

MECHANICAL BLUEPRINT INTERPRETATION.

NOTIFICATION
NOTES, VENDORS
LINE NO.

NORTH AMERICAN AVIATION, INC.
SPACE and INFORMATION SYSTEMS DIVISION
12214 LAKEWOOD BLVD., DOWNEY, CALIFORNIA

FITTING -
PYLON TO MISSILE, FORWARD
ATTACHMENT, STA207.000

ENT NO.	SIZE	XXXX-123456
53	D	

ENGINEERING ORDER

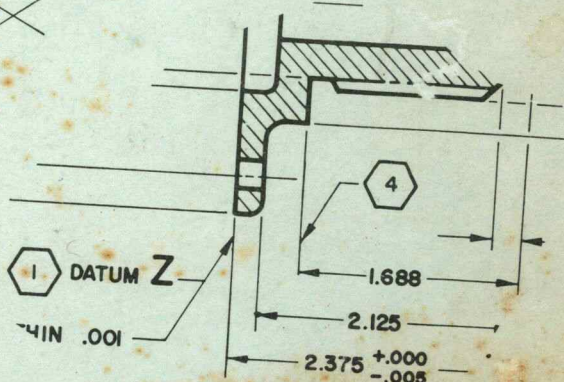
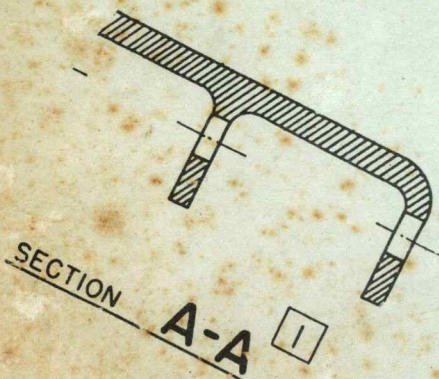
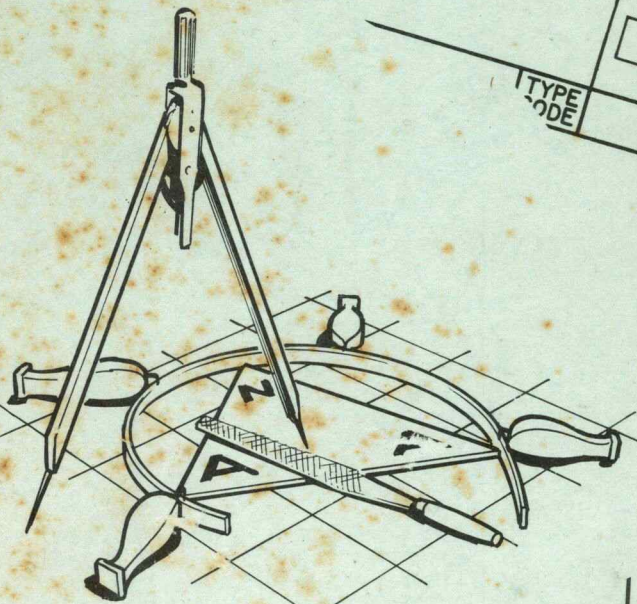
AUTHORITY: EG GO, MCR

PARTS MADE:

☐ OK TO USE
☐ MAY BE RWKD
☐ NOTED

TYPE
CODE

SUBJECT

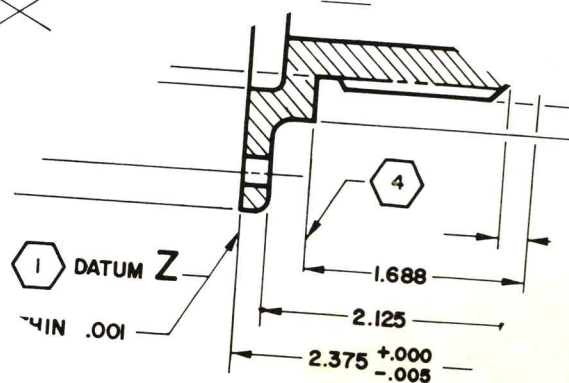
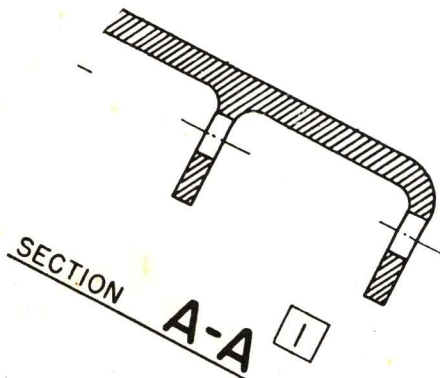
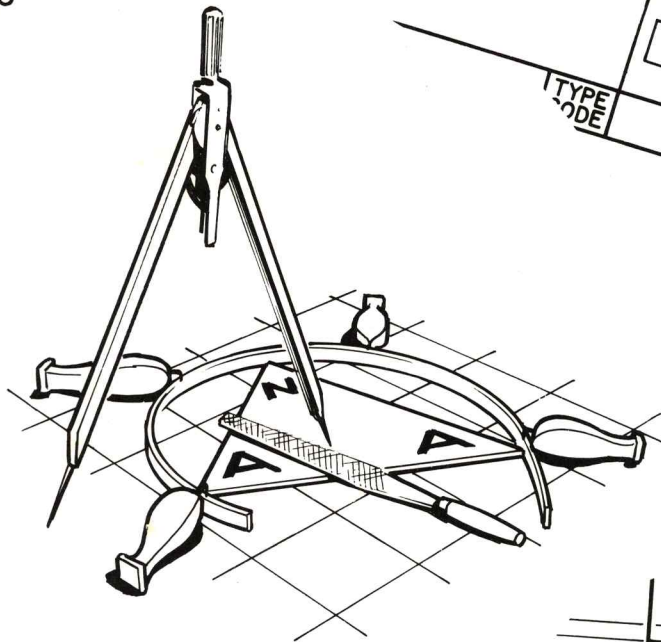


DEVELOPED BY
E.T. MORRISSEY
MANPOWER DEVELOPMENT

MECHANICAL BLUEPRINT INTERPRETATION.

NOTIFICATION		LINE NO.
NOTES VENDORS		
NORTH AMERICAN AVIATION, INC. SPACE and INFORMATION SYSTEMS DIVISION 12214 LAKEWOOD BLVD., DOWNEY, CALIFORNIA		
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ENT NO.	SIZE	XXXX-123456
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ENGINEERING ORDER	
AUTHORITY: EG GO, MCR	PARTS MADE:
	<input type="checkbox"/> OK TO USE <input type="checkbox"/> MAY BE RWKD <input type="checkbox"/> NOTED
TYPE CODE	SUBJECT



DEVELOPED BY
E.T. MORRISSEY
MANPOWER DEVELOPMENT

TRAINING MATERIALS

NON-CLASSIFIED

PERSONAL PROPERTY

MANPOWER DEVELOPMENT
DEPARTMENT 41-018

MECHANICAL BLUEPRINT INTERPRETATION

MARCH 1967

NORTH AMERICAN AVIATION, INC.
SPACE AND INFORMATION SYSTEMS DIVISION
11214 LAKEWOOD BLVD., DOWNEY, CALIFORNIA

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INTRODUCTION

Drawings function as the means of transmitting designs and data in graphic form from Engineering to Manufacturing, Inspection, and other concerned personnel. Consideration shall be given to the method of manufacture so that major parts or assemblies may be properly sequenced for fabrication and installation. Government contracts require that drawings be in accord with specific instructions relative to standard format and detailed preparation in order to be completely understandable by any other manufacturer. Large scale production of exact interchangeable parts requires that drawings be clear in presentation, accurate in dimension, complete in information, and subject to only one interpretation.

NOTES

TITLE BLOCK

This course is presented in the same manner of sequence by which we read a Blueprint. Therefore, the Title Block will be studied first as this is where we find the drawing number, name, material used, and pertinent information.

