soap and water after handling Telone. Carry eye wash bottle full of water. Carry at least 5 gallons of clean water for emergency washing. Wash contaminated clothing. Destroy contaminated leather gloves and shoes. Wash and aerate contaminated protective equipment until odor is gone. Consult the product label for Telone for important details on safety and handling.

Buffer zone.

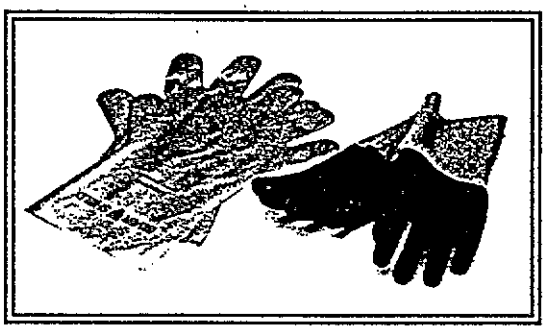
An application of Telone shall not be made within 300 feet of an occupied structure, such as a school, hospital, business or residence. No person shall be present at this structure at any time during the seven consecutive day period following application. This buffer zone does not apply to use on soils to be planted with perennial crops that will not experience additional 1,3-D treatment for at least three years. for example pineapple, perennial vines. hops, mint, fruit and nut trees.



Safety Equipment Supplies
Lab Safety Supply
P.O. Box 1368
Janesville, WI 53547-1368
Phone: 1-800-356-0783
FAX: 1-800-543-9910



Respirators: *Half-face respirator with face sealing goggles; full-face respirator.*



Gloves and Boots: *Wear gloves and boots made only of EVAL or neoprene when handling Telone. Leather gives no protection.*

Special Activities.

For special activities with exposure to high airborne concentrations of Telone, such as clean-up following large spills, handling of Telone in poorly ventilated areas and bulk tank cleaning:

- Body protection providing gas tight protection (level A) is required to prevent possible skin effects.
- A positive pressure atmosphere supplying respirator (MSHA/NIOSH) approval number prefix TC-19C or TC-13F) must be worn.

Personal Protective Equipment.

	Coveralls	Chemical-resistant suit	Chemical-resistant gloves	Chemical-resistant footwear plus socks	Shoes/socks	Chemical-resistant headgear	Chemical-resistant apron	Respirator: full face	Respirator: half-face	Respirator: full-face or half-face with face-sealing goggles	Respirator: Supplied-air
Handlers performing direct contact tasks	✓		✓	✓		✓*	✓			✓	
Handlers in enclosed cabs (not conforming with ASAE Standard S 525)	✓				✓				✓		
Handlers in enclosed cabs (conforming with ASAE Standard S 525)	✓				✓						
Applicators outside enclosed cab	✓		✓	✓		✓*				✓	
Handlers in treated area within 5 days after application	✓		✓	✓				✓			
Handlers exposed to high concentrations		✓	✓	✓		✓					✓

* If potential for overhead exposure

Maintenance

Maintaining Fumigation Equipment.

Regularly check and replace hose lines.

Since Telone and sunlight can cause hoses to deteriorate over time, always check all hose lines and fittings. Make sure you have no cracked, split or broken hose lines. Each year, make it a practice to replace hose lines to ensure safe, effective application.

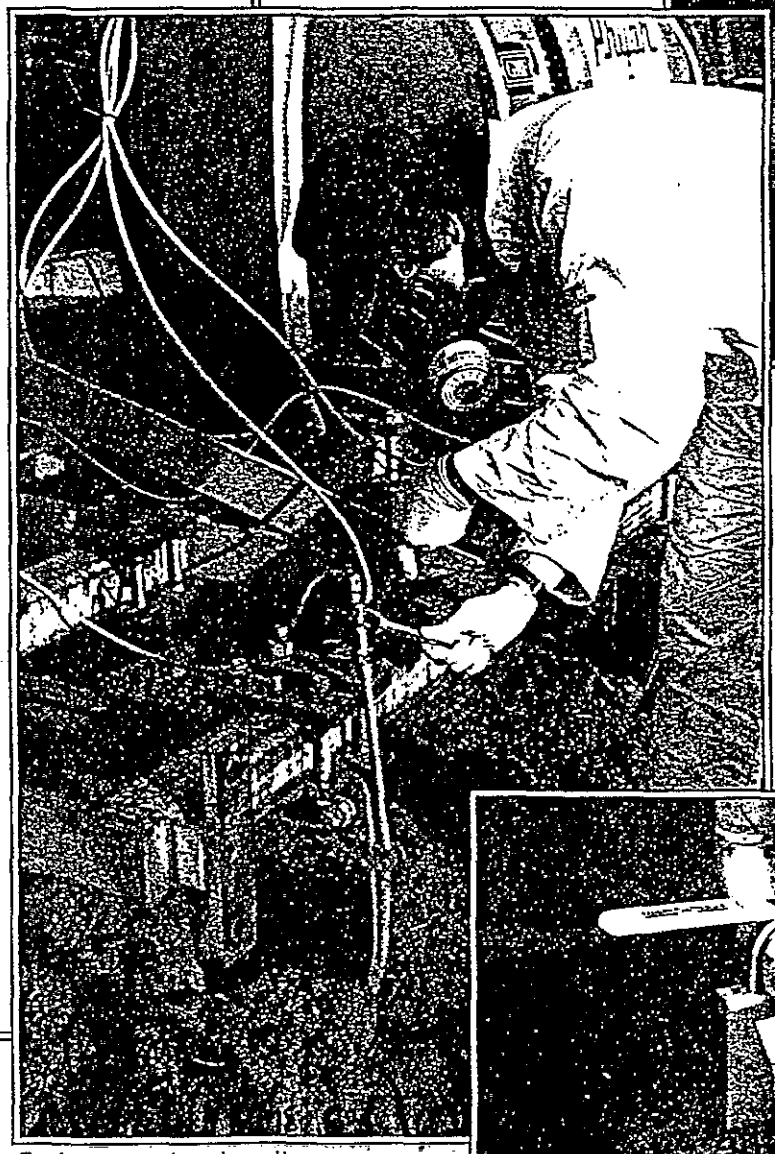
Keep dry-disconnects clean.

