SECTION 6 - TECHNOLOGY SAFETY DATA SHEET

TECHNOLOGY SAFETY DATA SHEET
FRAMATOME TECHNOLOGIES
Thermal Dynamics Corp. PAK45 Plasma Arc Torch
(Equipment Dismantlement)

<table>
<tr><th colspan="2">SECTION 1: TECHNOLOGY IDENTITY</th></tr>
<tr><td rowspan="3">Manufacturer’s Name and Address:

Framatome Technologies
3315 Old Forest Road
PO Box 10935
Lynchburg, VA 24506-0935</td><td>Emergency Contact:

Ken R. Palazzi

(804)832-3915</td></tr>
<tr><td>Information Contact:

Ken R. Palazzi

(804)832-3915</td></tr>
<tr><td>Date Prepared:</td></tr>
<tr><td>Other Names:

Plasma Arc Cutting System</td><td>Signature of Preparer:

Operating Engineers National Hazmat Program
1293 Airport Road, Beaver, WV 25813,
phone 304-253-8674, fax 304-253-7758

Under cooperative agreement DE-FC21-95 MC 32260</td></tr>
</table>

SECTION 2: PROCESS DESCRIPTION

The plasma arc torch provides a thermal cutting technique for cutting metal pieces. Plasma uses a high-powered electric arc in combination with high-velocity cutting gas to vaporize metal and create plasma. The plasma itself is a gas which has been heated to an extremely high temperature and ionized to make it electrically conductive. The plasma is then used to transfer an electric arc to the workpiece. The metal is melted by the heat of the arc and then blown away. The plasma torch is typically manipulated on a track or by a robot but manual manipulation and cutting is also used. The PAK 45 Plasma Arc system includes: a hand or machine mounted torch, the operator's console, gas regulators, and supply hoses and cables.

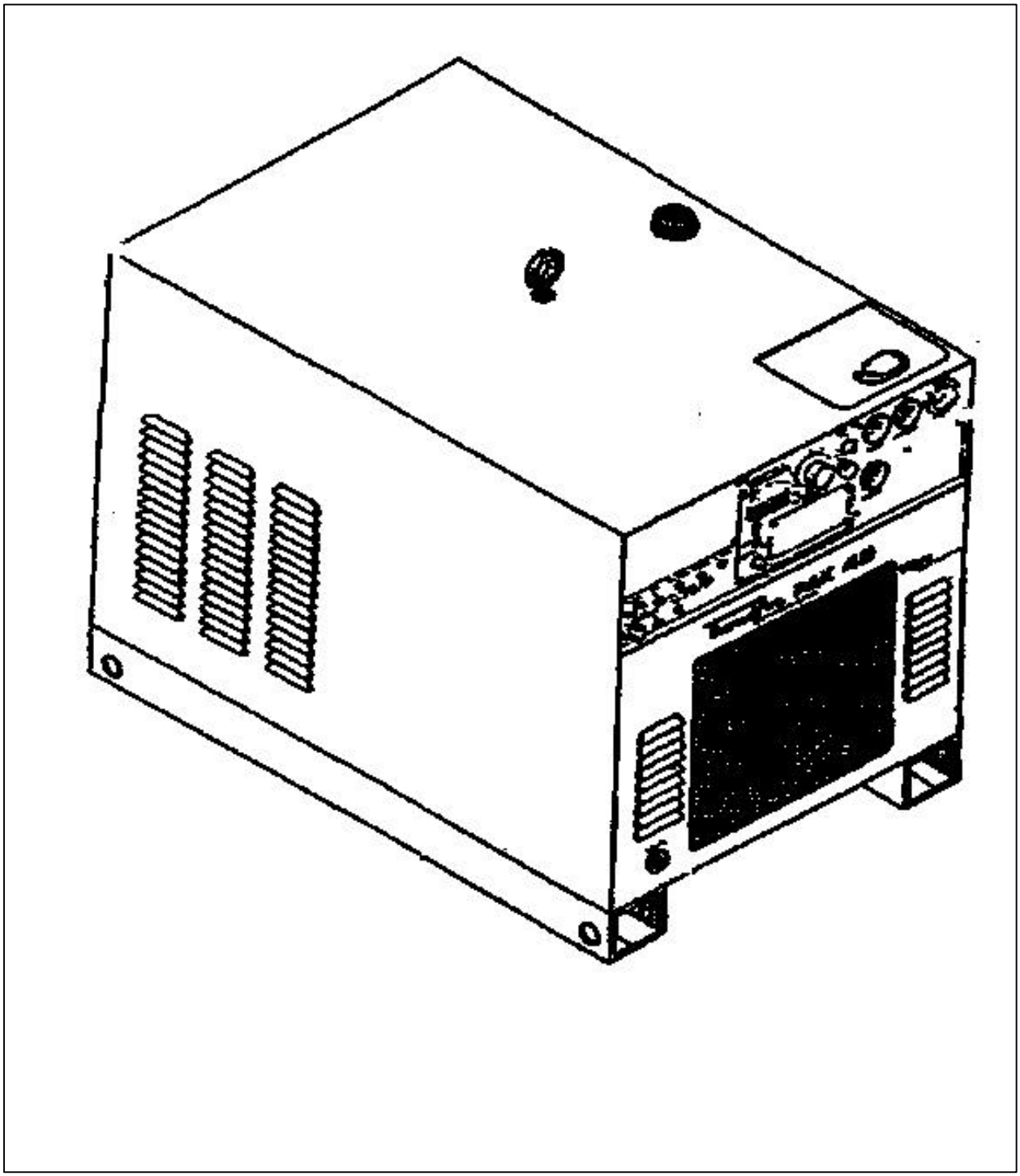
In the plasma arc torch, a shield gas such as nitrogen enters through the center of the torch. A pilot arc between the electrode and the front of the torch heats and ionizes the gas. The arc then transfers to the workpiece through a column of plasma gas. By forcing the plasma gas and electric arc through a small orifice, the torch delivers a high concentration of heat to a very small area. The dual-flow design of the plasma arc torch uses a secondary gas that assists the high velocity plasma in blowing the molten metal out of the cut. Direct current straight polarity is used for plasma cutting.

