# BORING EXPLOSIVES

## I. SCOPE

This SOP governs the tooling and procedures that will be used to make and enlarge blind holes in HE by means of boring. Boring, as defined in this SOP, is the use of a single-point cutting tool mounted on a boring bar that rotates on the axis of a spindle carrying the tool. In some cases, the cutting tool is mounted on a stationary tool holder and the workpiece rotates.

## II. LOCATION

Building TA-16-260, HE machining bays

## III. LIMITS

A. Personnel

See Group WX-3 SOP 8.2.0

B. Explosives

See WX-3 SOP 8.3.0

## IV. EQUIPMENT

A. See WX-3 SOP 8.1.0

B. Cutting Tools

1. Single-lip boring tool with an internal coolant passage

2. Single-lip boring tool without a coolant passage for shallow holes as defined in this SOP

## V. PROCEDURE

A. Setup and machining procedures must be performed in accordance with WX-3 SOP 8.7.4.

B. Remotely controlled operations are required on all explosive metal laminates when the metal portion is included in the cut.

*Indicated Change



Atch 12

V. (continued)

C. Boring Shallow Holes

A shallow hole has a depth of not more than 1.5 times the hole diameter. The procedures below must be followed for boring shallow holes in HE or HE-inert composites.

1. Only those cutting tools listed in Item IV.B, above, will be used.

2. A flow of coolant must be used through boring bars having coolant passages.

3. A flow of coolant must be used at the cutter-HE interface when tools without a coolant passage are used.

D. Boring Deep Holes

A deep hole has a depth of more than 1.5 times the hole diameter. The procedures below must be followed for boring deep holes in the HE or HE-inert composites.

1. Only those tools listed in Item IV.B.1, above, will be used.

2. Boring must not be used to bore deep holes 1/2-in. diameter or smaller.

3. Boring, however, may be used to enlarge the diameter of existing holes that are 1/2-in. diameter or smaller. Each advance of the cutting tool must not exceed 1.5 times the hole diameter cut. Each advance must be followed by a full retraction to allow chips to be flushed from the hole.

* 4. A flow of coolant must be used through the cutter. If barium containing materials are being bored, dry sump procedures per SOP 8.4.0 shall be used.

5. Holes deeper than 10 times the diameter of the tool require an SMI.

# DRILLING EXPLOSIVES

## I. SCOPE

This SOP governs the tooling and procedures that will be used to make and enlarge holes in explosives by means of drilling. Drilling as defined in this SOP is the use of a fluted tool that rotates on its own axis. A hole is defined here as any cavity that is more than one-half diameter deep.

## II. LOCATION

Building TA-16-260, HE machining bays

## III. LIMITS

A. Personnel

See WX-3 SOP 8.2.0

B. Explosives

See WX-3 SOP 8.3.0

## IV. EQUIPMENT

A. See WX-3 SOP 8.1.0

B. Cutting Tools

1. Two-lip twist drills with the chisel point removed, as is typical of a spiral point grind. Available in 1/8-in. diameter and larger with coolant passage.

2. Center cutting end mills. Available in 3/8-in. diameter and larger with coolant passage.

3. Single-lip straight flute drills (gun drill). Available in 3/32-in. diameter and larger with coolant passage.

*Indicates Change

Atch 13

V. PROCEDURE

A. All hole drilling will be done with drills having coolant passage.

B. Setup and machining procedures must be done in accordance with WX-3 SOP 8.7.4.

C. Remotely controlled operations are required on all allowable explosives for holes 2-in. diameter and smaller.

D. Remotely controlled operations are required on all explosive-metal laminates when the metal portion is included in the cut.

E. Only those cutting tools listed in IV.B will be used.

F. Holes larger than 0.500-in. diameter will not be drilled any deeper than 0.75 in. during a single insertion of the drill into the material.

G. Holes 0.500-in. diameter and smaller will not be drilled any deeper than 1-1/2 times the diameter during a single insertion of the drill into the material. Each advance must be followed by a full retraction of the cutting tool so that the flutes and water passage can be inspected, and chips can be flushed from the hole.

H. Coolant flow must be used through cutter coolant passages.

I. Jet pulser-type coolant flow should be used through the cutters 1/4-in. diameter and smaller.

J. Holes deeper than ten times the diameter of the tool require an SMI.

K. Flute length shall exceed the depth of hole drilled by one hole diameter for drills 1/2-in. and larger. For tools smaller than 1/2-in., the flute length shall be 1/2-in. longer than depth of hole.