When not in use, always keep dustcaps on all male and female dry-disconnects to protect the seals. Consult the manufacturer for more information on maintenance and warranty work.

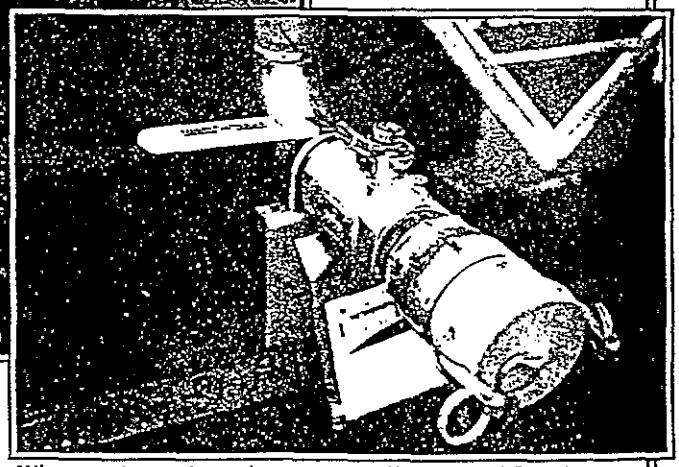
Flush application system with diesel fuel.

At the end of the season after completing all applications of Telone, flush tank, pump and hoses with fuel oil, kerosene, diesel fuel or similar petroleum solvent. Drain and fill the pump system with fuel oil or a 50/50 mix of motor oil and fuel oil. Never use water to flush the system.

Regularly replace in-line filters.



Each year, replace hose lines to ensure safe, effective application. Also maintain check valves and other components.



When not it use, keep dustcaps on all male and female dry-disconnects to protect seals.

Approved Uses.

Telone is recommended for control of nematodes in soils to be planted to crops that include (but are not limited to):

Vegetables

asparagus
beans
beets, red
black-eyed peas
broccoli
brussels sprouts
cabbage
cantaloupe
carrots
cauliflower
celery
collards
corn
cowpeas
cucumbers
eggplant
endive
garlic
horseradish
kale
kohlrabi
leeks
lettuce
melons
mustard greens
okra
onions
parsnips
peas
peppers
pimentos
potatoes
pumpkins
radishes
rutabaga
salsify
shallots
spinach
squash (summer)
squash (winter)
sweet potatoes
swiss chard
tomatoes
turnips
watermelons

Field Crops

alfalfa
barley
birdsfoot trefoil
buckwheat
clover
corn
cotton
flax
grasses
hops
kenaf
lespedeza
millet
milo
mint
oats
pasture grass
peanuts
popcorn
rye
safflower
sorghum
soybeans
sugar beets
sugarcane
tobacco
vetch
wheat

Fruit and Nut Crops

almonds
apples
apricots
bananas
blackberries
blueberries
boysenberries
cashew nuts
cherries
chestnuts
cranberries
currants
dates
dewberries
figs
gooseberries
grapefruit
grapes
hazelnuts (filberts)
hickory nuts
huckleberries
kumquats
lemons
limes
loganberries
nectarines
olives
oranges
peaches
pears
pecans
persimmons
pineapple
plums
pomegranates
prunes
quince
raspberries
strawberries
tangerines
tangelos
youngberries
walnuts

Nursery crops

floral plants
ornamentals
shrubs and bushes
forest, shade, fruit and nut trees
vine and bramble fruits of all types

When used according to state nursery regulations, Telone may be used in the production of certified nursery stock.

Materials to Use With Telone.

Hoses, pipes and transfer lines.