The main components of the PAK 45 Plasma Arc system are the plasma and secondary gases, the pilot arc/arc starter, the cutting arc, and the current control. The plasma gas flows to the torch around the electrode and out through the tip orifice. The secondary gas flows to the torch through the outer insulator, inner tip retainer, and the end piece and out around the plasma arc. The plasma gas used was an argon/hydrogen mixture and the secondary gas was nitrogen.

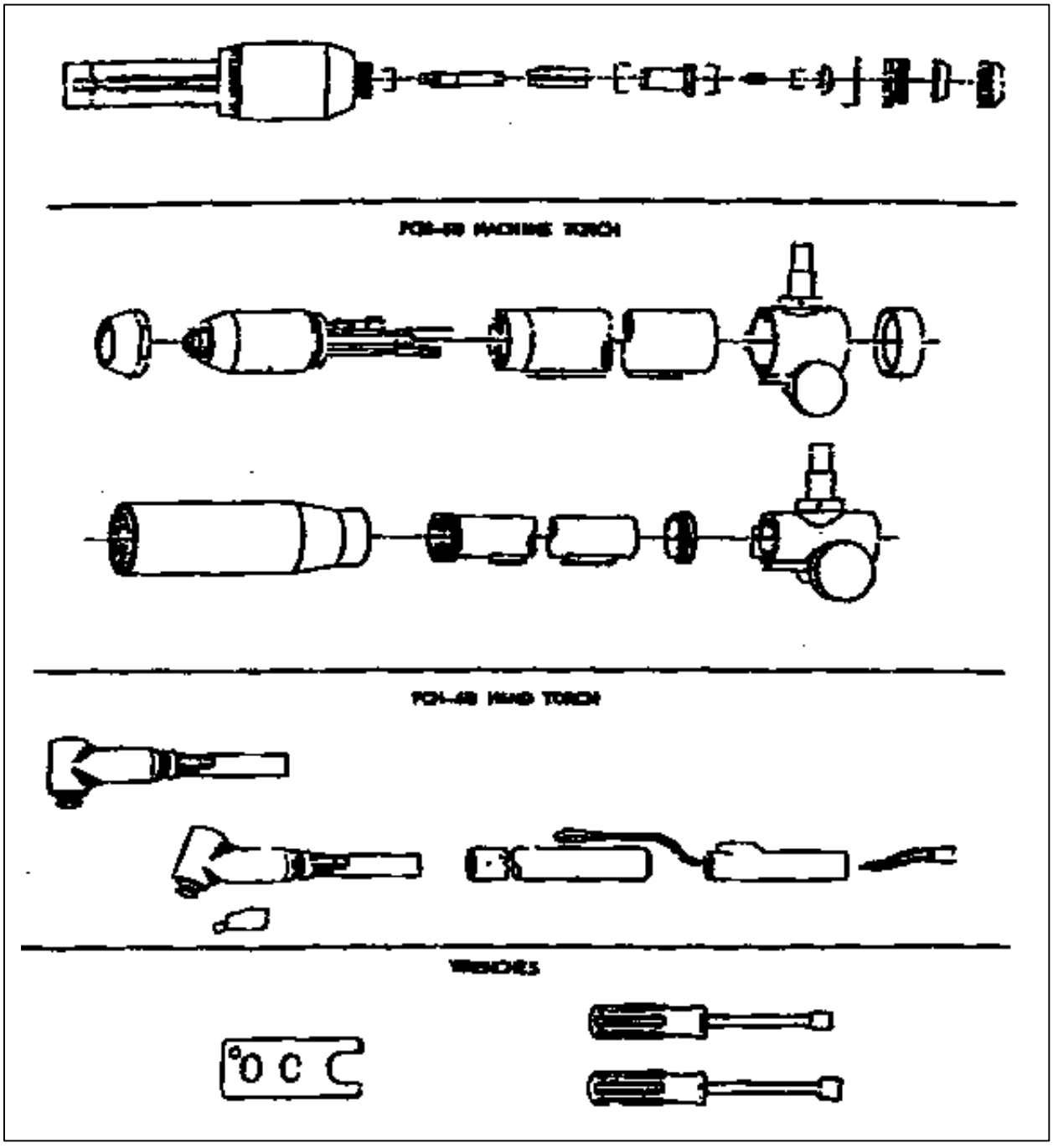
When the start button on the torch is pressed, the main contactor is activated. High voltage pulses jump the gap between the electrode and the tip in the torch which starts the pilot arc. The starter circuit provides 15 pulses per second which results in a rapid fire “pop, pop, pop” pilot arc. The pilot arc makes a path for transferring the main arc to the work. The main bridge rectifier converts the 3 phase AC power to DC for the main cutting arc.

The cutting current is set with the control knob, located to the right of the ammeter, on the control panel. The cutting current is stabilized against fluctuations due to changes in line voltages, material thickness, torch standoff, and travel speed.

SECTION 3: PROCESS DIAGRAMS



SECTION 3: PROCESS DIAGRAMS (CONTINUED)



SECTION 4: CONTAMINANTS AND MEDIA
Smoke and fume are generated during thermal cutting with the plasma arc torch. Consideration needs to be given to the contaminants of the metal being cut, any contaminants of coatings on the metal, and contamination in the area where the torch is being used for D&D activities. An air sampling plan will need to be developed, as appropriate for the site where the torch is used.

SECTION 5: ASSOCIATED SAFETY HAZARDS	
