

ERICKSON INCORPORATED



Supplier Tooling Manual

TSM-2

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CONTROLLED AND APPROVED BY:

The Erickson Incorporated Supplier Tooling Manual has been compiled, illustrated and edited by Tool Engineering and Manufacturing Engineering groups. Technical and logistical data has been coordinated with Manufacturing production operations, Materials group, and Quality.

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REVISION HISTORY			
Page	Remarks	Date	Rev
8,9,23,25,26,27	ADDED: Added requirements for entering V suffix between tool number and code.	10/20/2011	A
	REVISED: Figure 9.1, CN3; Figure 9.2, 9.4, 9.5, 9.6, 9.7 9.8.		
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See remarks for affected pages & table of contents for section locations.	ADDED: Section 4.3 Declaration of Excess Section 13.0 Supplier Tooling Audit UPDATED: Section 4.1 Records Table 9.1 Tool Codes & Definitions REVISED: Corrected minor spelling/grammar typos. Erickson Air-Crane references to Erickson Incorporated	10/10/2024	C

1.0 INTRODUCTION

This manual establishes and defines the requirements to Erickson Incorporated (EAC) suppliers and their sub tier suppliers for the control, maintenance, loss, transfer, documentation, acceptance, and identification of tools produced to support manufactured contracted or subcontracted parts. It further establishes requirements to document and maintain tooling furnished by EAC to a supplier or sub-tier supplier.

1.1 POLICY

The supplier shall comply with all provisions of this manual unless otherwise stated in purchasing documents. Exceptions will be documented on the purchasing documents as agreed by the EAC purchasing representative and the supplier.

2.0 DEFINITIONS

2.1 SUPPLIER PRODUCED TOOLING

Supplier produced tooling is defined as specific tooling items particular to the manufacture of EAC contracted or subcontracted parts made to the supplier's design or specifications, such as but not limited to, Assembly Tooling, Locating Tools, Templates, Blocks, Dies, etc., described herein. However, it does not include facilities, machinery, test equipment (except as particular to the product and specifically authorized by PO), shop aids, and/or perishable tools, such as drills, cutters, saws, tools acquired prior to contract, or other non-accountable tools. Supplier produced tooling must be such that they will maintain quality through a normal production run.

2.2 EAC FURNISHED TOOLING

EAC Tooling shipped to a supplier to produce a production part or assembly. These tools are manufactured per the Erickson Tool Standards Manual (TSM) or to an Erickson tool design drawing or may be owned by an EAC customer. EAC furnished tools are not to be altered or reworked unless authorized by EAC.

2.2.1 Master Tooling

If EAC furnishes master control tooling for control of production tools used for interchangeable items such as hole patterns, end of part, hinge points, etc., it shall be understood that EAC is responsible for accuracy of the furnished master tooling.

2.2.2 Production Tooling

Production tools furnished by EAC will have been visually inspected prior to shipment. Supplier use of such tooling is often on different equipment, or by different methods and processes than at EAC. Therefore, it is suggested that the supplier run a first part inspection to check the tool prior to a production run.

2.3 GENERAL DEFINITIONS

DUPLICATE TOOL

A tool identical to an existing tool used for rate purposes, or multi-capacity machines. Duplicate tools are used to perform the identical function as the original tool.

INTERCHANGEABLE

Interchangeable items shall be capable of being readily installed, removed, or replaced without alteration, misalignment, or damage to items being installed or to adjoining items or structure (ref MIL-I-8500).

MULTIPLE USE TOOL

Tools that are used to make multiple dash numbers other than that contained in the tool identification.

MISCELLANEOUS TOOL

Miscellaneous tools are those that cannot be categorized with a specific tool code.

NON-ACCOUNTABLE TOOL

The following are considered non-accountable tools and do not require acceptance or documentation by EAC: Shop equipment, Shop Aid (Industry Practice), Machine Control Media, Perishable / Expendable tools.

PERIODIC INSPECTION

A system involving re-inspection of special tooling at regulated intervals to ensure accuracy for product control.

PRODUCT ACCEPTANCE TOOL

A tool that is used to control or as a media of inspection to verify compliance to engineering requirements.

SEQUENCE/SERIES TOOLS

Similar tool types, having the same tool number and tool code performing different operations or stages of an operation. A tools progressive (or series) number is determined by the sequential position in which a tool is used.

SHOP AIDS

Shop Aids are simple time and labor-saving devices made by the manufacturing shops. Shops Aids are not charged as a direct item of cost, do not qualify as tooling and are not accountable. Shop Aids will be handled in accordance with supplier quality requirements.

SUPPLIER

This term refers to the entity for which EAC is under purchase order agreement to provide products and services.

SPECIAL TOOLING

Special Tooling is a tool defined as having been designed and/or produced to perform a specific function in the manufacturing, assembly or installation of a specific part number. Some examples include Jigs, Dies, Fixtures, Molds, Patterns and Gages.

STANDARD TOOLING

Standard Tooling is defined as general use tools developed to support production that are intended for a variety of applications. Their use is not restricted to a specific part number or family. Some examples include bucking bars, rivet sets, nut plate drill guides, wrenches, hand tools, measuring instruments, catalogue items, etc.

TOOL CODE

The alphabetic abbreviation of the tool name, i.e. "WF" for Weld Fixture; "FB" for Form Block, etc., as defined in Section 9.1 of this manual.

TOOL PROVE

The planned process that demonstrates the tool and associated manufacturing processes produce parts to engineering drawing and specification requirements.

STRF ORIGINAL, CHANGE AND TOOL ACCEPTANCE LIST FORM

The Supplier Tool Request Form (STRF) is EAC form number 0178 that the supplier completes when submitting the original tool proposal. This form is also used as a "Change" STRF form when submitting changes to the original proposal and then as the "Tool Acceptance List" STRF for documenting tools that have made an acceptable production part.

3.0 TOOL OWNERSHIP & REIMBURSABLE TOOLING COSTS**3.1 TOOL OWNERSHIP**

All tooling as defined in Paragraph 2.1 produced or acquired by a supplier or sub tier supplier on behalf of an EAC purchase order or contract will be the property of EAC. These tools will be itemized and identified as separate line items on the PO.

3.2 REIMBURSABLE TOOLING COSTS

EAC does not intend to own, purchase, or take possession of supplier tools which are usable for production of items other than EAC contracted or subtracted parts, tooling not used on conventional equipment, or by methods not generally accepted by industry. Such tools shall be provided at the suppliers cost and identified as the supplier's property.

EAC will not pay for tools producing standard Military Specification hardware, seals, etc.... as "Tooling". If setup charges are required for these items, it will be quoted separately from item cost, and will be treated as a nonrecurring charge.

