AIR-SPADE® ACCESSORIES

Extensions and Reducers with fittings (various lengths available)

HT-69 225 scfm (6.3m^3/min) @ 90 psig (6.2 bar) nozzle

HT-38 60 scfm (1.7m^3/min), 90 psig (6.2 bar) nozzle

HT-39 25 scfm (0.7m^3/min), 90 psig (6.2 bar) nozzle

Dix-Lock® Hose Fittings

HT-105 Comfort Hose, Lightweight Hose 10 ft. (3m) with couplings

HT-70 Lightweight Hose 25 ft. (7.6m) with couplings

HT-46 45° Angled Adapter

HT-79 Protective Head Gear with Scratch Proof Face Shield

HT-94 AIR-SPADE® Storage Case

For more information contact:

Concept Engineering Group, Inc.
15 Plum Street
Verona, PA 15147 U.S.A.
TEL: 01 412-826-8800
FAX: 01 412-826-8601
Phone (US and Canada): 1-888-557-2339
EMAIL: ceg@air-spade.com
WEB: http://www.air-spade.com

AIR-SPADE®

SERIES 2000

OPERATOR'S MANUAL

CONCEPT ENGINEERING GROUP, INC.
15 PLUM STREET
VERONA, PA 15147
U.S.A.

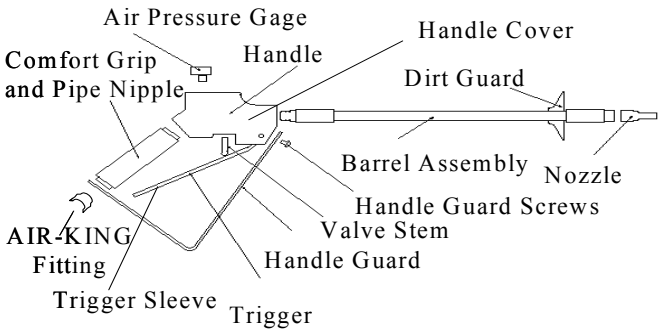
TEL: 01 412-826-8800
FAX: 01 412-826-8601
Phone (US and Canada): 1-888-557-2339
EMAIL: ceg@air-spade.com
WEB: http://www.air-spade.com

January, 2004
Revision 9

CONTENTS PAGE NO

REPLACEMENT PARTS

Item	Part Number
Handle	HT-22
Handle Cover	HT-60
Handle Guard	HT-04
Valve stem	HT-52
Barrel Assembly	HT-45
Air Pressure Gage	HT-10
Trigger	HT-08
Trigger Sleeve	HT-19
Comfort Grip	HT-07
Dirt Guard	HT-34
Handle Guard Screws	HT-05
Nozzle 150 scfm (4.2m^3/min) (6.2 bar) 90 psig	HT-37
Valve Stem Washer	HT-66
Valve Stem Spring	HT-18
AIR-KING AM-8 Hose Fitting	HT-20



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
Flow	Either 150 scfm (4.2m^3/min), 225 scfm (6.2m^3/min) 60 scfm (1.7m^3/min), or 25 scfm (0.7m^3/min) depending on nozzle size
Pressure	90 psig (6.2 bar)
Mach Number	2
Hose size	1 inch inner (25 mm) diameter minimum recommended

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

COMPRESSOR REQUIREMENTS

For the standard 150 scfm (4.2m^3/min) nozzle, it is recommended that this tool be used with a compressor rated at a minimum of 165 scfm (4.6m^3/min), 100 psig (6.4 bar). If alternate nozzles are purchased, the compressor must be of sufficient pressure capacity, 100 psig (6.4 bar), and have a flow at least equivalent to 110% of the nozzle's scfm rating. **The use of lower flow and/or lower pressure compressors may diminish the tool performance**.

MAINTENANCE

As with any quality tool, the AIR-SPADE® does require good care to ensure it works properly when you need it. It is good practice, prior to each use, to inspect 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 (eg. 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 Concept Engineering Group Inc. (CEG) against defects in material and workmanship for a period of 180 days. The unit will be replaced or repaired at CEG's option as a result of such defects. Warranty will commence upon date of shipment of tool by CEG.

CEG'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.

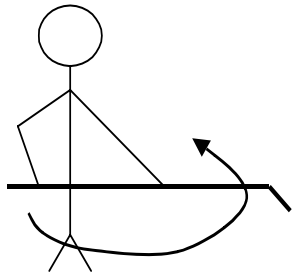
Any and all claims for warranty consideration must be coordinated through CEG. Do not return unit or parts without prior authorization. Returned unit or parts must be postage prepaid.

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 CEG 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.**



- To reinsert valve stem into bushing, place a small drop of oil on the stem assembly and reinsert into the brass bushing. Push down gently until the assembly is seated. Carefully place the spring on top of the valve stem assembly making certain that the spring fits down over the hex nut. Wrap the threads of the 1" pipe plug with pipe thread sealant tape and reinstall the plug. Reinstall the handle cover. Attach the tool to the air source and check the operation of the tool.