*VI. Restrictions

When barium containing materials are drilled and water is used as a coolant, dry sump procedures per SOP 8.4.0 shall be used.

# DRY MACHINING

## I. SCOPE

This SOP governs dry machining on specific explosives that would be damaged or degraded by the use of coolant.

## II. LOCATION

HE machining bays, Building TA-16-260

## III. LIMITS

### A. Personnel

See Group WX-3 SOP 8.2.0

### B. Explosives

See WX-3 SOP 8.3.0

## IV. ALLOWABLE EXPLOSIVES

### A. Established Explosives

NQ (or NQ formulations of which NQ is the only explosive component) when required to be machined dry.

* Baratol

* Boracitol

TATB (or TATB formulations of which TATB is the only explosive component) when required to be machined dry.

### B. Developmental Explosives

* Materials bearing an experimental code number, a four-digit code number prefixed by the letter X, have been approved for development and may be processed, but only to the extent permitted by the associated High Explosives Development proposal (HED). Developmental explosives, their weight limits, and associated HED numbers are listed in WX-3 SOP 1.1.0, Table 2. High speed machining test data must be available.

*INDICATES CHANGE

Atch 6

ROUGH DRAFT

V. ALLOWABLE EXPLOSIVE-INERT COMPOSITES

Composites of the allowable explosives listed above and the materials listed below may be machined dry by remote control.

Foamed plastics
Solid plastics
Adhesives
Graphite
Calcium sulfate casting powder
Inert HE-mockup materials
Fiber glass
Plastics filled with inerts listed here

VI. EQUIPMENT

See WX-3 SOP 8.1.0

VII. ALLOWABLE OPERATIONS

The only dry machining operations permitted are:

A. Turning
B. Facing
C. Milling
D. Coring analytical samples
E. Sawing with an arbor-mounted circular saw blade as defined in WX-3 SOP 8.9.0.
F. Boring shallow holes as defined in WX-3 SOP 8.8.2.
* G. Sawing with linear band saw as defined in WX-3 SOP 8.9.0.

VIII. PROCEDURES

A. Setup and machining procedures are given in WX-3 SOP 8.7.4.

B. Only remote control will be used.

C. No coolant will be used on the workpiece.

* D. Air will be used through cutters that contain coolant passages for drilling.

* E. The saw will be sealed with tape or plastic so that the barium compounds and TNT can be collected.

* F. A cold air gun will be placed on the saw blade to keep saw blade cool.

* G. The feed rate will not exceed more than 1-1/2" per minute.

# IN-SUMP TREATMENT OF WASTE WATER CONTAINING SOLUBLE BARIUM

## I. Scope

Sumps are used to separate by settling, high explosives (HE) and mock HE scrap produced in operating bays. Some explosive compositions and mock HE blends contain soluble forms of barium (primarily barium nitrate). Environmental Protection Agency (EPA) guidelines restrict the amount of soluble barium entering the environment. The purpose of this SOP is to establish a procedure whereby soluble barium may be fixed into an insoluble form. It is intended that this operation be performed by the HE Disposal crew prior to sump waste collection.

The sumps specifically identified in Section II will occasionally be used for barium component processing and at those times will be considered to contain soluble barium. When this occurs, the sumps will be treated according to the following procedure before sump cleaning. Should any other bays or buildings be used for barium or extraordinary operations, the Stock Preparation and Disposal Unit Supervisor shall be notified to see if this SOP will apply.

## II. Location

All sumps that service buildings or operating bays that process mock or explosives containing soluble barium. These include (but are not limited to) building 260 sumps behind Bays 22, 23 and 25, building 300 sumps, and building 302 sumps.

## III. Equipment

A. One gallon containers
B. Small scoop for chemicals
C. Vacuum tank (PN 213459) mounted on a truck

## IV. Limits

A. Explosives

Approximately 500 gallons of water-HE-mock HE slurry in vacuum tank.

B. Personnel

Four at sumps of settling tanks.

V. Treatment Procedure

A. The sumps listed in Section II have level indicators located on the outlet half of the sumps, which will signal when the water level has reached the 2/3's full point. When the light in the supervisor's office or process bay indicates the set-point has been reached, operations using water (machining or cleaning) will stop immediately and the Disposal supervisor notified. Cleaning (or machining) operations will remain stopped until the sump has been treated and cleaned.