4.0 CONTROL OF EAC TOOLING**4.1 RECORDS**

Supplier shall be required to maintain records of all suppliers produced and EAC furnished tooling that shall include:

- A. Tool number and Description
- B. Storage and Current Locations
- C. The purchase order and cost under which tooling was acquired or produced for.
- D. EAC packing sheet on which tool was received (for furnished tools only).
- E. Manufacturer and Owner of Tooling
- F. Service date (Initial date tool is created/received)

4.2 TOOL USAGE

Suppliers shall not use tooling manufactured for or furnished by EAC for purposes other than requirements under an EAC purchase order.

4.3 DELCARATION OF EXCESS

Any Erickson Owned or Customer Owned (Bell/Sikorsky tooling checked out to Erickson) tooling may be identified as unneeded and returned to Erickson to reduce cost of maintaining and inventorying of our suppliers and to relieve our suppliers of unnecessary exposure to risk of loss and audits.

Tooling is determined as excess or idle when records do not show any usage or transactions in the past 24 months. A review for unneeded, excess, or idle property will occur during a suppliers tooling audit report (see section 13.0) by Erickson Tooling Department.

Tooling declared as excess shall follow Section 7.0 Transfer of Tooling.

5.0 INVENTORY, STORAGE AND MAINTENANCE

5.1 INVENTORY

Supplier must maintain an inventory list of all Erickson Owned or Customer Owned (Bell/Sikorsky tooling checked out to Erickson) tooling and must be prepared to supply the list per Section 13.0.

5.2 STORAGE AND MAINTENANCE

The supplier is responsible for providing proper storage for all EAC owned tooling. Corrosion prevention methods must be used to ensure tool surfaces are free of rust. The supplier is expected to maintain and store the tool in a manner to protect it from the elements and damage beyond normal wear and tear.

5.2.1 Storage and Maintenance of Tools Subcontracted by Primary Supplier

The primary supplier must ensure that any EAC tooling passed to subcontractors is preserved, stored, and maintained in manner consistent with this document.

6.0 TOOL LOSS AND DAMAGE

6.1 ASSUMED RISK

Unless otherwise stated in purchase order, the supplier assumes all risk of loss and damage to EAC owned tooling while in the supplier's possession or control. The supplier shall be responsible for cost of repair or replacement of EAC owned tools, which are damaged, lost, or misused while in the possession of the supplier.

7.0 TRANSFER OF TOOLING

7.1 TOOLS REQUIRING TRANSFER

All EAC tooling including both EAC furnished tooling and tooling made by a supplier must be available for transfer upon request by EAC, within a reasonable period of time. Tool transfer requests will include a Tool Shipping Authority document (EAC form 0177). This document will indicate were the tool(s) is/are to be shipped and provide any special shipping instructions. The supplier will assist with the transfer by preparing the tool(s) for shipment. Tools shall be properly protected and secured to prevent shipping damage prior to transfer. Suppliers will be held responsible for tool damages incurred due to improper packing. Crating and shipping costs under such requests will be paid by EAC.

8.0 DOCUMENTATION

8.1 SUBMITTAL OF QUOTATIONS FOR TOOLING

When a supplier returns a proposal to build production parts requiring supplier produced production tooling, the supplier will submit a proposed list of production tools using EAC furnished STRF form. This form will auto generate a tool number and description based on the tool code and name listed found in table 9.1. This also includes part number(s) used on, price and functions and description of the tool. Instructions are provided on the form. The STRF original quote type STRF will be representative of the best estimate of tool requirements and estimated tool price. EAC Tool Engineering will evaluate the STRF for reasonable price and evaluation of existing tools that may be available to the supplier to manufacture the parts. Items such as destructive testing, x-ray, setup charges, qualifications testing, heat treatment, dimensional checks and shipping costs related to the production part are not to be included on tooling STRFs. Costs for such items are to be placed against costs of the production part. EAC will require any design data (CAD, Dwgs, etc..) used in the creation of an EAC owned tool to be provided to EAC at acceptance of first article part.

Note: The price for tools submitted on the STRF, when approved by EAC, represents the "Not to Exceed Cost". Any alterations, affecting cost, to tools after EAC approval will need to be submitted on a "change" STRF.

9.0 SUPPLIER TOOLING ACCEPTANCE REQUIREMENTS

9.1 Supplier Produced Tool Acceptance

Supplier tool inspection is the responsibility of the supplier, for certifying conformance to tool designs and / or engineering production part requirements. The supplier tool inspection will indicate acceptance of a tool by application of an inspection stamp in an area near the tool identification. When requested, the tool inspection procedure used by the supplier may be reviewed by EAC quality department. If requested the supplier shall provide the following (but not limited to): tool inspection record, physical tool, production part first article report, and any process certifications.

Suppliers will remake or rework tools at their own expense if a first article part or production part does not conform to engineering drawing requirements due to an unsatisfactory tool condition.

9.2 Payments for Supplier Produced Tools

Payment for an invoice for supplier produced tooling supporting a production part purchase order can only be made after the supplier submits the tool acceptance type STRF, the required tool documentation, and an acceptable first article production part has been produced. Exceptions can be made as required for high value tooling as follows:

- A. 35% of Not to Exceed Value - After design completion.
- B. 50% of Not to Exceed Value- At completion of tool.
- C. Balance of Actual - at Qualification / First Article Part.

9.3 Periodic Tool Validation

When an EAC furnished or supplier produced Product Acceptance Tool is used as a media of inspection, the supplier is responsible to implement a periodic inspection system that will verify continued conformity of parts produced by the tool and which assures early detection and correction of unsatisfactory tool conditions. This system should include the following:

- A. Database containing tool number, date of last inspection, and next inspection.
- B. Records documenting inspection results.
- C. Tool identified with a sticker or label indicating when last inspected and next due date.

9.4 TOOLS REQUIRING DOCUMENTATION

EAC may require specific tools manufactured by suppliers to carry a tool design drawing or tool design sketch. Some of these designs may also require EACs review and approval prior to the tool build.

Tools require drawing/sketches when:

- A. Requested by purchase order.
- B. Tool will be used as a "Product Acceptance Tool" (media of inspection). See "Product Acceptance Tool" definition in Section 2.3.

Tool designs require review and approval by Erickson Tooling Department when:

- A. Requested by purchase order.
- B. Product Acceptance Tool that controls interchangeability with mating components/tools.

9.4.1 Tool Photograph Requirements

All physical tooling will require the supplier to submit clear color photographs to EAC buyer along with the tool acceptance type STRF even if a tool design is furnished. The quantity and quality must be sufficient to clearly identify tool features and tool identification. Pictures may be conventional or digital meeting the following criteria:

- Conventional photos – 35 mm or larger 5 x 7 minimum thru 8 x 10 maximum.
- Digital photos – 1024 x 768 pixels or greater, .JPG format.

9.4.2 Tool Designs

When a tool design is required from the supplier, the drawing must conform to good tool design practices and provide all of the necessary information to produce, inspect, and re-make the tool, as well as determine whether the tool will meet the necessary tolerances to produce acceptable production parts and/or assemblies. All tool dimensions affecting production part features must reflect an allowable tolerance and should be based on a percentage of the production part tolerance. The design drawing should also include a basic parts list describing the material type used in tool construction.

