

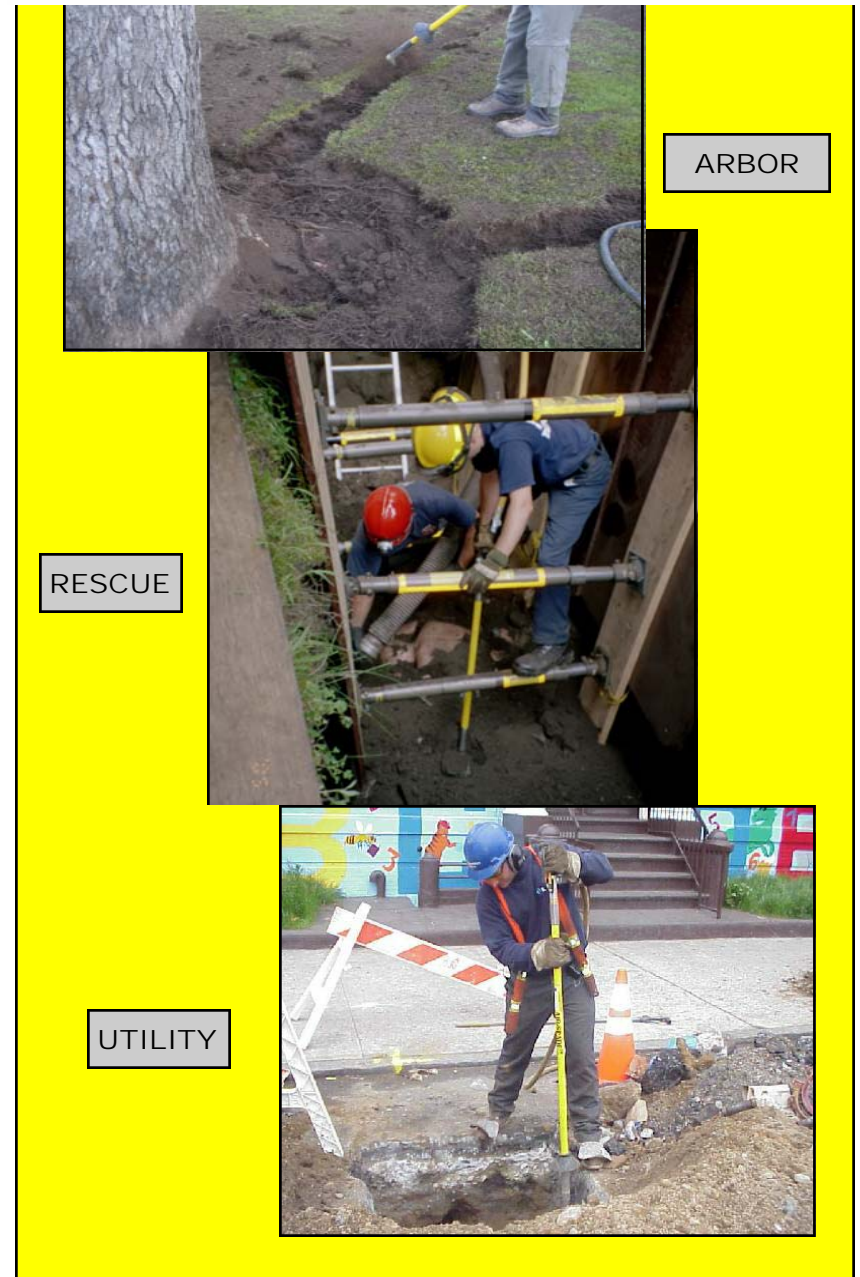
AIR-SPADE® ACCESSORIES

<u>Description</u>	<u>Part Number</u>
Auxiliary Handle Assembly	HT180
Air-Spade 2000 Handle Repair Kit	HT150
Lightweight Hose	
25 foot	HT111
50 foot	HT112
Supersonic Nozzles @ 90 psig	
25 scfm	HT126
60 scfm	HT125
105 scfm	HT156
225 scfm	HT127
Extensions with couplers	
2 foot	HT122
3 foot	HT121
4 foot	HT154
5 foot	HT120
Custom length	Call
Face Shield and Head Gear	HT136