B. Sumps suspected of containing soluble barium will be sampled by filling two one-gallon containers with liquid. Samples should be taken from the final cavity of the sump and should not contain solid material. The sump from which samples were taken should be identified on the container.

C. Both containers will be delivered to Building 460 for chemical analysis. The analysis will include pH (acidity) and soluble barium. Acidity can also be determined by WX-3 personnel directly. If a new sump has been sampled the length, width, and depth of that sump should also be obtained. The analytical results will be used to calculate the appropriate quantities of treatment chemicals to be used.

D. Building 460 personnel or the unit leader will calculate the appropriate quantity of diluted hydrochloric acid (HCl) and sodium sulfate ($Na_2SO_4$) with which to: 1) acidify the sump fluids to a pH from four to two; and 2) convert soluble barium to an insoluble $BaSO_4$. To assure complete conversion of soluble barium about twice the calculated amount of sodium sulfate will be added to the sumps.

E. Carefully add 1/2 of the diluted HCl to each portion of the sump. Operators will wear rubber gloves, aprons and face shields. The acid will be added slowly to the sump fluids. Both portions of the sump should be agitated with a wood paddle or rod for about five minutes.

F. The sodium sulfate should be divided into three portions with two portions added to the input side of the sump and one portion added to the output side. Both sides should be agitated manually with a wooden paddle or rod for a minimum of five minutes and the sumps allowed to settle overnight.

VI. Sump Cleanout

A. Collection procedures will follow SOP 12.1.4, section VI guidelines. Sumps that have been treated should be cleaned as thoroughly as possible with as much liquid as possible drawn into the truck mounted vacuum tank.

B. The sump truck should be drained into the filter vessels through a filter according to standard procedure. The filter should catch most of the suspended barium sulfate. The filter with barium sulfate may be burned in normal disposal operations.

C. Treatment dates and the HCl and $Na_2SO_4$ quantities will be recorded and sent to the Disposal Unit Leader upon completion of the operation.

VII. Sump Certification

A. After sump cleaning and draining, the sump will be thoroughly cleaned with pressurized water before being used for normal wet sump operations. Cleaning residue will be analyzed to assure sump condition or need for treatment.

B. If the sump is to be continually used to collect material from barium operations, the sump cleaning operation is not necessary.

VIII. (continued)

* H. A dust collector should be used if one is available.

* I. The saw blade will be equipped with stiff non-metal bristle brushes to wipe the blade before it passes around the bull wheel.

* J. Feeds and speeds shall be regulated to minimize the spread of dust.

* K. If HE dust is expected to be formed during machining, an approved, wet type, dust collector will be used (see WX-3 SOPs 8.4.0 and 1.11.2). The intake hood of the collector shall be placed as close to the cutter as possible.

* L. Before a workpiece is removed from the fixture. Dust must be brushed from the fixture and cutter into the waste collection pan.

* M. Additional operational requirements for dry machining of barium containing explosives include:

* 1. Major accumulations of dust shall be initially cleaned using a wisk broom and dust pan. This scrap will be packaged in paper bags or cardboard boxes for disposal.

* 2. Other cleaning will be accomplished with wet rags.

* N. At the completion of barium operations, including water washdown, if necessary, the bay/equipment will be thoroughly cleaned using dry sump procedures per SOP 8.4.0.

# PARTS CLEANING TANK

## I. SCOPE

This SOP governs the use of the parts cleaning tank, which is primarily intended for removing HE from tools, fixtures, and small equipment parts that require decontamination before they are returned to the tool crib or sent for modification and repair.

## II. LOCATION

Building TA-16-260, Bay 16

## III. PERSONNEL LIMITS

See Group WX-3 SOP 8.2.0

## IV. EXPLOSIVES LIMITS

A. For bay limit, see WX-3 SOP 8.3.0

B. The concentration of explosives in solution must not exceed 5 wt% of solvent.

## V. ALLOWABLE SOLVENT

The only solvent that will be used in the cleaning machine tank is dimethyl sulfoxide (DMSO).