Designs furnished on paper should utilize ANSI standard sheet sizes (A thru E) or roll size (J). When possible (if legible, yet not congested) utilize standard paper size formats 8.5 x 11(A), 8.5 x 17 (B), or 11 x 17 (C).

9.4.3 Tool Sketch

Where a sketch is used to document a tool, the sketch may be a freehand drawing, but still requires tool tolerances and a parts list describing materials used in tool construction and Tool Design Approval

Supplier shall provide one copy of the tool design for approval. This will be returned to the supplier indicating approval, or in the case of disapproval will indicate the necessary changes. EAC Tool Engineering (TE) shall perform tool design reviews and approval. Designs will be reviewed for function, stability, accuracy and tolerance points of interchangeability, and reference system used for alignment.

After a tool design has been approved by EAC, the supplier will be permitted to change designs to improve or facilitate tool usage at no cost to EAC. They may deviate from the tool drawing to correct minor errors in design calculations, clearances, etc. that do not affect fit, form, or basic function of the tool. These improvements or deviations do not require EAC approval. However, the supplier will be required to keep the tool design drawings up to date at all times.

Interchangeability requirements between supplier and sub-tier supplier purchased assemblies are wholly the responsibility of the supplier, unless otherwise specified by EAC purchase order.

9.4.4 Tool Documentation General

Tool designs, sketches and photographs will be identified with the complete tool number they document. Photographs must show a legible tool number or have text added to the picture to document the complete tool number, using the tool number as the file name is desired but does not fulfill this requirement.

10.0 TOOL IDENTIFICATION

10.1 TOOL IDENTIFICATION GENERAL REQUIREMENTS

Erickson Incorporated tool number identification markings shall be shown on all inventories, shipping documents, invoices and other records relating to the tool.

Suppliers having an established system of tool identification may use their system as well as the Erickson Incorporated system as long as the markings of the supplier's system are identified as such. If Supplier uses its own system in addition to the EAC system, Supplier must cross reference each item of special tooling with the Supplier's and EAC tool identification.

The Erickson Tool identification system consists of a tool identifier that is prefixed and suffixed to the engineering part number or assembly number as shown in FIGURE 9.1.

When two or more tools are assigned the same tool number and code letters to perform successive operations the tools will be identified by sequence use, as shown in FIGURE 9.1.

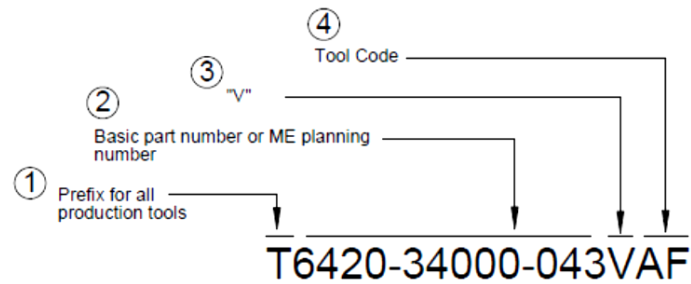
Number suffixes will be used to identify tool duplications as shown in FIGURE 9.1.

When a tool is composed of more than one component or detail, each detail will be identified. This is explained in more detail in section 10.5.1.2.

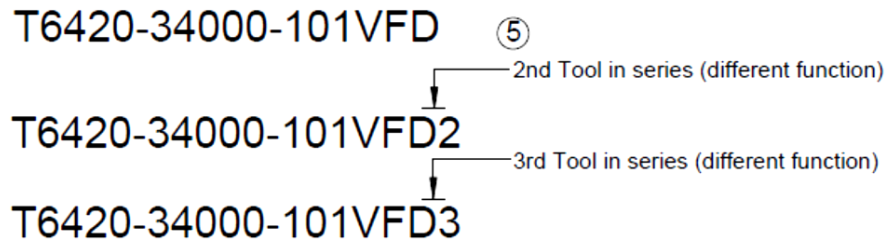
Tools shall indicate as to what part engineering revision that they were produced against.

10.2 TOOL NUMBERS

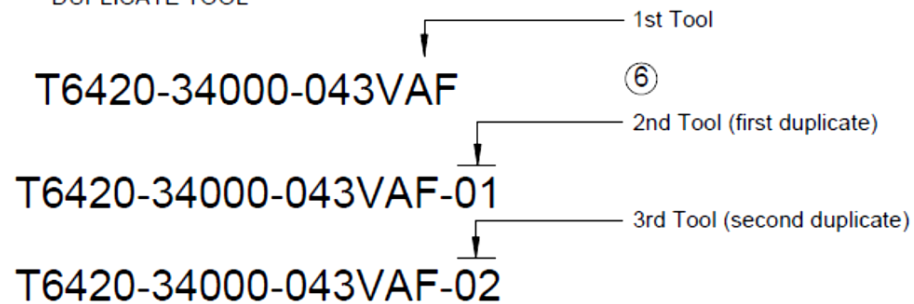
Tool numbers are assigned as shown on FIGURE 9.1



EXAMPLE:
TOOL STRING (TOOL IN SERIES)



EXAMPLE:
DUPLICATE TOOL



EXAMPLE:
TOOL IN SERIES AND DUPLICATE TOOL

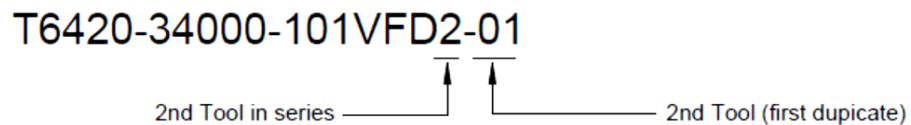


FIGURE 9.1 – TOOL NUMBERS

CN1 Prefix: "T" shall be used on all production tools.

CN2 Part Number: This number identifies the engineering drawing number or assigned ME planning number of the part or assembly for which the tool is used.

Part Number Selection NOTE: Where a tool is used to make both a left-hand part and right-hand part it is preferred that the left-hand number is used. It is also preferred that the tool is assigned the lowest detail number it makes, e.g. if a tool make a -101, -107, -109 use -101.

Attention should also be given to what level the tool is used on the part. This can be either at the detail or assembly level. Example: If a -101 detail is used in a -043 assembly and a 'hole pattern' specified on the engineering drawing for the -101 angle, and the hole is being drilled at the detail level, use the -101 number for the tool. If the 'hole pattern' in the -101 is planned to be drilled at the -043 assembly level, then the -043 number should be used for the tool.

CN3 V: To differentiate between tools produced at EAC and tooling produced by suppliers in support of production part purchase orders, the letter "V" will be placed between the part number and tool code.

CN4 Tool Code: Tool code letters indicating description of tool.

CN5 Use Sequence: Number identifies sequence in a tool string (tool series). This establishes the second, third, etc., tool of a different function needed to make a part.