- **CAUTION: The socket plug should be tightened flush with top surface of handle. Serious damage to the handle may result if plug is tightened below surface of handle.**

IN NO EVENT SHALL CEG 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. CEG 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 point or aim the AIR-SPADE® at any person during operation.

DO NOT tie, tape or otherwise lock or fasten the trigger into on 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 safely 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, operator should wear approved respiratory protection.

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 GAGE

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

VALVE STEM AND SEALING WASHER

- If your AIR-SPADE® has a handle cover, remove handle valve cover by drawing towards the rear of tool. This will expose the 1" (25mm) socket pipe plug. Insert a 1/2” (12.5mm) square socket wrench drive into the socket and turn counterclockwise to remove the plug. With a needle nose pliers remove the spring, washer, and valve stem.

- If replacing the sealing washer, wrap the top end of the valve stem with a cloth and grip with pliers or vice grips, remove the hex nut and replace the washer. Place a drop of Locktite thread sealer on the hex nut and reattach to the valve stem.

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 fiberglasss 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 1,230 mph (2000 km/hr), i.e. twice the speed of sound. The most commonly used nozzle is designed to utilize 150 standard cubic feet per minute (4.2m^3/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 CEG 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. CEG'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, CEG's AIR-SPADE® supersonic air jet excavation nozzles are different. Unlike propulsion nozzles, the energy

The dust shield should be positioned to deflect the blown soil, and the operator should wear the proper face and eye protection

TRENCHING

- For shallow trenching, hold the AIR-SPADE® at an angle between 30° and 45° from the horizontal and pointed in the direction that the trench is to be excavated. With the trigger depressed, move the nozzle from side to side for the desired trench width and blow the loosened soil out of the trench ahead of the AIR-SPADE®. Continue until the trench is formed to the required length. For deeper trenching, soil removal may be an issue. This type of trenching may best be done using the AIR-SPADE® in combination with a shovel, vacuum unit (like our SAFEX®), or other type of soil removal equipment which can remove the lose soil without damage to the buried items. **Be sure that any personnel are kept away from the soil spray, and protect any object that could be impacted by the blowing soil.**

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.

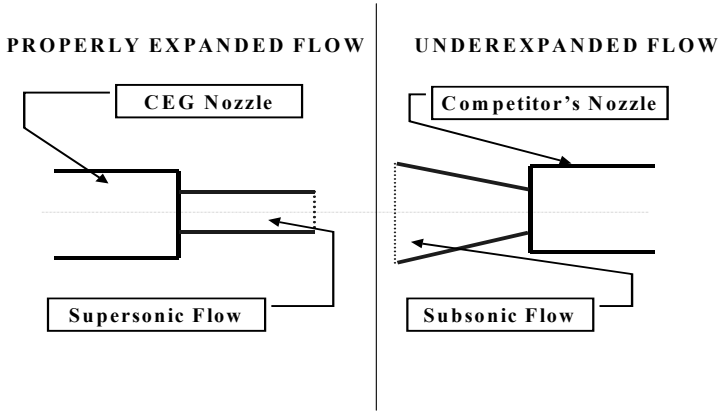
- Except in very hard and compacted clays, dwelling on the same spot tends to reduce the rate at which material is excavated and can increase the amount of material blown away from the excavation site.
- When boring a narrow hole in the soil, the tendency to expose the operator to material blown back directly out of the hole is increased. The AIR-SPADE® for general excavation is supplied with an auxiliary dirt shield that serves to confine any excavated material that may become airborne from leaving the general area of the nozzle.
- If soil is encountered that is difficult to dig, try adding some water to soften. Repeat until the desired results are obtained.

VERTICAL HOLES

For vertical holes, not larger than the diameter of the tool, place nozzle close to soil (Do not touch the soil) with the AIR-SPADE® in vertical position, depress trigger and thrust the tool into 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 vertical holes larger than the tool diameter, the hole should be started by outlining the footprint of the excavation and proceeding to remove the soil in 2-inch (50mm) lifts. Each lift of disturbed soil should then be removed with a shovel, vacuum, other removal system. This procedure should continue until the desired depth is reached. Note when plunging the tool into the soil and hole, the soil may be blown out along the axis of the tool.

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. CEG has developed its own proprietary design method and CAD-CAM interface for its supersonic air jet excavation nozzles. CEG 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. The AIR-SPADE® is covered by U.S. Patents No. 5,782,414, DES 408,830, and DES 435,207.



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. The tool comes equipped with an AIR-KING® AM-8 3/4" (19mm) (or similar Dix-Lock®) hose fitting. The compressor hose to which the tool attaches should be equipped with an AIR-KING® AM -11 (or similar Dix-Lock®), 1" (25 mm) fitting.
- 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. For instance, the tool output pressure; with 150 scfm (4.2m^3/min) flowing at 90 psig (6.2 bar) through a 1 inch diameter (25mm), smooth bore air hose, drops about 3 psig (0.2 bar) for every 50 feet (15mm) of hose with couplings.

Therefore, use of other than a 1 inch (25mm) inner diameter hose may effect the performance of the tool.

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 gage at the tool should be between 95 and 100 psig (6.5 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
- 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 foot per second (0.3 to 0.6 m/sec).