## VI. EQUIPMENT

A. Parts Cleaning Tank

1. Seventy-gallon capacity solvent tank

2. Rinse rack

*INDICATES CHANGE

Atch 7

DRAFT

VI. B. Filtering or Replacing Solvent

1. Fifty-five gallon drum

2. Air-powered flex hose pump

3. Rubber hose with length and diameter required to pump solvent into or out of tank

4. Funnel with filter

5. Long handled scraper

VII. PROTECTIVE APPAREL

In addition to issued apparel, operators must wear face shields, rubber aprons, and polyethylene disposable gloves when putting parts into the machine, removing them, rinsing them, draining or rinsing the tank, removing sludge, or refilling the tank. DMSO can readily penetrate the skin and carry inpurities with it into the blood stream.

VIII. PROCEDURE

A. Use of Tank

1. Parts must be placed in the tray/rack in a way that prevents damage during the soaking cycle.

2. If the parts to be cleaned exceed 50 lb in total weight (but do not exceed 100 lb), two men must place parts in and remove them from tank.

3. No specific cleaning cycles are prescribed; however, the parts must be soaked for at least one hour.

4. Before the parts are removed from the rack, the rack will be raised and the parts allowed to drain over a collection system. Drippings will be returned to the cleaning tank.

5. After complete drying, the parts may be flushed with water.

6. The lid of the cleaning tank must be kept closed except during loading or unloading.

7. Water must never be poured into the DMSO, as a reaction will occur, resulting in bubbling and splashing.

VIII. B. Solvent Replacement

Samples will be taken bimonthly and when the concentration of HE in the solvent reaches 5 wt%, as determined by the analytical laboratory, the tank must be drained and refilled with fresh DMSO.

* 1. The contents of the tank must be drained into five, 25, or 55 gallon drums. Notify the Disposal Supervisor for disposal when the can or drum is full.

* 2. When drained, the inside of the tank must be wiped with rags and any accumulation of sludge must be loosened with a long-handled scraper. Sludge and rags will be placed in an appropriate container.

* 3. The tank must be refilled by pumping fresh DMSO from the fifty-five gallon drums into the tank.

C. Solvent Filtering

On occasion the solvent will require removal of inert materials that can be filtered out.

1. The solvent must be pumped from the tank into fifty-five gallon drums equipped with a screened funnel.

* 2. The debris must be dumped into an appropriate cardboard box or bag.

3. The solvent must be pumped from the drums back into the tank.

* D. Cleaning

1. Cleanup operations will be performed immediately after a pour. The equipment used for melting and pouring will be thoroughly cleaned with hot water. Spilled explosives will be cleaned up and the floor washed with hot water.

2. The kettle vacuum exhaust system must be cleaned after each melt, as described in EOP 4.4.0-01.

3. After the molds have been stripped, they will be thoroughly cleaned with hot water. The floor will be cleaned with hot water.

4. Waste materials will be disposed of in accordance with WX-3 SOP 12.1.2.

5. The building sumps will be operated on a dry sump basis when explosives containing $Ba(NO_3)_2$ are being processed (baratol, etc.). For this type of operation the sumps will be dry before casting operations begin. After casting, kettle and casting floor cleaning will proceed. When the light in the supervisor's office or operating bay indicates the output side of the sump has been filled to the 2/3's point, all water use will stop. The Disposal Supervisor will be notified and bay cleaning with water will not restart until the sump has been drained. The same procedure will be followed for mold cleaning. Cleanup after non-barium containing casting may proceed as normal using wet sump procedures.

# SAWING EXPLOSIVES AND EXPLOSIVES-NONMETAL COMPOSITES

## I. SCOPE

This SOP governs the sawing of explosives and explosives-nonmetal composites. Band saw skip tooth blades and rotating multiple-tooth circular saws are the only tools to be used for sawing.

## II. LOCATION

HE machining bays, Building TA-16-260

## III. LIMITS

A. Personnel

See Group WX-3 SOP 8.2.0

B. Explosives

See WX-3 SOP 8.3.0

## IV. EQUIPMENT

A. Wells band saws utilizing a skip tooth, two-tooth/in. saw blade.

B. Machine tools suitable for use with arbor-mounted circular saw blades.

## V. PROCEDURES

A. Setup and machining procedures will be performed in accordance with WX-3 SOP 8.7.4.

B. Coolant Requirements

1. With the band saws, a flow of coolant through jets will be used on the saw blade, guide rollers, and the interfaces between the drive wheel and saw blade.

*Indicates Change

Atch 11

V. B. (continued)

2. With the circular saw blades mounted on spindle arbors, a flow of coolant will be used at the cutter-workpiece interface.