CN6 Duplicate or Identical Tools: Are identified on the tool with a duplication (serial number) rather than the word "duplicate" with -01 for the 2nd Tool (first duplicate). The 3rd tool (second duplicate) would be indicated by -02, -03 for the 4th, -04 for the fifth, etc.

NOTE: When only one (1) tool is manufactured, it shall be understood that no duplication or sequence identification is required on the tool or records.

10.3 TOOL CODES

To ensure the proper ordering and identifying of tools, a detailed explanation of each tool, its use, and tool code in the form of a two or more-letter suffix has been prepared in the following tool code table.

TABLE 9.1 – TOOL CODES AND DEFINITIONS

TOOL NAME	CODE	TOOL DEFINITION
ASSEMBLY TOOLS		
ASSEMBLY DRILL JIG	ADJ	Holds parts or sub-assemblies in correct relationship for a drilling operation; also provides bushings or other guides for cutting tools.
ASSEMBLY FIXTURE	AF	Holds parts or sub-assemblies in correct relationship for assembly, but does not provide tool guides for drilling, routing, and other machining operations.
ASSEMBLY FIXTURE ACCESSORY	AFA	Removable parts of an assembly fixture such as production part locators used in duplicate fixtures or in succeeding operation fixtures for the purpose of duplicating the location of a part in each fixture.
ASSEMBLY JIG	AJ	Holds parts or sub-assemblies in correct relationship for assembly; also provides means of guiding tools for drilling, reaming, routing, etc.
ASSEMBLY JIG ACCESSORY	AJA	Removable parts of a jig, such as, production part locators used in duplicate jigs or in succeeding operations for the purpose of duplicating the location of a part in each jig.
BRAZE JIG	BJ	Holds parts in position for brazing operation.
DRILL FIXTURE	DF	Holds parts in correct position for drilling operations.
DRILL JIG	DJ	Holds parts in correct position for drilling operations, also provides bushing or other guides for cutting tools.
DRILL PLATE	DRP	Flat plate with locators having correctly located bushings to guide cutting tools for drilling operations.
FLOOR ASSEMBLY DRILL JIG	FADJ	Floor mounted tool that holds parts and sub-assemblies in correct relationship for drilling operations. May also provide guides for other cutting tools.
FLOOR ASSEMBLY FIXTURE	FAF	Floor mounted tool that holds parts or sub-assemblies in correct relationship for assembly but does not provide tool guides for machining and drilling operations.
LOCATING JIG	LJ	Holds or locates parts in correct position for assembly operations.
RIGGING FIXTURE	RF	Used to aid in assembly and rigging operations.
RIVETING JIG	RJ	Holds parts or sub-assemblies during riveting operations. Tool does not locate parts or provide drill or cutter guides.
RESISTANCE WELD JIG	RWJ	Holds parts for resistance and induction welding parts. Includes electrodes and coils.
SUB-ASSEMBLY JIG	SAJ	Holds parts in correct relationship for assembly and provides means of guiding tools for drilling, reaming, routing, etc.

SPINNING OR STAKING TOOL	STT	Used to stake bearing or bushings.
SPECIAL WRENCH	SW	Use when wrench is peculiar to one part and cannot be used elsewhere.
SPOT WELD FIXTURE	SWF	Holds parts in position for spot welding.
SPOT WELD JIG	SWJ	Holds parts in position and provides a guide for welding electrodes.
WELD DRILL JIG	WDJ	Holds parts in position for welding and drilling operations and provides guides for the cutting and welding tools.
WELD FIXTURE	WF	Holds parts in position for welding.
WELD & TRIM FIXTURE	WTF	Holds parts in position for welding and trimming operation
BOND TOOLS		
BONDING APPLY FIXTURE	BAF	Holds parts in correct location in relation to a larger part or assembly during bonding.
BOND FIXTURE	BF	Holds parts or assemblies in their proper relationship for bonding operations
BONDING TOOL CONTOURED	BNT	Holds parts in correct contour and position for forming and bonding.
COMPUTER GENERATED		
CAD DEVELOPED LAYOUT TEMPLATE	CDLT	A CAD developed flat pattern of a part which includes the outline, bend information and location of holes. It may also include other necessary information need to manufacture the part (may be Mylar or Physical)
CAD GEOMETRY NON-PHYSICAL TEMPLATE	CGNT	A CAD developed template used for transferring an electronic dataset (i.e. CAD to CNC)
DIGITAL MASTER	DM	A CAD developed digital configuration control used to check or manufacture production tools.
MODEL DATA SHEET	MDS	Used in conjunction with other codes: A supplemental sheet for a 3D part model containing information such as notes, tolerances, identification location, etc.
DIES		
CASTING DIE	CD	Permanent mold for making production castings from molten metal, see also MEM.
EXTRUSION DIE	ED	Die used in an extrusion press or rolls for extruding intricately shaped sections of material.
FORM DIE	FD	Consists of a punch and die whose shape is directly reproduced on the work, principally by bending action.
FLATTENING DIE	FLD	A flat surfaced anvil and punch used to flatten metal parts in a power press.
FORGING DIE	FRD	Die or mold used for forging aluminum or other metals.
SWAGE DIE	SWD	A press operated closing die for such operations as cable terminal swaging or hydraulic hose coupling attachment.
TUBE BENDING DIE	TBD	Die about which a tube is bent.
TUBE CLAMP DIE	TCD	Tool to clamp tubing against bending die while forming the tube.
ELECTRICAL TOOLS		

ELECTRICAL INSPECTION FIXTURE	ELIF	Fixture to hold a part or assembly for checking electrical function, continuity, etc. Fixture will usually contain wiring, connectors, instrumentation, etc., as required.
ELECTRICAL INSPECTION GAGE	ELIG	A mobile tool for checking electrical function, continuity, etc., of a part or assembly. Gage will usually contain connectors, wiring, instrumentation, etc., as required.
WIRE HARNESS BOARD	WIR	A board or Mylar having a symbolic diagram shown on its surface simulating the wiring of aircraft circuits.
EQUIPMENT		
MECHANICAL EQUIPMENT	ME	Specific mechanical equipment designed and/or manufactured for specific applications such as pneumatic, hydraulic, and electrical power sources.
PRESSURE TESTING EQUIPMENT	PTE	Equipment required to pressure test parts or assemblies.
SPECIAL EQUIPMENT	SE	A piece of equipment designed and manufactured for a specific application and not covered by any other tool code.
TEST EQUIPMENT	TE	Any standard equipment manufactured or modified for a specific test on the aircraft or engineer, such as, vibration, sound temperatures, etc.
FIBERGLASS / COMPOSITE /AND MOLDED PARTS		
COMPRESSION MOLD	CM	Closed cavity mold for molding plastic & rubber under heat and pressure.
LAY-UP BLOCK	LUB	Tool used for the lay-up and cure of parts made from composite materials (fiberglass, graphite, Kevlar, etc.)
METAL MOLD	MEM	Metal mold used for casting metals, plastics, etc.
PLASTIC MOLD TOOL	PLM	Used for producing plastic molded parts from low melting, pouring or injection molding.
VACUUM MOLD	VM	Mold used in vacuum forming parts.
GAGES / INSPECTION		
BALANCE TEST ADAPTER	BTA	Accessory tool used in the balancing of flight control surfaces or other balancing requirements.
BALANCE TEST WEIGHT	BTW	A piece of material having the weight equal to the difference in weight of an assembly in which the pivot point is not located at true center. Specified material, configuration, and weight of tool must be defined on tool order.
CONSTRUCTION DRILL PLATE	CDP	Secondary master, made from another master drill plate or gage for tooling coordination.
CHECK FIXTURE	CF	Holds parts or assemblies in position for checking such items as dimensions, angles, hole location, trim, etc.
CHECK GAGE	CKG	Physical medium control for checking extreme limits of production parts or tools.
GAGE STAND	GS	Used primarily to support a gage during tool manufacture and/or periodic inspection.