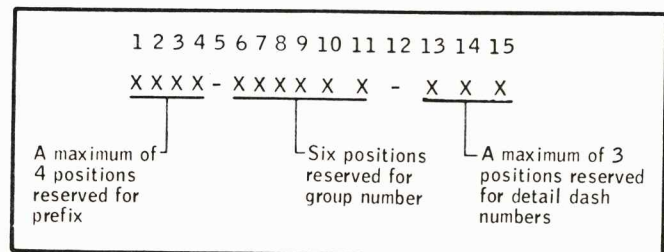
The drawing Title Block, located in the lower right-hand corner of each drawing, is preprinted on all production drawing vellums. It is divided into eleven main areas which contain pertinent information relative to the part, assembly or installation.

QTY REQ'D							PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	CODE IDENT	MATERIAL	DATA SPECIFICATION SIZES, NOTES, VENDORS	LINE NO.		
LIST OF MATERIAL OR PARTS LIST														
HEAT TREAT		-3, -5, & -7 TO XX COND PER XAOXXX-OOX		UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES. TOLERANCES ON: DECIMALS ANGLES .XX = ± .03 .XXX = ± .010 ± 30' HOLES NOTED "DRILL" 013 THRU .040 + .001 -.001 041 THRU .130 + .002 -.001 131 THRU .229 + .003 -.001 230 THRU .500 + .004 -.001 501 THRU .750 + .005 -.001 751 THRU 1.000 + .007 -.001 1.001 THRU 2.000 + .010 -.001 DO NOT SCALE PRINT				DR BY I. DOE		X-XX-XX		NORTH AMERICAN AVIATION, INC. SPACE and INFORMATION SYSTEMS DIVISION 12214 LAKEWOOD BLVD., DOWNEY, CALIFORNIA		
FINISH		<div style="border: 1px solid black; width: 20px; height: 20px; text-align: center; line-height: 20px;">3</div>						CHK BY U. DOE		X-XX-XX				
SUBS THRU END								APPROVED BY				FITTING - PYLON TO MISSILE, FORWARD ATTACHMENT, STA 207.000		
								H.E. DOE						
								N.O. DOE						
						CODE IDENT NO.		SIZE	XXXX-123456					
						03953		D						
								SCALE 1/1		SHEET				

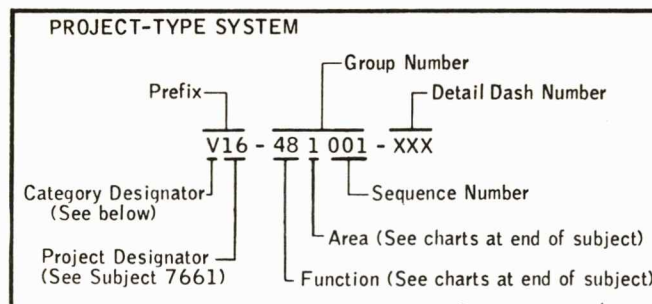
DRAWING NUMBERS

Production Drawing numbers are made up of three groups of numbers, separated by dashes. This number has a maximum of 15 positions with positions 5 and 12 reserved for dashes.

NORTH AMERICAN AVIATION, INC. SPACE and INFORMATION SYSTEMS DIVISION 12214 LAKEWOOD BLVD., DOWNEY, CALIFORNIA	
FITTING - PYLON TO MISSILE, FORWARD ATTACHMENT, STA 207.000	
CODE IDENT NO.	SIZE
03953	D
XXXX-123456	
SCALE 1/1	SHEET



Two types of numbering systems are utilized. The Project Type System or the General Order System.



Production drawing numbers are assigned to all drawings except for special applications.

When applicable, the General Order will be assigned as the drawing prefix. Special prefixes will be used as applicable.

For project-type drawing prefixes, category designator letters have been assigned; as additional categories or projects are developed, they will be added.

The first three digits of the drawing numbers will be assigned in the appropriate group category for which the part was designed (regardless of where it assembles), and the last three digits are assigned serially in that group.

SPECIAL PREFIXES

The following paragraphs list those drawings which receive an alphabetical addition to the project or general order numbers as assigned, and although such drawings are not production drawings, their drawing or part numbers shall not exceed 15 positions.