For additional items including air compressors, folding dirt screens, and soil test instruments please see our web site www.air-spade.com

AIR-SPADE®

2000 Series



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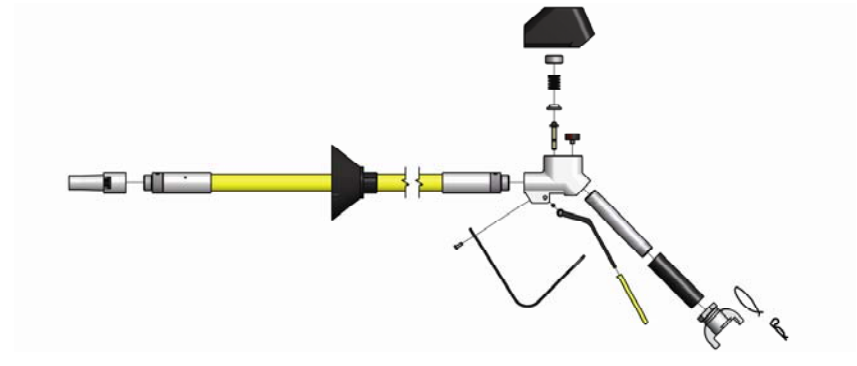


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STANDARD AIR-SPADE® PARTS LIST

<u>Item</u>	<u>Part Number</u>
Air-Spade 2000 Handle Assembly	HT117
Air-Spade 4' Barrel with Dirt Shield	HT118
45 Degree Angled Adapter	HT119
Nozzle 150 scfm @ 90 psig	HT123
1" ID x 10' Lightweight Air Supply Hose	HT57
Storage Case with Lock	HT132

AIR-SPADE® Exploded Parts Diagram



AIR-SPADE® parts and specifications are subject to change or improvement at manufacturer's discretion.

The AIR-SPADE® is covered by U.S. Patents 5,782,414, DES 408,830, and DES 435,207.

USE OF EXTENSIONS AND REDUCERS

- To install an extension, remove nozzle by turning counterclockwise. Attach the barrel coupler to the male threads of the AIR-SPADE® barrel and hand tighten only by turning clockwise. Tighten the barrel extension by turning clockwise, by hand, until tight with the barrel coupler. Replace nozzle on the open end of the barrel extension. Hand tighten the nozzle by turning clockwise. Tool is now ready for use. To uninstall, just reverse the procedure.
- To install a reducer, remove the handle and nozzle per the previous instructions and then install the nozzle and handle on the reducer.



SPECIFICATIONS

Model:	Series 2000
Standard nozzle:	150 scfm (4.2m ³ /min)
Optional nozzles:	25 scfm (0.7m ³ /min)
	60 scfm (1.7m ³ /min)
	105 scfm (3.0m ³ /min)
	225 scfm (6.4m ³ /min)
Pressure	90 psig (6.2 bar)
Mach Number	2

COMPRESSOR REQUIREMENTS

Nozzle (scfm)	Compressor Size (scfm)
25	30
60	60 - 70
105	125
150	175 - 185
225	250

Note: a smaller nozzle may always be used on a larger compressor, but not the reverse.

MAINTENANCE

As with any quality tool, the AIR-SPADE® does require good care to ensure it works properly. It is good practice, prior to each use, to inspect the tool for any loose or visibly damaged parts. Dirt or other foreign material around the trigger or valve stem should be removed. A light oil or lubricant (e.g. WD40) may be applied around the exposed valve stem. Tighten or replace worn parts as needed.