INSPECTION FIXTURE	IF	Holds parts or assemblies in correct position to check items such as the contour, attach points, hole sizes, location, etc., and is used by the Inspection Department.
INSPECTION GAGE	IG	Physical medium of control to inspect such items as dimensions, contours, angles, hole locations, etc., and is used by the Inspection Department.
MASTER CONTROL GAGE	MCG	Dimensional authority to control the accuracy of a master and supersedes the master gage as the authority. Master controls shall not be duplicated.
MASTER DRILL PLATE	MDP	A master plate used for controlling a critical hole pattern. (Usually ½" or thicker with drill bushing.) Not a template.
MASTER GAGE	MG	Dimensional authority for the construction and control of production tools, establishing relationship between holes, surfaces, and/or contours of a specific part, mating part or assembly.
PLUG GAGE	PG	Cylindrical plug used to check high and/or low limits of holes.
RING GAGE	RG	Cylindrical hole gage to check high and/or low limit of shafts and pins.
SNAP GAGE	SG	"C" frame type tool for checking high and/or low tolerance dimensions on a part.
THREAD GAGE	THG	Gage used to check thread form of internal or external threads.
TRANSFER GAGE	TRG	Used to position one or more gages or separate sections of the same gage with respect to one another.

HANDLING TOOLS

FUSELAGE SUPPORT CRADLE	FSC	Movable stand used to cradle and/or support the fuselage during various assembly operations, usually to provide added support to overhanging structure.
HANDLING TOOL	HAT	Special tooling and accessory used to hold and stabilize parts and assemblies during handling and lifting (do not use for hoisting and lifting tools – use HT).
HOISTING TOOL	HT	Used with or as a part of a crane or other lifting unit for handling airplane assemblies or parts during manufacture.
PROTECTIVE BOX	PB	A metal, wood or fabric box used to protect a fragile part during production operations or transportation.
PROTECTIVE COVER	PC	A metal, wood or fabric cover used to protect a fragile part during production operations or transportation.
SHIPPING CRATE	SC	A container used to house and protect from damage of a part or assembly during handling and shipment.
TRANSPORTATION DOLLY	TRD	A mobile, work-supporting stand used to transport units.
WORK STAND	WKS	Any structure or scaffolding used to support workmen or to provide work surfaces or storage spaces to facilitate work.

MACHINING TOOLS

ADAPTER PLATE	AP	Plate used in conjunction with MFB & MF, or as required.
BORING BAR	BB	A bar used on a boring machine or lathe, supporting one or more tool bits for an internal machining operation.
BORING FIXTURE	BOF	Holds work in correct position for boring operation.

BROACHING FIXTURE	BRF	Holds work in correct position for broaching operations.
CHUCK JAW	CJ	A movable part of a chuck that clamps a part for a machining operation.
FORM TOOL	FT	A cutting tool used in generating a special form or profile.
GRINDING FIXTURE	GF	Used to hold parts in correct position for a grinding operation.
HOLDING FIXTURE	HF	Fixture used to support and/or locate a part in a position for a machining operation but does not provide tool guides.
LATHE ARBOR	LA	An arbor containing centers and is used for locating and clamping a part to be machined on a lathe.
LATHE FIXTURE	LF	Holds work in correct position for turning operation and is fastened to a face plate, held in a chuck, or mounted directly on the spindle of a lathe.
MACHINE EQUIPMENT	MA	An accessory for a machine made or altered for a specific application.
MILL FIXTURE	MF	Holds parts in correct position for a milling operation and provides a means for setting the cutters.
MILL FIXTURE BASE	MFB	Covers riser blocks or sub-base for MF.
MILL FIXTURE CLAMP	MFC	Special clamps used with MF or MFB.
TAPPING FIXTURE	TF	Holds parts in position for tapping operations.
VICE JAWS	VJ	Vise inserts holding parts in position for machining operations and provides a means for setting the cutting tool.

MASTER TOOLS

MASTER MODEL	MM	A series of two or more templates fastened together on a common base to form a skeleton structure. The structure is filled with plastic or plaster. MM is the basic authority for controlling contour on the aircraft.
MASTER PLASTER	MP	A secondary master taken from a splash from the MM and modified as necessary.

MISCELLANEOUS

FORMING MANDREL	FM	Internal tool used to support parts while forming.
FOAM TOOL	FMT	Molds and other tools used in foam tooling applications.
HEAT TREAT FIXTURE	HTF	Used to hold and restrain parts during heat treat operations.
MISCELLANEOUS TOOL	MIT	Tools and equipment used in various operations for which tool codes have not been established. Tool order will carry the actual title of the tool. Do not use when other codes are available.
PLATING EQUIPMENT	PE	Tanks, electrodes, clamps, mandrels, etc., required to electrodeposit or electroform.
PRODUCTION ILLUSTRATION	PI	An illustration used to augment and/or clarify engineering drawings and/or manufacturing engineering "planning" assemblies. Also used to define and clarify machining operations and inspection criteria and methods.
PLASTER SPLASH MODEL	PDM	A plaster (plastic, or fiberglass) splash from a male or female master model or other master.

