



OPERATORS MANUAL

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OVERVIEW

- All of the information compiled below comes from 35 years, (since 1982), of experience in the Industry.
- Many of the points touched on come directly from Contractor experiences that have been relayed to MAG Tool Inc.
- MAG Tool retains no liability for any problems that may arise from the use of our Nordic Freeze Pipe Freezing System, or other systems sold by MAG Tool Inc.
- If Double Freezing, additional components will be required. Please consult the Tech Sheet or call the Factory direct @ 1 - 800 - 661 - 9983.

Nordic Freeze can save time and money when repairs or new installations are needed on piping systems. Nordic Freeze freezes the water in the pipe to form a temporary stop valve made of ice. With Nordic Freeze there is no need to drain the system or shut off the supplies, so you get through the work much faster and easier. Nordic Freeze is clean, fast and effective.

The technique by which one or more temporary ice plugs are used to isolate sections of a piping system is recognized as the most effective method of maintenance and repair, eliminating totally the need to drain down the lines. Nordic Freeze is a simple, easy to use and economical pipe freezing system.

Major Points to Consider:

- Safe
- Quick
- Inexpensive
- No need to drain down the system
- No loss of expensive or corrosive chemicals
- No expensive re-testing of chemical concentrations
- Shutoff capability from outside of the building
- Equipment isolation when servicing
- Cross connection prevention insurance
- Increased productivity of small crews responsible for large systems

Minor Points to Consider:

- There have been 10,000 freeze kits sold in London, England alone, (1986)
- English sales are 1,500 per year, (1986)
- The most common freeze is 38 mm, (1-1/2")
- The biggest North American market is Hospitals
- Discourage the practice of turning the bottles upside down if a Bottom Siphon Cylinder cannot be found
- MAG Tool Inc. stocks the dip tubes

INSTRUCTIONS

1. HOW DOES NORDIC FREEZE WORK

- Liquid Carbon Dioxide is held under pressure in a CO2 Siphon Cylinder.
- When the cylinder valve is opened, the liquid CO2 runs through the hose and into the cavity formed by the Nordic Freeze Jacket, which has been fastened around the pipe.
- The liquid CO2, upon reaching atmospheric pressure and temperature, immediately turns to a mixture of CO2 gas and dry ice.
- The dry ice has a temperature of -43 C, (-109 F), and this intense cold will freeze the water in the pipe.
- A microscopic view of the inside of a pipe would show a roughness, which grips the ice plug as it is formed when the CO2 is applied. There are literally thousands of these little grippers on the inside of the pipe.
- With the expanding of the fluid inside, and the shrinking of the pipe carrying the liquid, a very effective seal is formed.

2. HOW LONG WILL THE ICE PLUG TAKE TO FORM

- This depends on the size of the pipe and the temperature of the water. The following table gives the approximate freezing times for unpainted pipe containing static cold water @ 20 C, (68 F), degrees or colder.

Freeze Table (to be used as a guide only)												
Pipe Jacket	NF 9001		NF 9002		NF 9003		NF9004		NF 9006		NF 9008	
	203mm (8")		305mm (12")		356mm (14")		508mm (20")		711mm (28")		838mm (33")	
Pipe Size	13mm (1/2")	19mm (3/4")	25mm (1")	38mm (1 1/2")	51mm (2")	76mm (3")	76mm (3")	102mm(4")	127mm(5")	152mm(6")	178mm (7")	203mm (8")
# of Injections	2	2	3	4	3	6	6	7	9	11	15	17
Injection Time	1 minute	1 minute	1 minute	1 minute	5 minute	5 minute	6 minute	8 minute	12 minute	12 minute	12 minute	12 minute
Waiting Time	3 minute	3 minute	5 minute	5 minute	5 minute	5 minute	8 minute	10 minute	8 minute	8 minute	8 minute	8 minute
Total Time (min)	8 minute	8 minute	18 minute	24 minute	30 minute	60 minute	84 minute	126 minute	180 minute	220 minute	300 minute	340 minute
CO2 Req.	.454kg 1lb	.454kg 1lb	1.5kg 3lb	3kg 6lb	8kg 18lb	16kg 36lb	19kg 42lb	30kg 65lb	110kg 243lb	134kg 297lb	183kg 405lb	216kg 475lb

Notes:

- Steel and copper pipe take about the same amount of time to freeze.
- Plastic pipe can take 5 - 6 times longer to freeze than copper pipe and in some cases cannot be frozen. Plastic pipe is very difficult to freeze, use caution.
- Painted pipes take longer to freeze than unpainted pipes. Clean a painted pipe prior to freezing, if possible.
- Pipe containing warm water takes longer to freeze than those full of cold water.
- Vertical pipes will usually take longer to freeze than horizontal pipes.
- It is important to note that the injection time, the waiting time and the total time required for various pipe sizes, as shown in the Chart, is to be **used as a guide only**.
- Room and water temperature will cause all of these factors to vary.