Hoses, pipes and transfer lines should be rated for the maximum working pressure of the system. Compatible materials include:

- Nylon
- Cross-linked polyethylene
- High-density polyethylene
- Polypropylene
- Steel
- Copper
- Low-density polyethylene
- Teflon
- Stainless steel
- Brass
- EPDM

The following are recommended for fixed piping:

- Schedule 40 seamless carbon A53
- Schedule 10-40 stainless steel

Seals, gaskets and packing.

Viton A seals have been used satisfactorily; however, they may deteriorate rapidly if sliding or rotary seals are operated dry. Seal, gasket and packing materials include:

- Teflon
- Kalrez
- Nylon
- Viton A
- Polypropylene
- EPDM

Pumps, valves and fittings.

Stainless steel is the best recommendation for pump shafts. Mild steel may be used but will rust and may cause premature seal failure. Pump shaft materials include:

- Stainless steel
- Cast iron
- Brass
- Steel

Compatible materials for pump housing include:

- Stainless steel
- Cast iron
- Nodular iron
- Brass

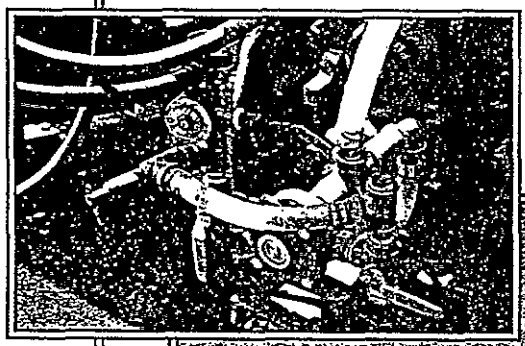
Valves and fittings may be made of:

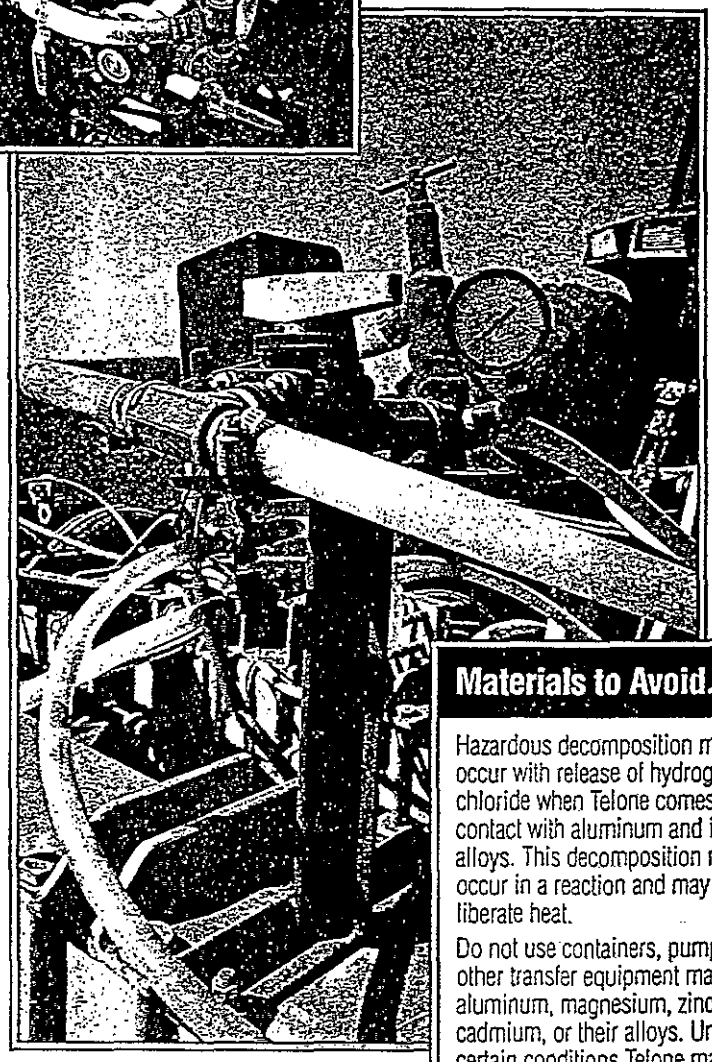
- Stainless steel
- Brass
- Copper
- Polypropylene
- Steel
- Cast iron
- Nylon
- Cross-linked high-density polyethylene

Screens and strainers.

Make sure the pressure rating on the strainer exceeds the pressure output on the system. Compatible materials for strainers and screens include:

- Stainless steel
- Brass
- Copper
- Monel
- Nylon





Materials to Avoid.

Hazardous decomposition may occur with release of hydrogen chloride when Telone comes into contact with aluminum and its alloys. This decomposition may occur in a reaction and may also liberate heat.

Do not use containers, pumps, or other transfer equipment made of aluminum, magnesium, zinc, cadmium, or their alloys. Under certain conditions Telone may be severely corrosive to such metals. (*Note: zinc includes "galvanized."*)

PVC, Buna-N, neoprene and fiberglass have the potential to dissolve and therefore should not be used in service with Telone.

DowElanco™

9330 Zionsville Rd.
Indianapolis, Indiana 46268-1054

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