LIMITED WARRANTY

The AIR-SPADE® Series 2000 tool is warranted by Guardair Corporation against defects in material and workmanship for a period of 180 days. The unit will be replaced or repaired at Guardair Corporation's option as a result of such defects. Warranty will commence upon date of shipment of tool by Guardair Corporation.

Guardair Corporation's warranty shall not be effective if the tool has been the subject of misuse, negligence or accident, or if it is configured or used in any manner inconsistent with the directions set forth in this operator's manual. Wear and tear from normal use is not covered under this warranty.

Any and all claims for warranty consideration must be coordinated through Guardair Corporation. Do not return unit or parts without prior authorization. Returned unit or parts must be postage prepaid.

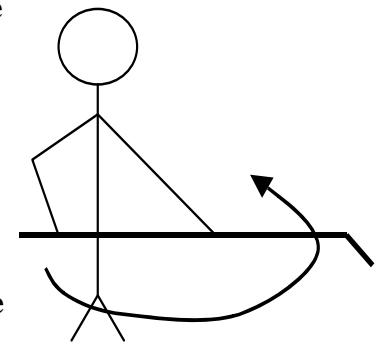
The purchaser's recovery for damages resulting from any and all causes whatsoever, including, but not limited to, breach of contract, breach of warranty, negligence or strict product liability will be limited to the replacement of the components of the tool with respect to which losses or damages are claimed, provided that Guardair Corporation has been notified of any alleged defect within the warranty period.

USE OF THE 45° ADAPTER

The entire assembly is tightened by hand with no tools required. To install the 45° adapter, clean the threads and o-ring of any dirt and apply anti-sieze compound to the threads. Screw the knurled barrel extension coupler to the barrel connector on the nozzle end of the tool. Do not screw the adapter into the handle. Apply anti-sieze compound to the male end of the adapter. Before inserting the adapter into the extension coupler, make sure the locking ring is screwed on to the adapter until it shoulders. Screw the adapter, with locking ring, into the extension coupler to within 1/16" of the locking ring, Rotate adapter to the desired orientation and lock in place by tightening the locking ring against the extension coupler.



CAUTION: When using the 45° adapter with the AIR-SPADE®, especially with the 150 / 90 nozzle, the air will push the tool away from the direction that the nozzle is aimed. To prevent this action from occurring unexpectedly, the operator should be sure to place his free hand half way down the barrel to brace the tool against the force produced by the air.



TRIGGER SLEEVE AND GRIP

- Unthread the Universal fitting and save. Unthread the 2 screws and discard. Remove the trigger guard and save. Slide off the trigger sleeve and the grip and discard. Slide on the new trigger sleeve and new grip. Applying talc or evaporating solvent to the inside of the grip will ease installation. Position the existing trigger guard onto the handle. Thread the 2 new screws into the handle. Apply Teflon tape to the new threads of the handle. Thread the existing Universal fitting onto the handle.

AIR-SPADE® handle repair spare parts kit

- A handle repair kit is available that includes the following spare and replacement parts:

Pressure Gauge, Valve Assembly, Lubricant,
2 Button Screws, Lanyard, Clip, Comfort
Grip, Trigger Sleeve and Valve Stem Spring

Contact Guardair Corporation to order
part # HT-150.

IN NO EVENT SHALL GUARDAIR CORPORATION BE LIABLE TO THE PURCHASER OR ANY USER OF THE AIR-SPADE®, OR TO ANY OTHER PERSON OR ENTITY, FOR INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, INCLUDING THE COST OF PROVIDING SUBSTITUTE EQUIPMENT DURING PERIODS OF MALFUNCTION OR NON-USE AND DAMAGES FOR DELAY. THE WARRANTIES AND REMEDIES SET FORTH ABOVE ARE THE SOLE AND EXCLUSIVE WARRANTIES AND REMEDIES AVAILABLE. GUARDAIR CORPORATION SPECIFICALLY DISCLAIMS ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE AND ALL OTHER WARRANTIES, WHETHER EXPRESS, IMPLIED OR STATUTORY.