3. HOW DO I KNOW IF THE ICE PLUG HAS FORMED

- Firstly, by having followed the correct injection time and waiting time for the pipe size.
- Secondly, by checking if the pipe is equally cold on both sides of the Nordic Freeze Jacket.
- Thirdly, by looking for frost on the pipe on both sides of the Nordic Freeze Jacket.
- If you are not sure that an ice plug has formed, inject CO2 once more and wait a few more minutes.
- Do not test for an ice plug too early or you may destroy a partially formed plug.
- It is a good idea to crack a flange, or break a bonnet on a valve close to the freeze prior to cutting the line open. If neither exists, drill a 1.58 mm, (1/16"), hole in the pipe to check for excessive pressure. If for some reason the freeze didn't work this hole is easily plugged with a wood dowel or a plastic coated screw.

4. ONCE FORMED, HOW LONG WILL THE ICE PLUG LAST

- If the cavity created by the Nordic Freeze jacket is kept full of dry ice, the ice plug will remain solid and will not melt.
- If the jacket is left on the pipe, the ice plug can take anywhere from a few minutes to a few hours, depending on the size of the pipe, how much of the dry ice has evaporated, room and water temperature, etc.
- If the Nordic Freeze jacket is taken off the pipe, the ice plug will melt in 3 - 10 minutes.
- If working on an extended repair, inject CO2 every 15 minutes once the ice plug has been formed. This procedure will maintain a freeze for as long as required.
- Keep track of your injections in the Nordic Freeze log.

5. THE CO2 CYLINDER

The CO2 Cylinder			
NF9081	22.7 Kg	50 Lb	
	24.1 Kg	53 Lb	empty
	38.4 Kg	103 Lb	full
	21.8 Kg	48 Lb	usable gas
	0.9 Kg	2 Lb	residual

The CO2 Cylinder			
NF9080	9.1 Kg	20 Lb	
	13.9 Kg	29 Lb	empty
	22.3 Kg	49 Lb	full
	8.2 Kg	18 Lb	usable gas
	0.9 Kg	2 Lb	residual

6. HOW MANY FREEZES CAN I GET FROM A 9.1 kg, (20 lb), CYLINDER

- 5 - 10 on 19.04 mm, (3/4"), diameter pipe.
- 3 - 5 on 25.40 mm, (1"), diameter pipe.
- 2 - 3 on 38.10 mm, (1-1/2"), diameter pipe.
- 1 - 2 on 50.08 mm, (2"), diameter pipe.
- When freezing over 50.08 mm, (2"), diameter pipe, we recommend that at least two tanks be on hand to ensure that a sufficient amount of CO2 is available.
- Also, as stated previously, the room and water temperature will cause both the freezing time and CO2 consumption to vary. These figures are intended as a guide only.
- When renting Bottom Siphon Cylinders from the Local Gas Supply House, ensure they are Bottom Siphon.
- Remember to add the NF-9025 Valve Seal supplied in the NF Kit to prevent excess flow, and remember to remove the Valve Seal when you return the Rented Cylinder.

7. CAN NORDIC FREEZE, FREEZE HOT WATER

- Yes, but it is difficult. Place two Nordic Freeze Jackets side by side, touching each other. This will act as a single, double - length jacket. Inject CO2 into both jackets simultaneously which will produce a double convection current in the hot water, and should freeze the water.
- If double jacketing, keep the jackets abutted to prevent an ice plug from coming out the side of the pipe between the two jackets. We recommend taping the two NF Jackets together with Duct Tape to prevent separation.
- Allow 2 - 4 times as long on our times indication and 2 - 4 times as much CO2.
- When the pumps are shut down to isolate a system, ensure the adjacent valves are closed as well.
- To effect a good freeze you need a static head and a full pipe of fluid.
- We recommend that extra CO2 tanks be available, as a great amount of CO2 will be used.
- Warm horizontal pipes are easier to freeze than warm vertical pipes