Probability of Occurrence of Hazard: 1 Hazard may be present but not expected over background level 2 Some level of hazard above background level known to be present 3 High hazard potential 4 Potential for imminent danger to life and health	
A. ELECTRICAL (LOCKOUT/TAGOUT)	RISK RATING: 3
The plasma arc torch presents electrical hazards. Installation and maintenance of the equipment needs to be done in accordance with the National Electrical Codes. Proper grounding, immediately replacing any cracked or damaged insulating parts, etc. need to be part of the standard operating procedures for the plasma arc torch system.	
B. FIRE AND EXPLOSION	RISK RATING: 4
Heat, sparks, or flame present during thermal cutting has the potential to cause fire or explosion. When fire hazards present in the area cannot be moved, guards must be set up to contain heat, sparks, and slag. Hydrogen is a flammable gas and proper precautions need to be taken when used with the plasma arc torch.	
C. CONFINED SPACE ENTRY	RISK RATING: 1-4
Not part of this technology unless the specific location where the torch is being used is a confined space. Thermal cutting operations can present additional hazards in a confined space. Confined space entry and rescue procedures should be followed and additional consideration given to the limited work space, hazardous atmosphere, slipping hazards, flammability, combustibility, and toxic fumes in relation to their ability to be caused by the thermal cutting process itself.	
D. MECHANICAL HAZARDS	RISK RATING: 1
Assembling the cylinders and the cutting torch poses pinch points.	
SECTION 5: ASSOCIATED SAFETY HAZARDS (CONTINUED)	
E. PRESSURE HAZARDS	RISK RATING: 4
The compressed gas cylinders present a hazard and are discussed under "K". of this section.	
F. TRIPPING AND FALLING	RISK RATING: 2
Hoses present potential hazards.	