SAMPLE PART	SP	An accurately constructed production part made to nominal dimensions and accepted as the dimensional authority for the fabrication and/or coordination of tools. Sample parts shall be painted in red.
SPECIAL PERISHABLE TOOLS	SPAT	Perishable tools required to fabricate parts or assemblies, i.e. tools that are not applicable to standard factory use. Tool documents will carry actual title of tool.
SILK SCREEN	SS	A pattern used for stenciling of parts or assemblies.
(PREFIX) STANDARD TOOL	STDT	This code applies to standard tools and accessories designed, manufactured, or procured for a variety of applications such as, but limited to; bucking bars, rivet sets, nut plate drill guides, Zephyr guides, rivet shavers, wrenches, hand tools, measuring instruments, gages, micrometers, catalogue items and other items not specifically made for a given engineering part application.
(PREFIX) TOOL DESIGN SKETCH	TDS	Sketch and/or reports used to publish layouts, charts, graphs, proposals, and/or drawings of portions of existing tools.
TOOL KIT	TK	A compliment of tools in a box required in a sequence of machining operations with a specific jig or fixture.
TOOL SETUP INSTRUCTIONS	TSI	A drawing or other written instruction, describing fully the setup and use of any given tool, including cutter applications, speeds, feeds, etc.
TEST JIG	TSJ	A devise supporting or containing a unit or assembly of equipment and/or product for conducting tests to determine function, durability, or quality of the product when exposed to various conditions of environment.
PATTERN TOOLS		
CASTING PATTERN	CP	A wood or metal form used for making a mold for casting. Used to check contour. See Also PAT
PATTERN	PAT	Wood or metal pattern used to develop a metal, wood, plaster, or plastic mold. See also CP.
SHEET METAL TOOLS		
BLANKING DIE	BD	A die used in power press to produce flat patterns or blanks of a predetermined size and shape.
BENDING FIXTURE	BDF	Holds parts in correct position for bending operations.
BLANK AND PIERCE DIE	BPD	A die used in a power press, combining piercing, and blanking in a strip stock or single blanks and in single or multiple stages.
BRAKE BAR	BRB	A punch used to bend or form flat metal parts to required shapes on a press brake and is not necessarily the same shape as the formed part.
BRAKE DIE	BRD	A punch and die combination used to bend or form flat metal parts to required shapes on a press brake and is not necessarily the same shape as the formed part.
CHEM MILL FIXTURE	CMF	Tool or rack used to hold parts during chem. mill operations.
CONTOUR ROUTER FIXTURE	CRF	Tool used to profile and drill irregular shaped parts.
DROP HAMMER DIE	DHD	A punch and die combination used for drop hammer forming operations on sheet metal, extruded sections, etc.

DINKING DIE	DKD	A hollow punch with a sharp beveled cutting edge, used for punching shapes from cardboard, rubber, fabric, etc., using wood or other suitable material as an anvil for the punch.
FORM BLOCK	FB	A block of required shape used to form sheet metal in either a power press or in hand forming.
FORM ROLLS	FR	Rolls used on a power machine (such as a Buffalo Roll) to end metal bars, strips, extruded shapes, etc., into required curves, forms, or segments.
HYDRO BLOCK	HB	A tool made of aluminum, steel or kirsite for use on a rubber head hydro press or "bag" press for forming aluminum and other light metals.
HAND ROUTER FIXTURE	HRF	A tool usually applied to an irregular shaped or formed part which provides a guide for hand routing cutouts and perimeter.
JOGGLE DIE	JD	A form die and punch having the shape of the required joggle; used for off-setting operations in a power press.
JOGGLE BLOCK	JDB	An insert formed to the shape of the required joggle; used for off-setting operations in power press.
PIN ROUTER BLOCK	PRB	A block used on pin router machine for guiding the work against the cutter to produce parts.
ROUTER ADAPTER	RA	A guide used with or on a hand router or other routing equipment to establish a controlled setback from the router bit to the guide surface.
ROUTER BLOCK	RB	A block used on the Onsrud Overam router to guide the work against the cutter to produce parts.
REPRODUCTION (METAL)	REPT	A photographic reproduction, usually on metal, of an engineering non-dimensional drawing or loft layout.
ROUTER TRIM JIG	RTJ	Tool applied to a part or assembly, which provides guides for routing and trimming operations (usually hand routing). May also incorporate bushings for drilling operations.
SPINNING BLOCK	SB	A form against which metal parts are spun to a required shape.
SANDING FIXTURE	SDF	Holds parts in position for sanding operations.
SAWING FIXTURE	SF	Holds parts in position for sawing operations.
STRETCH JAW INSERT	SJI	Used to hold a part of material during stretch operations.
STEEL RULE DIE	SRD	A low-cost short run die for blanking parts by the "steel rule" die process.
STRECH FORM BLOCK	STFB	Used to form sheet metal on a Hufford type form machine. Blocks may be made of kirsite, plastic, tooling board, aluminum, etc.
TUBE COMPOUND CLAMP SET	TCCS	A set of dies used to clamp a curved section of tubing.
TUBE CONTOUR FIXTURE	TCF	Used to check the EOP (end of part) and contours of bends on all tubing, pneumatic, and hydraulic lines.
TRIM JIG	TJ	Holds parts in position and establishes guides for trimming operations.
TUBE MANDREL	TMD	A tool placed inside the tube to prevent the tube from crushing in forming.
TUBE PRESSURE DIE	TPD	A tool that forces the tube around the bending die.

TUBE WIPER DIE	TWD	Used with the TPD to prevent the tube from crushing in forming.
TWIST FIXTURE	TWF	Used to apply a controlled twisting force to an extrusion
ZEPHYR DRILL TOOL	ZDT	Template used exclusively for a Zephyr (or equivalent) drilling of parts.
TEMPLATES		
APPLY DRILL TEMPLATE	ADT	Used as a guide for such operations as drilling, trimming, etc., on parts previously shaped or formed.
APPLY TRIM TEMPLATE	ATT	Used as a guide for trimming parts previously shaped or formed, also on extruded parts.
BRAKE FORM TEMPLATE	BFT	Used as a guide for setting press brake tools to form a part and consists of a template with V blocks centered on the bend line, with tooling holes for locating a part.
CHEM MILL TEMPLATE	CMT	Tool for scribing or masking material on parts to be chem milled.
CHECK TEMPLATE	CT	A section cut of a part or assembly, usually made of template stock. Used to check the contour.
DEVELOP LAYOUT TEMPLATE	DLT	A developed flat pattern of a part which includes the outline, bend information, and location of holes. See also DRT and NT.
DEVELOP LAYOUT TRIM TEMPLATE	DLTT	A developed flat pattern of a part, normally to net trim, including bend information and location of holes. Tool is normally 3/16 to 1/4 thick aluminum (for use on Marwin or similar profile equipment in lieu of conventional routing tools). Tool to carry T/H locator and tabs as necessary and should be bushed.
DRILL TEMPLATE	DRT	Made of template stock, having a pattern of guide holes, traveling bushings, locally inserted bushings used for stack drilling, or as a drill plate. May also incorporate all provisions of a DLT.
FORM BLOCK TEMPLATE	FBT	A plan view template of the outline of the form die.
GUIDE TEMPLATE	GT	Hardened steel template used in filing parts.
LAYOUT DOT TEMPLATE	LDT	An apply type template used for transferring a rivet pattern to a part
LOCATION TEMPLATE	LT	A template used to locate a part and/or sub-assembly.
MASTER TEMPLATE	MAT	A master which defines contour and/or hole locations in a plane as related to reference points or lines.
MASK AND SPRAY TEMPLATE	MST	Used to mask and protect certain areas and/or parts or portions of parts during painting or spraying operations.
NIBBLER TEMPLATE	NT	A template used as a guide for trimming parts in a nibbling machine. May incorporate all provisions of a DLT but must be thick enough to provide a guide surface.
PROFILE TEMPLATE	PFT	Used to establish the profile trim of a part and is used in machining and hand trimming operations.
ROUTER DRILL TEMPLATE	RDT	A tool combining the features of a DLT and incorporating drill bushings for drilling tab tie down holes and/or required pilot or tool holes. For use with router tools only – see also DRT.
SCRIBE TEMPLATE	SCT	Flat template used to provide a guide for rough or finish trim or parts of sub-assemblies.
SHEAR TEMPLATE	SHT	Used for rough shearing material prior to forming on a drop hammer or stretch press.