8. WILL THE ICE PLUG BURST THE PIPE

- The ice plug will not extend beyond the width of the Nordic Freeze Jacket.
- Therefore, the pressure increase in the closed section of the pipe will be small.
- If you use two Nordic Freeze Jackets to isolate both incoming pressure and head pressure, keep them at least 609.60 mm, (24"), apart.
- In the case above, the pressure increase will be less than 50 lbs / inch² , (3 Bar). An example of this application would be in reference to a valve change out, or Tee cut in.

9. WHAT PRESSURE WILL THE PLUG HOLD

- In a laboratory test, an ice plug withstood a pressure of 10,000 lbs / inch² , (690 Bar).

10. CAN I WELD, BRAZE OR SOLDER NEAR AN ICE PLUG

- Yes, but be sure that the Nordic Freeze Jacket cavity is full of dry ice.
- Work at least 12 pipe diameters or a minimum of 406.40 mm, (16"), away from the jacket, (on a small pipe diameter), to prevent the cold pipe from affecting the welding, brazing or soldering.
- Stay 609.60 mm, (24"), away from closed ends, bends or bull headed tees.
- The use of "**Hot Dam**" as supplied with your Nordic Freeze Kit, or a bucket of water and some rags to prevent the heat from traveling toward the ice plug is always recommended.

11. WHEN THE JOB IS FINISHED, WHAT SHOULD I DO WITH THE DRY ICE IN THE JACKET CAVITY

- The dry ice will evaporate by itself within a few minutes.
- It can be placed in a trash can or flushed down a drain.
- Be sure that unaware adults, children or animals do not come in contact with dry ice.
- Always wear protective gloves when handling dry ice.
- Do not thaw the frozen pipe with a torch, allow it to thaw naturally.

12. FREEZE ALTERNATIVES TO PIPING SYSTEMS

- Shafts for installing bearings and gears.
- Transmitters used in the Oil Patch must be calibrated @ - 40 C, (- 40F).