SAFETY INSTRUCTIONS

DO NOT operate the AIR-SPADE® until operating and safety instructions are fully read and understood.

DO NOT use the AIR-SPADE® as a pry bar.

DO NOT make any modifications to the AIR-SPADE®.

DO NOT screw the 45° adapter into the handle.

DO NOT point or aim the AIR-SPADE® at any person during operation.

DO NOT tie, tape or otherwise lock or fasten the trigger into an open operating position.

DO NOT expose bare skin to the supersonic air stream exiting the nozzle.

ALWAYS wear appropriate protective work clothing and equipment. Cut and puncture resistant gloves, approved safety eye glasses with side shields and / or face protection, and approved hearing protective earplugs or earmuffs are recommended while operating the AIR-SPADE®. Eye protection should comply with ANSI Z87.1 -1989. Ear protection should provide a NRR of at least 20 dB. In extremely dusty conditions, always wear approved respiratory protection. Wear approved electrically insulated footwear and gloves if working near underground electrical lines.

Before reinstalling the handle, apply a small amount of commercial grade anti-sieze compound to the threads to prevent galling of the threads

AIR PRESSURE GAUGE

- An air pressure gauge may be removed with any plain suction cup tool, which is commonly available at any auto parts store, by turning counterclockwise. A new gauge may be inserted by putting a small amount of thread sealant on the gauge stems threads and turning in by hand as far as possible, then tightening with the suction cup tool.

VALVE STEM

- If your AIR-SPADE® has a handle cover, remove handle valve cover by drawing towards the rear of tool. Unthread the valve cap and save. Remove the spring and valve components and discard. Apply lubrication to the new valve stem and insert into the handle. Insert the new seal with the black seal face facing downwards. Insert the new spring. Apply Teflon tape to the threads of the existing valve cap and thread into the handle until flush with handle. Replace the existing cover.

AIR-SPADE® PARTS, DISASSEMBLY AND RE-ASSEMBLY

AIR-KING® HOSE FITTING

- Should It be necessary to remove the AIR-KING® hose fitting, carefully snug aluminum handle casting in a vise, being careful not to unscrew steel nipple from handle casting. Loosen and remove the AIR-KING® fitting by turning it counter clockwise. **Before reinstalling the hose fitting, wrap the treads with pipe tape to prevent galling of the threads between the steel pipe nipple and the AIR-KING® hose fitting.**

NOZZLE

- The nozzle has been designed for easy assembly and disassembly by hand without the need for wrenches. However, in the unlikely event of a tighter than normal connection, flats are provided on the nozzle for wrench application. **Before re-installing the nozzle, remove any dirt or foreign material from the threads and o-ring, and apply a small amount of commercial grade anti-sieze compound to the threads.**

HANDLE

- The handle has also been designed for easy assembly and disassembly by hand from the fiberglass barrel. A spanner wrench may used on the barrel connector if necessary.

ALWAYS check that the compressor is delivering the specified pressure to operate the AIR-SPADE® .

ALWAYS ensure that all personnel near the area being excavated are aware that AIR-SPADE® is being used and that they wear appropriate personal protection as indicated.

ALWAYS protect any surface that could be chipped or damaged by a dislodged soil or rock particle adjacent to the excavation work area by suitable drop cloths, screens, or other means.

ALWAYS connect air hoses in full compliance with federal, state, and local codes. Inspect hoses for leakage, kinking, abrasion, corrosion or any other signs of wear or damage. Worn or damaged hose assemblies should be replaced immediately. Safety devices should be used in accordance with manufacturer's recommendations.

ALWAYS inspect the AIR-SPADE® tool for loose or damaged parts prior to use. Tighten, repair, and / or replace as necessary before use.

ALWAYS expect the AIR-SPADE® tool to push up when using the 45° adapter. Brace against the upward force by holding the tool in accordance with the operating instructions.

ALWAYS adhere to all the safety instructions for the compressor as set forth in its manufacturer's manual.