SHRINK TEMPLATE	SRT	Tool/template used for contouring parts on a foot shrinker.
STENCIL TEMPLATE	ST	A paper or metal template containing numbers or letters used for painting and/or marking assemblies.
SPOT WELD TEMPLATE	SWT	Template used to transfer spot weld patterns to parts.
TOOLING TEMPLATE	TT	A tool designed by Tool Design and used by the Tool Room to build a tool. These templates are generally for section cuts on water line, fuselage station, etc., (where a FBT or DLT does not exist) having direction notes stamped on them showing their relationship to the aircraft.
TUBE TEMPLATE	TUT	An apply template made from a tube large enough to slip over the part to locate trim, holes, cut-outs, and slots as required.

11.0 TOOL PART MARKING AND IDENTIFICATION

11.1 Tool Marking

All tooling manufactured for EAC production parts are identified with the:

- A. Tool number
- B. Engineering drawing revision and tool change number
- C. Origin of manufacture (use your cage code or company name)
- D. Purchase Order number
- E. "Property of EAC"
- F. EAC Asset No. (if applicable)
- G. Also used on (if applicable)

NOTE: The Engineering Drawing Revision is replaced with a tool design (drawing) revision if the tool has tool design drawing and will not carry a change letter. These tools are identified by placing a "TD" before the revision letter.

11.2 Tool Change Levels

Non-designed tools shall carry the part engineering drawing revision level and tool change level. Tool change levels are used to indicate the tool revision level for non-designed tools. Change level 00 indicates initial release. When tools are reworked yet the engineering drawing has not changed tool change levels are indicated by a Chg. 01, Chg. 02, Etc.

11.3 Additional Information

Additional identification and/or information such as hole sizes, material type and thickness, bend angle, and radii peculiar to the function of the tool. This can also be stamped or marked appropriately in the area of the tool number.

11.4 Tool Inspection Stamp

A Tool Inspection Stamp is either impression or permanent ink stamped under or near the tool identification on completed tools.

11.5 Multiple Piece and Removable Details

Multiple piece tools and removable details are identified differently depending on if the tool carries a tool design, or if the tool is non design.

11.6 Designed Tools

When designed tools have loose and removable details, these details will be identified with the tool number and tool design detail number. If applicable include approximate location station, waterline, butt line and detail function.

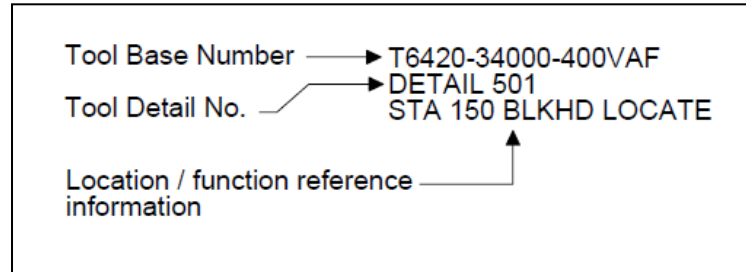


FIGURE 9.2 – REMOVABLE DETAILS, DESIGN TOOL

11.7 Non-Design Tool

On non-design tools (tools without tool design drawings) that have removable details or multiple parts such as form dies with pressure plates, joggle dies, etc.; these units will be "PART" marked so that the complete tool marking is on at least one unit. Only part 1 (usually tool base or largest component) will be identified with complete tool marking and the total number of detachable parts, e.g. PART 1 OF 3. The remaining parts will be identified with the base tool number and their specific part number, e.g. PART 2, PART 3, etc.