Special test equipment tool drawings shall have a "TE" preceding the drawing numbers, e.g., TE9564-55096.

Guide master drawings shall have a letter "M" preceding the drawing number, e.g., MV16-541233.

Printed (or etched) circuit masters shall have a letter "M" preceding the drawing number, e.g., MG18-541234-XXX

"9" PREFIX TO GROUP NUMBER

The number "9" preceding the drawing group number is used to indicate special or unusual characteristics of certain types of drawings. The classes of drawings employing this designation are listed below.

Postcontract Proposal

Design Layout

Design Specification Control

Rework (NAA)

Substitution

Design Assembly and Installation Test

Hydra-Pneumatic Schematic

Electrical and Electronic Reference Drawings

The "9" group number shall be constructed in the following manner: the fourth or fifth digit of the group number shall be dropped and the number "9" shall precede the existing group numbers; thereby maintaining a six-digit number. For example, an assembly drawing for the Warhead Compartment would be numbered XXXX-312001 and the related schematic drawing would be numbered XXXX-931201.

The drawing classification or general order number will be assigned in the normal manner.

On such drawings the number "9" is used as an integral part of the drawing number, i.e., it is not set out by a dash or a space.

SPECIAL APPLICATION NUMBERS

Certain classifications of drawings have established prefixes and group numbers as noted in the following paragraphs.

Precontract and Post Contract Preliminary Layouts shall have a "PL" prefix followed by a special group number series as assigned by Preliminary Analysis, e.g., PL-1478.

Proposal Drawings made prior to the assignment of a General Order number shall have an "AD" prefix followed by a special group number series as assigned by Preliminary Analysis, e.g., AD-301.

Packaging Drawings shall have an "MK" prefix (except where previous contractual commitments or documentation require the use of "DX" prefix), e.g., MK3XX-XXXXX.

Special Dimensional Tool Drawings shall be prefixed with a "T" followed by "-4" (for this Division) and a serial number as assigned by Tool Design, e.g., T-4-1042.

Specification Control Drawings are given a special series of definitive numbers by Central Specifications, e.g., ME195-0002

NAA Shapes Drawings (extrusions, machined, rolled, welded, etc.) are given the Corporate numbering system consisting of 15 position alphanumeric number, e.g., MS043-1512-0001

NAA Design Standards Drawings (design practices, fastener installations, cutouts, lightening holes, "O"-ring groove dimensions, etc.) utilize the Corporate numbering system, e.g., MP032-0001.

Corporate Standard Part Drawing numbers consist of a ten position alphanumeric number, e.g., MD123-0001.

Facilities Drawings shall have a "DF" prefix followed by a special group number series as assigned by the Number Assignment Clerk.

Fixture and Test Specimen Drawings shall be prefixed by "DTT" followed by the "1000" series group number as assigned serially by the Assignment Clerk, e.g., DTT-1016. Design Assembly Test and Design Installation Test Drawings will also be assigned a "DTT" number if they are not drawn to production configuration.

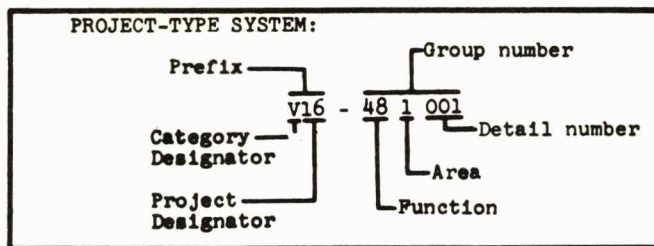
DRAWING NUMBER ASSIGNMENT

All new engineering drawings shall carry the assigned prefix followed by the six-digit group number selected from the applicable number chart. Drawings will be serially numbered by the Release Group in the normal manner.

DRAWING NUMBERING

PROJECT-TYPE SYSTEM

Project-type prefix drawing numbers are used on new programs, (Saturn, Apollo, Paraglider, etc.)



1. CURRENT DESIGNATION SYSTEM

1.1 End items, which do not have customer-assigned model designations, are assigned company model designations by the Procedures Function of Engineering Data in accordance with the following instructions.