C. Machining Rates

1. The wells saw is fixed at 210-ft/min blade speed.

2. The revolutions per minute on circular saw blades of various diameters used on other machine tools will be set so that it will not exceed the 210 sfpm rate.

3. All sawing of explosives will not exceed a two-in./min feed rate of workpiece or cutter.

* D. When barium containing materials are processed, they will be machined dry. Cleanup shall comply with dry sump procedures per SOP 8.4.0.

ROUGH DRAFT

# CASTING OF EXPLOSIVES

## I. SCOPE

* A. This SOP applies to the operations necessary to obtain cast stockpieces from castable explosives. The operations involve melting, pouring, cooling, stripping the stockpiece from its mold, and cleaning.

B. Casting Instructions (CIs), Form WX-3-106, will be issued for each mold type and for each type of castable explosive. The CI will contain detailed information that will be needed to cast an acceptable stockpiece in a specific mold.

C. Melt Instructions (MIs), Form WX-3-107, will be issued for each type of castable explosive.

D. Instructions on how to operate the melt kettles and other equipment associated with the casting operations will be specified in the Equipment Operating Procedures (EOPs).

## II. LOCATION

Building TA-16-302

## III. LIMITS

A. Personnel Limits

See Group WX-3 SOP 4.2.0

B. Explosives Limits

See WX-3 SOP 4.3.0

## IV. EQUIPMENT

A. Y-kettle and associated equipment
B. Lee kettle and associated equipment
C. Walk-in ovens
D. Molds and associated equipment
E. Efflux viscometer and stop watch
F. Hard rubber buckets
G. Insulation boxes, Drawing 13Y-83569
H. Transportation containers
I. Hand Tools

*Indicates Change

Atch 10

V. MATERIALS

A. Mold release compounds
B. Methyl Chloroform, acetone
C. Clean rags, paper tissues, and tape
* D. Paper bags
E. Cardboard boxes

VI. PROCEDURE

A. Melt preparation

1. The kettle to be used will be prepared for operation by following the EOP for the kettle.

2. The kettle jacket water supply will be turned on and the temperature controller adjusted to the melt temperature specified in the appropriate MI.

3. The blade clearance check will be run.

4. The kettle agitators will be turned on and the rpm adjusted to that specified in the MI.

5. Sufficient explosives will be poured into the kettle to allow the formation of a melted heel. The remainder of the explosives should be added at a rate to avoid the formation of excessively large chunks.

6. Additives, as specified in the MI, may be added either before or after a vacuum is applied.

7. When no visible lumps remain, the kettle may be closed and vacuum applied as specified in the MI.

8. After the specified agitation period and release of the vacuum, the material will be ready for pouring.

B. Pouring

1. Before starting a melt, the molds will be set up, positioned for convenient pouring, and checked for cleanliness and function.

2. If tempered water is to be used in the cooling cycle of the molds, all hose connections will be made at the appropriate water stations, and the molds will be checked for proper water flow and leaks. Evidence of obstructed water flow or leaks will be reported to the Casting Crew Leader.

VI. B. (continued)

3. Molds that do not use tempered water in the cooling cycles may be preheated in the walk-in ovens to a temperature not to exceed 100°C.

4. The inner surfaces of the molds will be coated with a thin layer of mold release compound.

5. In overcasting operations, the material to be overcast may be wiped with acetone before being preheated in the walk-in ovens. The preheating temperature will not exceed 70°C.

* 6. A cardboard box will be placed under the pouring spout of the kettle. Paper insulating material may also be used to absorb HE drippings. The box, bag, or insulating material must be positioned so that dripping molten explosives will be caught in the box.

* 7. The molten explosives will be poured from the kettle into hard rubber buckets that have been preheated to reduce heat loss. The buckets will be manually carried to the mold for pouring. The buckets must never be filled more than three-fourths of their capacity.

* 8. Before and during the course of a pour, a viscosity test with an Efflux viscometer may be run.

* 9. Pouring troughs may be used as an aid in filling the molds in cases where the shape of the mold is such that air entrapment is likely.

* 10. Care must be used to minimize spillage and dripping of explosives during pouring operations.

* 11. After the molds have been filled, the freezing cycle may be started as specified in the CI.

C. <u>Stripping</u>

1. Upon completion of the freezing cycle, the castings will be stripped from the molds.

2. Castings that weigh under 50 lbs. may be lifted from the molds by hand. Castings that weigh 50 lbs. or more will be lifted with the aid of mechanical devices.