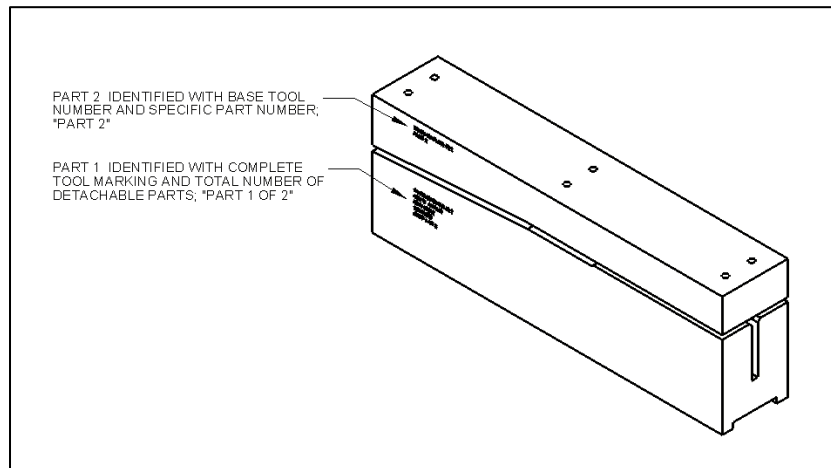


FIGURE 9.3 – MULTIPLE PART, NON-DESIGN TOOL

11.8 Standard Tool Marking Examples

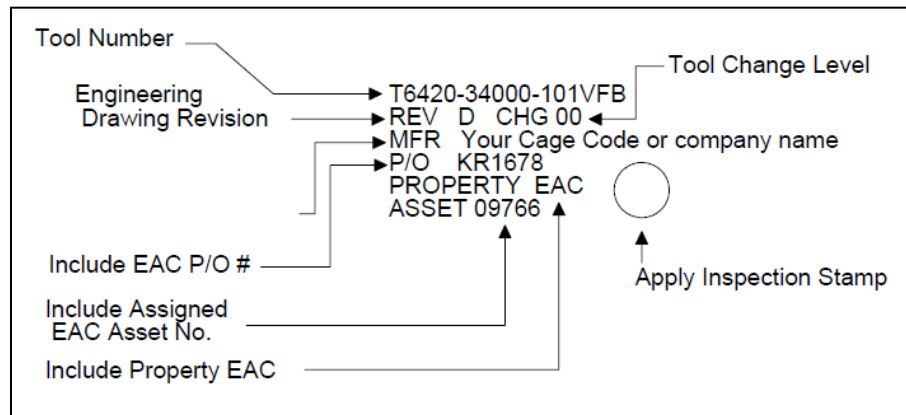


FIGURE 9.4 – NON-DESIGN TOOL MARKING

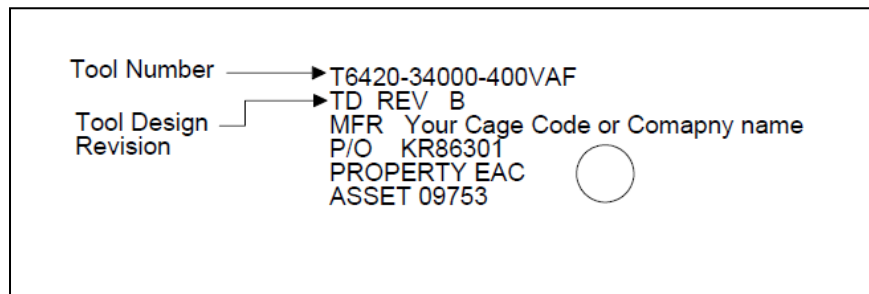


FIGURE 9.5 – DESIGN TOOL MARKING

11.9 Also Used On

It is not acceptable to make two tools on one base tool number and identify as two separate tools. If a single tool produces more than one part number, the tool must include the also used (A/U) part dash number (i.e. T6420-66301-101 DJ, A/U -102, A/U -103). Detachable details used to make other part numbers must be identified with "Used to make -101" along with tool number and "PART 2", etc.

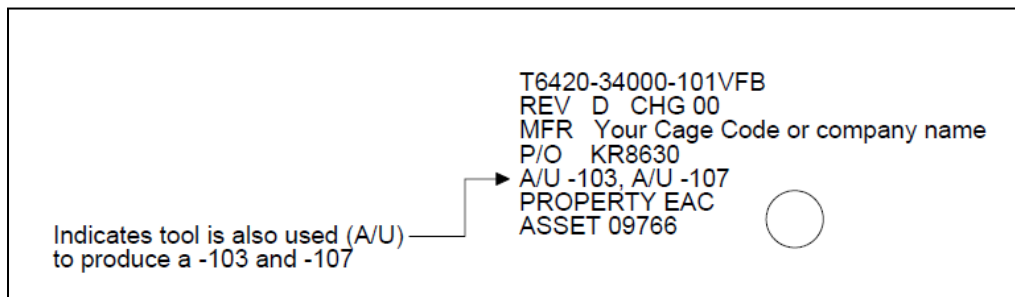


FIGURE 9.6 – TOOL ALSO USED ON

11.10 Reworked Tools

Reworked tools will be stamped with the abbreviation "RWK" followed by the Tool Order number. The Tool will be marked CHG 01 or next subsequent change number. Reworked design tools will have a tool design change record or a tool drawing revision level change and will have a metal identification plate with lines to record the revision record.

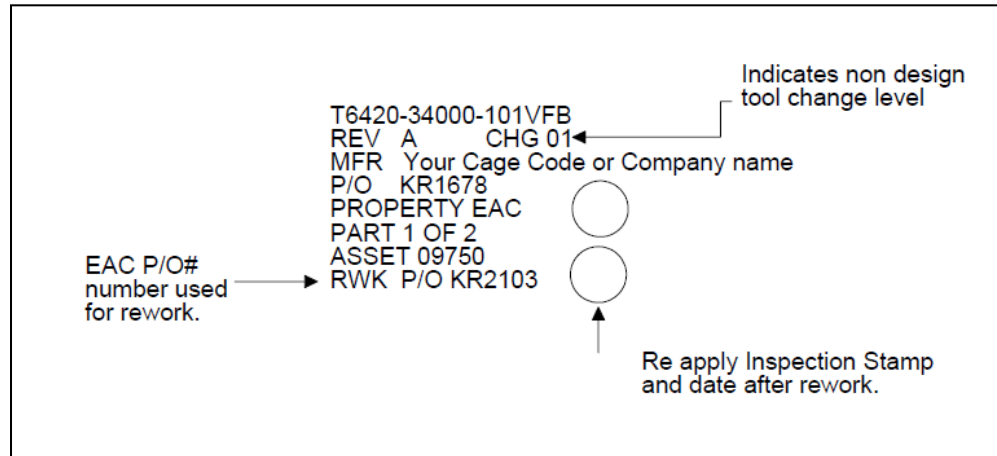


FIGURE 9.7 – REWORKED TOOL MARKING

11.11 Asset Numbers

Asset numbers will be supplied by your EAC buyer when required. Tools shall have the asset number permanently marked below the part marking .

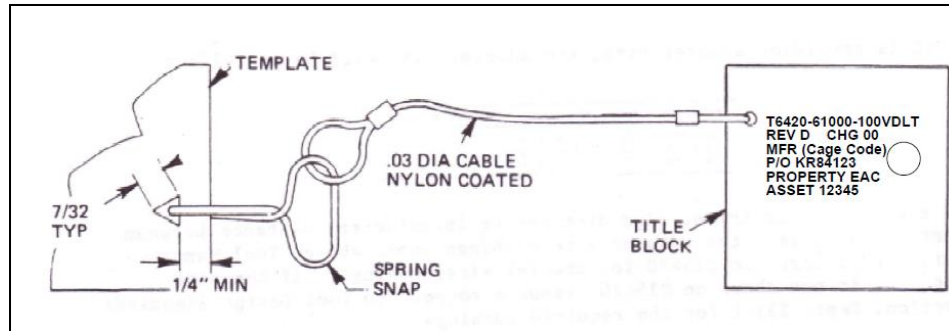
11.12 Marking Methods

Small Tools, Templates, etc., may be steel stamped, engraved, vibro-peened or electrolytic etched with the required information. Large tools shall have an EAC tool nameplate attached, and steel stamped, engraved, or vibro-peened with the required information.

Letters should be 3/32 – 3/8 for all types of identification.

11.13 Tools too Small to Mark

If the Tool is too small to carry the required information a 2.5 x 3.0-inch metal tag should be attached to the tool and used as a title block. If the tool is too small to carry a tag, then mark a storage container or bag with tool number.

**FIGURE 9.8 – TOOLS TO SMALL TO MARK**

12.0 PROCURED TOOLING

12.1 TOOL MANUFACTURING

New tools manufactured for use at EAC and delivered directly to EAC will be procured on a purchase order and EAC tool planning will be provided. Tools shall comply with requirements defined in the tool planning documents.

13.0 SUPPLIER TOOLING AUDIT

13.1.1 SUPPLIER TOOLING AUDIT REPORTS

The Supplier Tooling Audit Reports (STAR) is a bi-annual audit of suppliers who currently have Erickson or Customer tooling (Bell, Sikorsky, etc.) that has been checked out by Erickson and transferred to a supplier for use. This audit will be initiated by Erickson on an EAC 7091 form and completed by the supplier.

Upon audit request, the supplier will have 30 days to complete and return the STAR form. During an audit when requested by the supplier, Erickson Tooling will determine if any EAC/Customer tooling is considered excess and may at their discretion approved a supplier's request for a Declaration of Excess (See Section 4.3). When Supplier has completed audit, supplier is to sign and return the STAR form. In the event a supplier needs addition time to complete their inventory. They may reach out to Erickson for an extension.