1.2 Company model designations consist of a category prefix letter and project designation number, a dash, and a serially assigned number to distinguish different items within a category, e.g., M3-1, A3-23, etc.

1.3 The following categories and projects have been assigned; as additional categories or projects are developed, they will be added:

Category Prefix Letters:

A = Auxiliary Equipment
B = Carrier Equipment
C = Checkout and Control Equipment
H = Handling Equipment
K = Kits and Miscellaneous
M = Missiles
P = Pylons
R = Mockup
S = Servicing Equipment
T = Training Equipment
V = Space Vehicles

Project Designation Numbers:

2 = WS131-B Program
3 = Minuteman Program
4 = NASA Booster
5 = (Canceled)
6 = Warhead Ballast, AGM-28A
7 = Saturn S-II
8 = Sandwich Rocket Motor Case
9 = Nozzle Control Unit Assemblies
10 = Minuteman Adapter Console
11 = (Not used)
12 = Paraglider Full Scale Test Vehicle
13 = (Not used)
14 = Apollo Complete
15 = Apollo Launch Escape System
16 = Apollo Command Module
17 = Apollo Service Module
18 = Apollo Adapter
19 = Acceleration Recording Console
20 = Paraglider Tow Test Vehicle

22 = Paraglider Prototype Systems
23 = Apollo GSE (MIT End Items)
24 = Apollo Spacecraft LEM Adapter (Grumman & NAA End Items)
25 = Apollo Simulator Complexes (To include Test Fixtures used in simulating Operations.)
26 = Biosatellite
27 = Boilerplate 1101

34 = Apollo Complete, Block II
35 = Apollo Launch Escape System, Block II
36 = Apollo Command Module, Block II
37 = Apollo Service Module, Block II

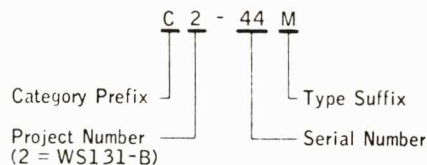
1.4 Additional dash numbers or letters will not be added to model designations.

1.5 Company model designations will not be changed to reflect changes in configurations unless the functional purpose of the end item is changed.

2. FORMER DESIGNATION SYSTEMS

2.1 Prior to the adoption of the current system described at paragraph 1 above, a similar system was utilized for support equipment; since this former system appears on many current drawings and documents, it is described herein as a matter of historical reference.

2.2 In the former system, the company model designation for research and development consisted of a category prefix letter and project number, a dash, a serially assigned number to distinguish different items, and a suffix letter (or letters) for the type of equipment, as shown in the following example:



Category Prefix

A = Auxiliary
C = Checkout
H = Handling
S = Servicing

Type Suffix

A = Automatic
K = Kit
M = Manual
T = Test

2.3 To distinguish between R&D and production contracts, a dash "A" was added to the model designation:

C2-44M	R&D Version
C2-44M-A	Production Version

2.4 Certain end items of support equipment, found in the following example, were assigned company model designations in a manner other than that described in paragraph 2.2.

PY-1 = Pylons
K2-1 = Nontactical Instrumentation System
MD-6 = Captive Ballast
MD-3 = Minuteman

2.5 In certain cases, particularly in the R&D phase, additional dash numbers or letters were added to a model designation for different versions or usages of the same model; this practice is no longer being used.

DRAWING NUMBERING

APOLLO ONLY (BLOCK I)