3. The castings will be placed in approved shipping boxes with Kimpak and moved to Building TA-16-303.

# OPERATION OF MACHINE TOOLS

## I. SCOPE

This SOP governs the use of machine tools. Special instructions when required for specific operations will be given in SMIs.

## II. LOCATION

HE machining bays, Building TA-16-260

## III. LIMITS

A. Personnel

See Group WX-3 SOP 8.2.0

B. Explosives

See WX-3 SOP 8.3.0

## IV. ALLOWABLE EXPLOSIVES

A. Established Explosives

1. Operator-Attended Machining

Any of the explosives listed below, or combinations of them, may be machined with an operator in attendance. The use of coolant is required.

| | |
|---|---|
| Baratol (see Note 1) | TATB or TATB formulations of which TATB is the only explosive component (see Note 1) |
| Boracitol (see Note 1) | |
| Composition B and B-3 | |
| 75/25 Cyclotol | |
| TNT | PBX 9502 |
| Octol (with no more than 75% HMX) | |

Note 1: When these explosives are to be machined dry, they shall be machined in accordance with WX-3 SOP 8.8.0.

*Indicates change

Atch 8

IV. A.

2. Remotely Controlled Machining

Any of the explosives listed below, or any combinations of them, shall be machined by remote control. The use of coolant is required, except as noted.

| | | |
|---|---|---|
| XTX 8003 | PBX 9206 | LX-04 |
| PBX 9001 | PBX 9401 | DATB |
| PBX 9007 | PBX 9404 | NQ (See Note 1) |
| PBX 9010 | PBX 9405 | RDX (See Note 2) |
| PBX 9011 | PBX 9407 | Detasheet C and D |
| PBX 9205 | PBX 9501 | Composition A-3 |
| | PBX 9503 | Pentolite |
| | | Tritonal |

Note 1: If NQ (or NQ formulations of which NQ is the only explosive component) is to be machined dry, it shall be machined in accordance with WX-3 SOP 8.8.0.

Note 2: To be machined in accordance with WX-3 SOP 8.9.4.

B. Developmental Explosives

Materials bearing an experimental code number, a four-digit number prefixed by the letter X, have been approved for development and may be processed, but only to the extent permitted by the associated High Explosives Development proposal (HED). Developmental explosives, their weight limits, and associated HED numbers are listed in WX-3 SOP 1.1.0, Table 2.

* C. Any barium containing material requiring coolant shall be processed using dry sump procedures as stated in SOP 8.4.0.

V. <u>ALLOWABLE EXPLOSIVE-INERT COMPOSITES</u>

A. Explosive-Inert Composites

1. Operator-Attended Machining

Any combination of the established explosives in Item IV.A.1, above, may be machined as a composite with the following inert materials by operator-attended procedures. Coolant requirements are defined in Item VII.E, below.

V. A. 1.

Foamed plastics
Solid plastics
Plastics filled with inerts listed here
Adhesives
Graphite
Calcium sulfate casting powder
Inert HE mockup materials
Fiberglass

2. Remotely Controlled Machining

Any combination of the allowable explosives described in Item IV and inert materials described in V.A.1 above, may be machined with the following metals but only by remote control.

Aluminum and its alloys
Copper
Constantan
Lead
Tantalum and its alloys
Tungsten and its alloys
Steel

3. Tu/Nb Composites

All combinations of HE and Tu/Nb shall be machined in accordance with SOP 8.9.3.

4. Coolant Requirements

* Coolant requirements are specified in Item VII.E of this SOP. Special restrictions for barium containing materials also apply (reference SOP 8.4.0).

VI. EQUIPMENT

A. Machine Tools

Those machine tools designed or modified for machining HE.

B. Ancillary Equipment

Approved equipment as defined in WX-3 SOP 8.4.0.

ROUGH DRAFT

VI.

C. Process Tooling

Process tooling includes cutting tools, cutting tool holders, cams, numerical control tapes, CNC programs, holding fixtures, handling equipment, and special machine tool equipment. All process tools that are identified and maintained on running inventory lists by drawing, sketch, or stock number are approved to be used in Building 260. These lists are maintained by the HE Machining (HEM) Unit Leader of the Fabrication Section. Approved NC tapes are listed on a tape status report, which is maintained by the Group WX-12 Design Drafting Services (DDS) Section.