SECTION 5: ASSOCIATED SAFETY HAZARDS	
G. LADDERS AND PLATFORM	RISK RATING: 2
Not part of this technology but may be required for D&D activities. All regulations for working from ladders and platforms, including the OSHA scaffolding standard, must be followed.	
H. MOVING VEHICLE	RISK RATING: 2
Not part of this technology but may be required for D&D activities. All precautions and safety requirements for large pieces of equipment will need to be followed. For example, all moving vehicles should have working back-up alarms, warning lights, etc.	
I. BURIED UTILITIES, DRUMS, AND TANKS	RISK RATING: N/A
Not part of this technology.	
J. PROTRUDING OBJECTS	RISK RATING: N/A
Not part of this technology.	
K. GAS CYLINDERS	RISK RATING: 4
Compressed gas cylinders account for one of the primary hazards associated with the plasma arc torch. If the compressed gas cylinders are damaged, gas can escape with great force and the cylinder itself can explode causing injury to workers and possibly damaging property. One example of this type of hazard is called “rocketing”. The cylinder acts as a “rocket” if damaged or ruptured. The “rocket” (cylinder) can break through concrete walls or travel through open spaces.	
L. TRENCHING AND EXCAVATIONS	RISK RATING: N/A
Not part of this technology.	
M. OVERHEAD LIFTS	RISK RATING: 2
Not part of this technology but may be required during D&D activities. All applicable standards and precautions must be followed for the type of equipment used. At a minimum, anyone in the work area should be wearing a hard hat.	
N. OVERHEAD HAZARDS	RISK RATING: 2
May be part of this technology if the piece being cut is overhead. At a minimum, anyone working in the area should be wearing a hard hat. It needs to be assured that all workers in the area are aware of the overhead work being done and avoid the area when possible.	

SECTION 6: ASSOCIATED HEALTH HAZARDS	
A. INHALATION HAZARD	RISK RATING: 3
Fumes and gases produced by the thermal cutting process vary widely and are relative to the metal being worked, coatings on the metal, and contaminants inherent in the environment where the metal is located. When chlorinated solvent vapors are exposed to ultraviolet radiation, they can produce phosgene gas. Phosgene gas is extremely toxic and a human poison by inhalation. All solvents, degreasers, or potential sources of vapors need to be removed from the area where the plasma arc torch is being used.	
B. SKIN ABSORPTION	RISK RATING: 1
This would be dependent on the contaminants at the site and would be identified by the site characterization.	
C. HEAT STRESS	RISK RATING: 1-4
Ambient conditions, work rates, and PPE levels must be considered. The worker may be subjected to an increase in heat stress due to the heat generated during thermal cutting operations. The sparking, flame, slag, and hot metal will all add to the heat load.	
D. NOISE	RISK RATING: 2
The technology presents a potential noise hazard.	
E. NON-IONIZING RADIATION	RISK RATING: 1-4
The ultraviolet light produced by the thermal cutting process can damage the eyes. This can be in the form of a “flash” burn or after long term exposure, cataracts. Proper protection for eyes when performing cutting operations using the plasma arc torch is the welding helmet with the correct filter in place. The filter lenses and plates must meet the test for transmission of radiant energy as prescribed in ANSI Z87.1, *Practice for Occupational and Educational Eye and Face Protection*. Filter darkness needs to be chosen in compliance with OSHA 29 CFR Subpart Q Welding, Cutting, Brazing. Other workers in the area must wear safety glasses with an appropriate darkness rating. It is also recommended that dark clothing be worn to reduce reflection under the welding helmet.	
F. IONIZING RADIATION	RISK RATING: 1-4
Not part of this technology, but may be associated with the area where D&D activities are taking place.	
G. COLD STRESS	RISK RATING: 1
Technology does not produce a hazard, but ambient conditions need to be considered.	
H. ERGONOMIC HAZARDS	RISK RATING: 3
During cutting operations, many ergonomic stressors can be placed on the body from awkward and static postures. There is also concern for the manual force and	