FUNCTION

(XXX-48XXXX) FIRST 2 DIGITS OF GROUP NUMBER

	COMMAND MODULE & ESCAPE SYSTEM	SERVICE MODULE & ADAPTER
000002	GENERAL	GENERAL
01XXXX	WIND TUNNEL MODELS	WIND TUNNEL MODELS
03	HANDBOOK DRAWINGS	HANDBOOK DRAWINGS
10		
20		
30	BODY GROUP INSTALLATION	BODY GROUP INSTALLATION
31	INNER STRUCTURE	FAIRING (FWD)
32	HEAT SHIELD	BASIC STRUCTURE
33	EQUIP SUPPORT STRUCTURE	EQUIPMENT SUPPORT STRUCTURE
34		TANKS
40	POWER SYSTEMS	POWER SYSTEMS
41	ENGINE INSTALLATION	ENGINE INSTALLATION
42	ELECTRICAL WIRING, ALL SYSTEMS	
43	ENGINE CONTROL	ENGINE CONTROL
44	ELECTRICAL INSTALLATION	ELECTRICAL INSTALLATION
45	ELECTRICAL POWER SYSTEMS	ELECTRICAL POWER SYSTEMS
46	PROPELLANT PRESSURIZATION SYSTEM	PROPELLANT PRESSURIZATION SYSTEM
47	PROPELLANT OXIDIZER SYSTEM	PROPELLANT OXIDIZER SYSTEM
48	FUEL SYSTEMS	FUEL SYSTEMS
50	VEHICLE MECHANISMS	VEHICLE MECHANISMS
51	INSTRUMENT INSTALLATION	INSTRUMENT INSTALLATION
52	ATTITUDE CONTROL EQUIP	ATTITUDE CONTROL EQUIP
53	CREW FURNISHINGS	
54	ELECTRO-MECHANICAL EQUIP	ELECTRO-MECHANICAL EQUIP
55	MISCELLANEOUS MECHANISMS	MISCELLANEOUS MECHANISMS
56	LAUNCH EQUIP	LAUNCH EQUIP
57	EARTH LANDING SYS	
58 x 0	HYDRAULIC EQUIP	HYDRAULIC EQUIP
58 x 5	PNEUMATIC EQUIP	PNEUMATIC EQUIP
59	PYROTECHNIC EQUIP	PYROTECHNIC EQUIP
60	LIFE SUPPORT SYSTEMS	LIFE SUPPORT SYSTEMS
61	ENVIRONMENTAL CONTROL	ENVIRONMENTAL CONTROL
62	BIO-INSTRUMENTATION	BIO-INSTRUMENTATION
63	FOOD & WASTE SYSTEM	FOOD & WASTE SYSTEM
70	ELECTRONIC CONTROL SYSTEMS	ELECTRONIC CONTROL SYSTEMS
71	COMMUNICATION SYSTEMS	COMMUNICATION SYSTEMS
72	NAVIGATION EQUIP	NAVIGATION EQUIP
73	STABILIZATION EQUIP	STABILIZATION EQUIP
74	RADAR EQUIP	RADAR EQUIP
75	INSTRUMENTATION	INSTRUMENTATION
76	ELECTRONIC & DISPLAY EQUIP	ELECTRONIC & DISPLAY EQUIP
77	ELECTRONIC & DISPLAY EQUIP	ELECTRONIC & DISPLAY EQUIP
79	MISCELLANEOUS EQUIP	MISCELLANEOUS EQUIP
80	GROUND SUPPORT AND CONTROL	GROUND SUPPORT AND CONTROL
	EQUIPMENT COMPLETE	EQUIPMENT COMPLETE
81	HANDLING EQUIP	HANDLING EQUIP
82	AUXILIARY EQUIP	AUXILIARY EQUIP
83	FLIGHT TEST EQUIP	FLIGHT TEST EQUIP
84	SERVICE EQUIP	SERVICE EQUIP
85	CHECKOUT EQUIP	CHECKOUT EQUIP
86	TRAINING EQUIP	TRAINING EQUIP
87	GLOBAL OPERATIONS SUPPORT SYSTEMS	GLOBAL OPERATIONS SUPPORT SYSTEMS
88	MODIFICATION KIT	MODIFICATION KIT