13. COMMON SENSE

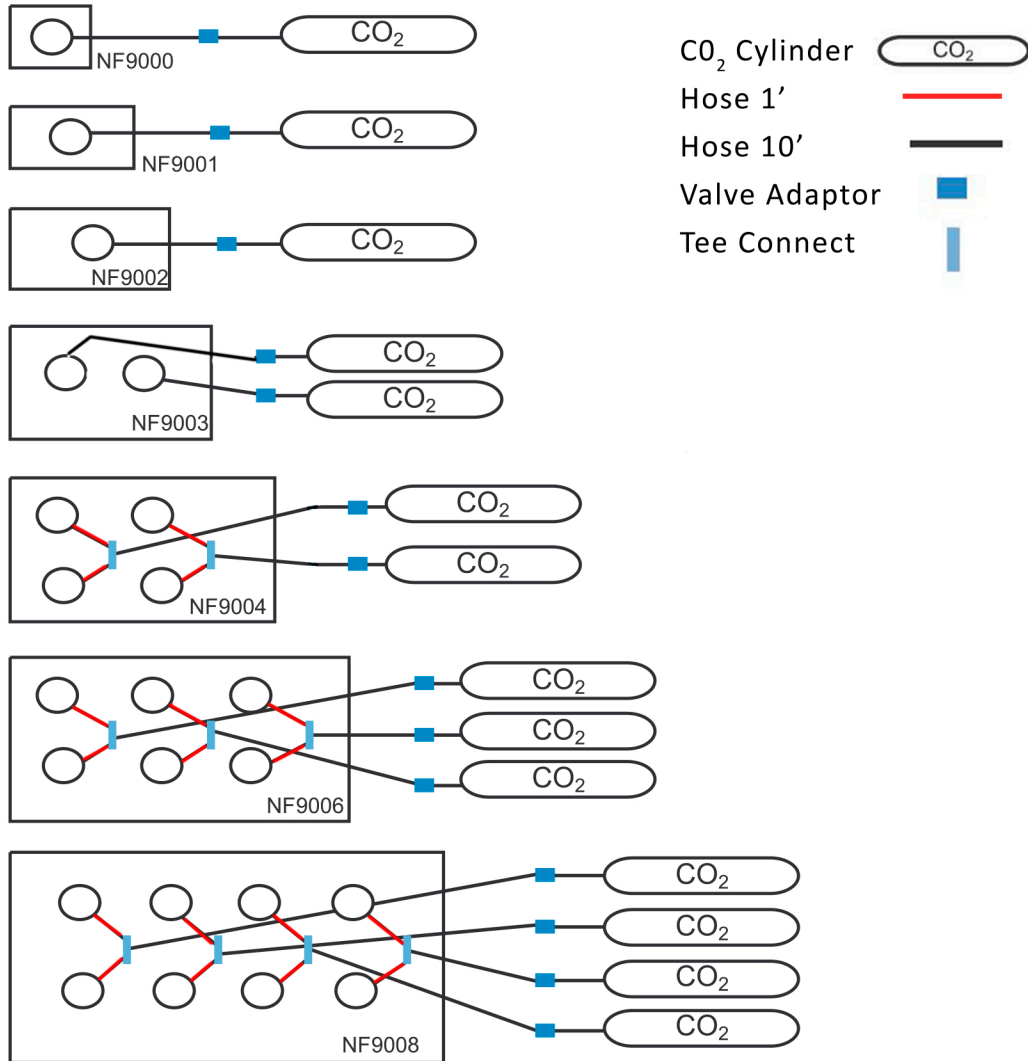
- Use it! As in the case of the rubber mallet supplied with the Nordic Freeze Kit. This is not used to straighten bananas as some would think. But rather, the mallet is used to pound on the outside of the Nordic Freeze Jackets whilst injecting the liquid Carbon Dioxide, to ensure the dry ice is properly formed around the complete circumference of the pipe, and not just close to or at the injection point / points.
- CO2 is heavier than air. If using Nordic Freeze in a confined area, the waste Carbon Dioxide can displace the Oxygen. Provide proper ventilation.
- After the initial injection, if the jacket feels empty, inject again until the jacket feels full.
- Turn off the valve and wait the suggested waiting time between injections.
- Be sure to complete the number of injections and waiting times.
- Be sure to have extra CO2 on hand.
- If your Jacket is full and rock hard prior to the last injection, don't put the last injection in, you may split the Jacket.
- If unsure as to what is in the line, take a sample and put it in your freezer at home and see if it will freeze, (always recommended).
- If the freeze application is larger than 203.20 mm, (8"), or if you are unsure as to what do, consult the factory.

• It is highly recommended that a freeze be performed in the shop on a small diameter pipe, (1/2" or 3/4"), to allow the Contractor or Service Personnel to obtain some familiarity with the Nordic Freeze Product prior to attempting a live freeze.

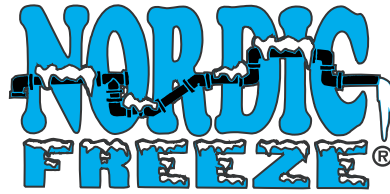
NOTE: Prior to the release of the Ice Plug within the frozen line, it is recommended to use an appropriate means to backfill the drained section of pipe with water. This will cushion the velocity of the Ice Plug when it releases, and prevent possible damage to the system.



Hose/Cylinder Connection Instructions for Nordic Freeze Kit



Product	Hose 1'	Hose 10'	Valve Adapt.	CO2 Cyl.	Tee
NF9000	0	1	1	1	N/A
NF9001	0	1	1	1	N/A
NF9002	0	1	1	1	N/A
NF9003	0	2	2	2	N/A
NF9004	4	2	2	2	2
NF9006	6	3	3	3	3
Nf9008	8	4	4	4	4



COMPLETE THIS LOG AS YOU PROCEED WITH THE JOB IN ORDER TO MAINTAIN A RECORD AND CHECK LIST FOR YOUR REFERENCE.

NAME: _____ DATE: _____ AIR TEMP: _____

PIPE MATERIAL: _____ SIZE ID: _____ OD: _____ H²O: _____

JACKET #: _____ WT OF CO² CYLINDERS: _____ (use only Siphon Tube Cylinders)

As you complete each injection and waiting period note the actual time in table below and initial.

INJECTION #	INJECTION MINUTES	INJECTION INITIAL	WAIT TIME MINUTES	WAIT TIME INITIAL
Start @				
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				