GENERAL INFORMATION

The AIR-SPADE® Series 2000 is a hand held tool that produces a "laser-like" jet of air moving at approximately 1,200 mph (1900 km/hr), i.e. twice the speed of sound. The most commonly used nozzle is designed to utilize 150 standard cubic feet per minute (4.2m³/min) of compressed air at 90 pounds per square inch (6.2 bar) gauge. The AIR-SPADE® tool consists of a manually operated, spring return, on / off valve, a rigid barrel, and a Guardair Corporation supersonic nozzle. It is to be connected to a standard industrial air compressor capable of producing the above stated flow at the above stated pressure.

The AIR-SPADE®'s supersonic jet of air effectively penetrates and dislodges most types of soil, but is harmless to non-porous items like buried pipes or cables. Unlike the hard cutting edges of shovels, picks, digging bars, blades or buckets, only the high speed air of the jet contacts the soil. Excavating with an AIR-SPADE® is much easier and many times faster than hand excavation. The AIR-SPADE® can excavate rocky types of soils where a shovel cannot be used. Guardair Corporation's AIR-SPADE® is made in different sizes tailored for the job. The AIR-SPADE® is ideally suited for jobs requiring precise, safe excavation.

Although supersonic nozzles have been designed and built for many years for rocket engines, AIR-SPADE®'s supersonic air jet excavation nozzles are different. Unlike propulsion nozzles, the energy

- For shallow, wide excavations, hold the AIR-SPADE® at an angle between 30° and 45° from the horizontal and point it in the direction that is to be excavated. With the trigger depressed, move the nozzle from side to side for the desired width and blow the loosened soil ahead of the AIR-SPADE®. Continue until the excavation is formed to the required length. Canvas cloth, plywood, or a collapsible barrier (see accessories) can be useful to confine the loosened material to the work area.
- For deeper sheet excavations or trenches, like with larger holes, loosen the soil in lifts of several inches and remove the soil by appropriate means including a shovel, backhoe, or vacuum unit (like our AIR-VAC)

SHUT DOWN

- Shut down the air compressor according to the manufacturer's instructions.
- Close the air compressor's air supply valve.
- With the AIR-SPADE® pointed up and away from all personnel or loose objects, depress and hold in the AIR-SPADE® trigger until all compressed air from the tool and hose is fully expelled and the air pressure gauge on the tool reads "0".
- Disconnect the air hoses and store the AIR-SPADE® as desired.

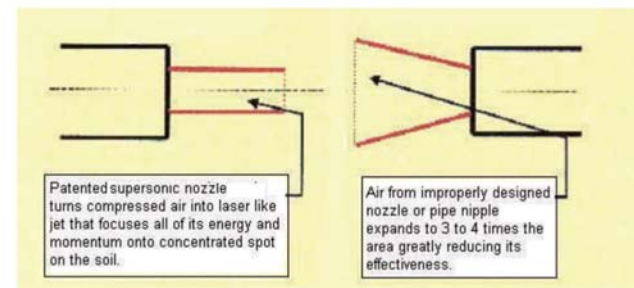
Note, when excavating always observe proper safety instructions as listed in this manual and other procedures specific to the application.

- Except in very hard and compacted clays, dwelling on the same spot tends to reduce the rate at which material is excavated and can increase the amount of material blown away from the excavation site.
- Watering the work area ahead of time can be helpful. Watering reduces airborne dust if the soil is extremely dry. It also reduces the soil strength making digging easier.
- For small diameter holes, place the nozzle close to the soil, depress the trigger, and thrust the tool into the soil slowly. When resistance is met, draw the AIR-SPADE[®] slowly out of hole and reinsert. This will usually allow the loose soil to exit the hole and the tool can then be inserted down to the depth of the barrel.
- For large diameter holes, move the tool back and forth across the footprint of the excavation to loosen the soil to a depth of several inches, e.g. 2-3 inch lifts. Each lift of disturbed soil should then be removed by suitable means such as a shovel or a vacuum. This procedure should continue until the desired depth of hole is reached.
- Note when plunging the tool into loose soil or when boring a narrow hole in the soil, the tendency to expose the operator to material blown back directly out of the hole is increased. The dirt shield should be positioned close to the ground surface to best confine any excavated material from the hole.