D. Prescribed Process Tooling

Prescribed process tooling is approved tooling that is called out on a process drawing or process sheet for a specific operation.

VII. PROCEDURES

A. Personnel

1. Technicians who perform HE machining shall be trained in the operation of machine tools by the HEM Technical Supervisor, or a designated qualified HE Machinist.

2. Each technician is responsible for using good machine shop practices to prevent damage in the operation of machine tools.

B. Maintenance

1. The Technical Supervisor is responsible for establishing procedures to ensure that machine tools are properly cleaned of machining waste and that approved rust preventive methods are followed to minimize deterioration of precision surfaces.

VII. B.

2. Difficulties and malfunctions experienced in the operation of machine tools, interlocks, or related controls shall be reported to the Technical Supervisor as specified in WX-3 SOP 1.0.6.

3. A documented, regularly scheduled preventive maintenance program will be conducted on all machine tools in HEM. This will include both electronic and mechanical maintenance.

4. Both scheduled and unscheduled maintenance work on machine tools and controls shall be performed only by personnel in the WX-12 Plant and Equipment Services, Instrumentation (INST), and Machine Maintenance (MM) Units, or those authorized by them.

5. INST and MM personnel shall inform the HEM Technical Supervisor before beginning maintenance activities on machine tools or controls.

6. An appropriate out of order sign shall be displayed by INST and MM personnel to mark equipment under repair.

C. Machining Parameters

Machining rates and depth of cut on HE and HE-inert composites shall be prescribed by process drawings or specific SOPs and shall not exceed the following:

1. Feed Rate

a. The maximum feed rate for a single-point tool shall be 0.015 in. per revolution of the tool or work-piece.

b. The maximum feed rate for drilling, as prescribed in WX-3 SOP 8.8.1, shall be 0.015 in. per revolution of the tool.

c. The maximum feed rate for a rotating cutter having multiple cutting edges, such as mills and slab mills, shall be 0.015 in., plus 0.005 in. for each additional flute, but shall not exceed 0.035 in. per revolution.

d. The maximum feed rate for sawing is prescribed in WX-3 SOP 8.9.0.

VII. C.

2. Spindle Speed

The maximum spindle speed of a cutter or workpiece shall be 500 rpm.

3. Cutting Rate

The maximum cutting rate shall be 210 surface feet per minute.

4. Depth of Cut

a. The maximum depth of cut by a single-point turning tool on a rotating workpiece shall be 1/2-inch.

b. The maximum depth of a cut by a single- or multiple flute rotating cutter depends upon many factors, including tooling, fixturing, shape, and machinability of the HE. Process drawings shall prescribe the maximum depth of cut for a specific operation involving the use of these cutters.

D. The Use of Scanner Plots with NC Lathes

The use of scanner plots for HE contouring operations on NC lathes shall conform to the guidelines listed below:

1. The Use of Scanner Plots For Remote Control Operations

a. During remote machining operations, a scanner plot should be used to interlock the programmed tool path and machine movements.

b. If a tool-force detector is not in use, then a scanner plot shall be used for all HE remote control contouring operations.

2. Scanner Plots for Operator-Attended HE Contouring Operations on NC Lathes

A scanner plot should be used on NC lathes during operator attended HE contouring operations.

VII.

E. Use of Coolant

1. A flow of tempered water sufficient to keep the cutting face wet and to flush away chips shall be directed at the interface of the cutter and workpiece. Tempered water is defined in WX-3 SOP 8.6.0.

2. Water shall be used on established explosive-inert composites when the HE portion is included in the cut.

3. When specified on process drawings, a spray mist of air and water may be used on established explosive inert composites if the HE portion is not included in the cut.

4. When specified by SMIs, dry machining may be performed on established explosive-inert (nonmetal) composites if the HE portion is not included in the cut.

5. Water shall be used on developmental explosive-inert composites unless SMIs specify spray mist or dry machining.

* 6. When water is used with barium containing materials (HE or inert), dry sump procedures as stated in SOP 8.4.0 shall be used.

F. Remotely Controlled Machining

1. The keys to the remote control locks will be issued from the tool crib when an operator is assigned to a job requiring remote control.

2. Each person who operates the remote controls of a machine shall have the following responsibilities:

   a. The remote controls shall be locked OFF and the key removed whenever the controls are not attended.

   b. Before startup, the machine shall be checked for possible interference between stationary and moving components, including workpiece and equipment, so that no damage can occur when the machine is turned on.