SECTION 6: ASSOCIATED HEALTH HAZARDS	
repetitive motions that may be required. In order to make a cut, workers may have to get into tight places by twisting themselves into place or by propping their bodies into awkward positions. Stresses occur from holding the head and arms in unnatural, fixed positions for long amounts of time. This often results in stiffness and soreness in the body. Overhead work can result in a condition know as shoulder tendonitis (inflammation of the tendons of the shoulder) and there is concern for the stress placed on the back from bending to cut pieces located on ground level.	
I. OTHER	RISK RATING: N/A
None noted at this time.	

SECTION 7: PHASE ANALYSIS
A. CONSTRUCTION/START-UP
The set-up/start-up phase presents several hazards including pinch points, struck by slips/trips/falls, muscular/back injury, electrical hazards, and exposure to gases.
B. OPERATION
The operational phase presents several hazards including exposure to contaminant, muscular/back injury, pinch points, laceration hazards, slips/trips/falls, pinch points, struck by hazards, exposure to noise, eye hazards (ultraviolet and infrared light), burn hazards, fire/explosion hazards, electrical hazards, heat stress, and exposure to contaminants.
C. MAINTENANCE
The maintenance phase presents several hazards including pinch points, electrical hazards, slips/trips/falls, muscular/back injury, and exposure to contaminants.
D. DECOMMISSIONING
The decommissioning phase presents several hazards, including exposure to the contaminant, pinch points, slips/trips/falls, and muscular/back injury.

SECTION 8: HEALTH AND SAFETY PLAN REQUIRED ELEMENTS
A. AIR MONITORING
Fumes and gases produced by the thermal cutting process vary widely and are relative to the metal being worked, coatings on the metal, and contaminants inherent in the environment where the metal is located. Iron oxide, nickel, cadmium, zinc, lead, oxides of nitrogen, and carbon dioxide are examples of the types of inhalation hazards that may be present during thermal cutting operations. A sampling plan specific for the site and the pieces being cut will need to be developed. Noise monitoring will need to be conducted.
B. WORKER TRAINING
Training that may apply in this case may include but not be limited to: HAZWOPER (Hazardous Waste Operations and Emergency Response), HAZCOM (Hazard Communication), Respiratory Protection, PPE (Personal Protective Equipment)

SECTION 8: HEALTH AND SAFETY PLAN REQUIRED ELEMENTS
Training, Hearing Conservation, Fire Extinguisher, Heat Stress, Electrical Safety, Working with Compressed Gases, non-ionizing radiation training, Ergonomics (proper lifting, bending, stooping, kneeling), specific training for equipment operation, CPR/First Aid/Emergency Response/Bloodborne Pathogens, Lockout/Tagout, Hand Signal Communication, and Construction Safety (OSHA 500) and/or General Industry Safety (OSHA 501).
C. EMERGENCY RESPONSE
Emergency response planning for a site needs to assure adequate coverage for hazards described in the TSDS. Having at least one person per shift trained in CPR and first aid is recommended.
D. MEDICAL SURVEILLANCE
Evaluation of personnel's general health with emphasis on the cardiovascular and respiratory system and the back. In addition, medical surveillance as required by OSHA standards must be conducted. Initial and annual audiograms may be required.
E. INFORMATIONAL PROGRAM
Workers must be trained in specific operation of equipment before use.

SECTION 9: COMMENTS AND SPECIAL CONSIDERATIONS
Only personnel who have been adequately trained in the operation of this technology should be permitted to operate and/or work with the equipment.