to accelerate the air comes from the release of its compression rather than from the combustion of a fuel. Because of their small size, special tooling and computer-aided-machining is used to manufacture the nozzles. Guardair Corporation has developed its own proprietary design method and CAD-CAM interface for its supersonic air jet excavation nozzles. Guardair Corporation continues to refine and improve its design through detailed mathematical modeling and laboratory experimentation.

An AIR-SPADE[®] supersonic air jet is vastly different than pressured air exiting from a pipe nipple or a square edged orifice. These flows expand suddenly to atmosphere in a unfocused, complicated manner. The AIR-SPADE[®] supersonic jet has more kinetic energy and more focused momentum than these other air streams. In practical terms the AIR-SPADE[®] supersonic jet can do more work, dislodge harder materials, and move more material than these jets.

Patented supersonic nozzle turns 90 psig compressed air into laser-like Mach 2 jet. Jet penetrates and fractures friable materials like soil, but harmlessly goes around buried pipes, cables, fiber optic lines, or even tree roots.



OPERATING INSTRUCTIONS

IT IS THE RESPONSIBILITY OF THE USER TO READ AND UNDERSTAND THESE INSTRUCTIONS PRIOR TO OPERATION. FAILURE TO ADHERE TO THESE INSTRUCTIONS CAN RESULT IN PERSONAL INJURY. THE OPERATOR SHOULD HAVE A THOROUGH WORKING KNOWLEDGE ON HOW TO PROPERLY USE THE AIR COMPRESSOR TO WHICH THE TOOL IS ATTACHED.

BEFORE OPERATION

- Check the compressor for sufficient fuel and oil levels.
- If a portable compressor is used, make sure it is secure from accidental motion.
- Make sure the compressed air supply valve on the compressor is closed, i.e. no air flowing.
- Make sure that all hose connections are securely made and any safety clips are installed.
- Use hose for compressed air service of sufficient rated working pressure for the operating value of the tool.
- Use air hose of an appropriate diameter and length for the job.

Pressure loss (psi) for 50' hose					
Air flow (cfm) at 90 psig					
Hose Size	25	60	105	150	225
3/4"	0.3	1.6	5.6	12.3	25.0
1"	0.1	0.4	1.3	2.8	5.5
1 1/4"	0.0	0.1	0.4	0.8	2.0
Friction loss is proportional to length.					

STARTING

- Start the compressor according to the manufacturer's instructions which may vary from unit to unit.
- Check that the compressor is operating correctly and that the dead head pressure is sufficient for proper tool operation.
- Make sure that the AIR-SPADE[®] trigger is not depressed, i.e. that the valve is closed, and that the nozzle is pointed away from all personnel or any loose object that could be moved accidentally by the air stream. Open the compressor's air supply valve.
- Securely holding and pointing the AIR-SPADE[®] away from all personnel and any loose objects, depress the AIR-SPADE[®]'s trigger, opening its valve, and read the compressor discharge pressure gauge and the gauge on the tool. The pressure on gauge at the tool should be between 80 and 100 psig (5.5 and 6.9 bar). If it is not, the output pressure of the compressor and / or the size of the hose may need to be changed.

NORMAL EXCAVATION

- For normal excavation, the best performance is achieved by holding the nozzle roughly perpendicular to the ground about 1 inch away from the surface.
- Depending on the soil type, the AIR-SPADE[®] is best moved along the surface to be excavated at a rate on the order of one to two feet per second (0.3 to 0.6 m/sec).
- A portable barrier or fence is useful as a backdrop to keep dislodged soil confined to the working area. (See accessories)