ROUGH DRAFT

VII. F. 2.

c. Personnel shall be cleared from both bays of a bay pair and the blast door closed to the entrance corridor of the bays before a remotely controlled operation is started.

G. Concurrent Operations

Concurrent operator-attended HE machining operations shall not be permitted in the same bay. They are permitted within the same bay pair.

# ANCILLARY EQUIPMENT

## I. SCOPE

This SOP governs ancillary equipment used in conjunction with machining operations performed by HE Machining Unit of the Fabrication Section.

## II. LOCATION

Building TA-16-260, Bays 3 through 25; and Buildings TA-16-261 and 263

## III. LIMITS

### A. Personnel

See Group WX-3 SOP 8.2.0

### B. Explosives

See Group WX-3 SOP 8.3.0

## IV. DUST COLLECTOR

* A portable, wet-type, HE dust collector may be used to collect dust during dry machining of HE or inert materials. Operating and cleaning instructions for the dust collector are given in WX-3 SOP 1.11.2. When barium-containing mock or HE materials are processed, the operating water (10-15 gal.) should be dumped into a barium process sump.

## V. VACUUM TRAPS

Vacuum traps prevent the entrance of HE into the building vacuum system. Detailed operating procedures for vacuum traps are given in WX-3 SOP 8.4.5.

## VI. COOLANT INTERLOCKS AND JET PULSERS

A. Coolant flow control valves in each bay will be set by operators to provide the flow of tempered water needed during machining operations. The flow control is interlocked and will shut off the machine tool if the water flow drops below the flow rate setting.

*Indicates Changes

Atch 9

VI. (continued)

B. Jet Pulsers

1. Jet pulsers are used to force coolant at approximately 300 psi through coolant passages in the drill. The HE machinist must carefully observe the water flow and be particularly observant when using small drills.

2. The flow control meters may be bypassed when the jet pulser is in use.

VII. PARTS CLEANING TANK

The use of the parts cleaning tank is defined in WX-3 SOP 8.4.8.

VIII. SURFACE PLATES

A. The granite surface plates on movable tables used for inspection in the bays must be located where they will not interfere with operations or obstruct exit routes from the bays.

B. The wheels must be locked to prevent movement whenever an HE workpiece is on the surface plate.

IX. TOOL CARTS

A. HE must not be placed on tool carts.

B. Tool carts must be positioned in the bay so they will not interfere with operations or obstruct exit routes from the bay.

C. Each operator must be responsible for keeping his tool cart, tool boxes, and tools free of HE.

X. AIR HOSE REEL

The air hose reel in each bay must be equipped with a safety nozzle only. With this type of nozzle, a line pressure up to 90 psi may be used.

## XI. SETTLING BASINS

### A. Normal Operations (Non-barium Containing Materials)

* 1. The HE settling basins located outside the building on the roadway collect machining waste that flows from the machine tools to the gutters in the bays. The settling basins are serviced in accordance with WX-3 SOP 12.1.2.

* 2. Waste materials that will not readily flow from the wet pan on the machine tool into the settling basin wire basket must be collected by the operator and placed in plastic bags and cardboard boxes for disposal. Disposal procedures must be in accordance with WX-3 SOP 12.1.2.

* 3. Auxiliary settling basins lined with cloth filter bags must be used for collecting machining chips for reprocessing. Materials will be handled in accordance with WX-3 SOP 8.1.0 XI.H.5.

* B. Operations with Materials Containing Barium

* 1. When materials containing barium are being processed a dry sump (settling basin) procedure will be followed. Before operations begin the building should assure the sump is dry. If a significant quantity of fluid is in the sump the Disposal Supervisor should be notified.

* 2. Barium containing materials will normally be processed dry, however, some operations may require a coolant. In any event, subsequent cleaning will require some water. The operation or clean-up may proceed until the sump indicator light signifies that the 2/3's level of the output portion of the sump has been reached. At this point the operation or cleanup shall cease and the Disposal Supervisor shall be notified.

* 3. Operations or cleanup requiring water may not continue until the sump has been treated and drained.

## XII. TELEVISION SYSTEM

The closed circuit television in each bay must be used to monitor remotely controlled machining operations.

## XIII. INTERCOM SYSTEM

The intercom system between a remote operating cubicle and operating bay must be used to monitor operating sounds during remotely controlled machining operations.