AREA

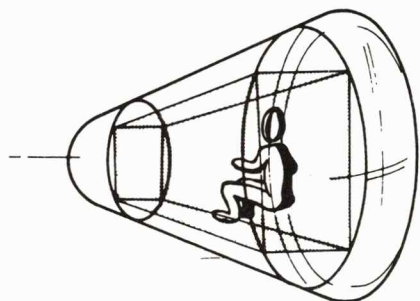
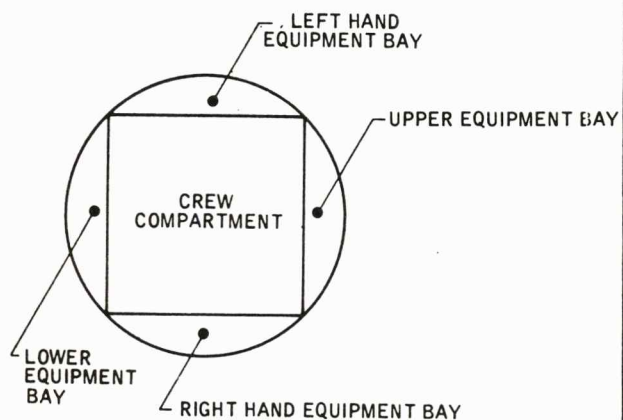
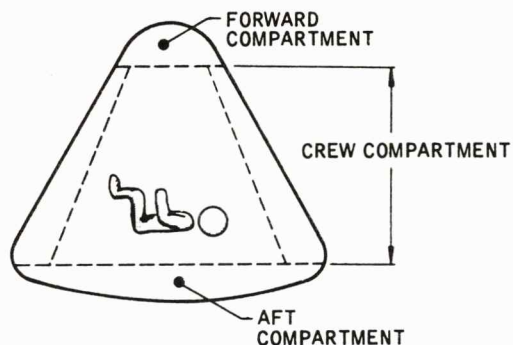
(XXX-XX1XXX) 3RD DIGIT OF GROUP NUMBER (1)

	COMMAND MODULE & ESCAPE SYSTEM	SERVICE MODULE & ADAPTER
XX0XXX	(1)	(1)
XX1XXX	CREW BAY	RIGHT UPPER SEXTANT
2	RH EQUIP BAY	RIGHT MIDDLE SEXTANT
3	LH EQUIP BAY	RIGHT LOWER SEXTANT
4	LOWER EQUIP BAY	LEFT LOWER SEXTANT
5	UPPER EQUIP BAY	LEFT MIDDLE SEXTANT
6	FORWARD COMPARTMENT	LEFT UPPER SEXTANT
7	AFT COMPARTMENT	CENTER SECTION
8	TULSA FACILITY (S&ID)	
9	TULSA FACILITY (S&ID)	

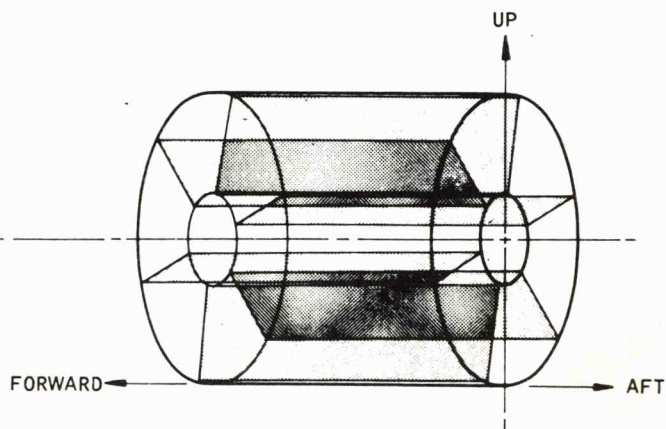
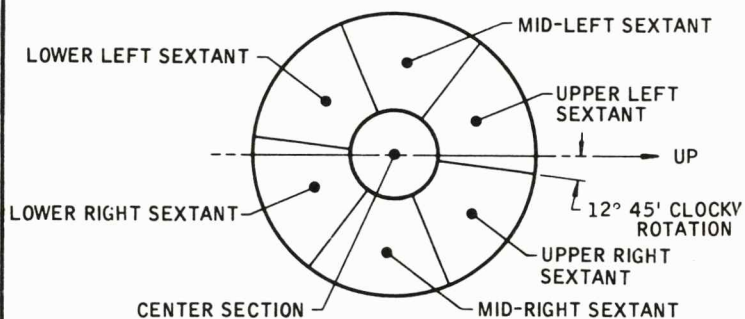
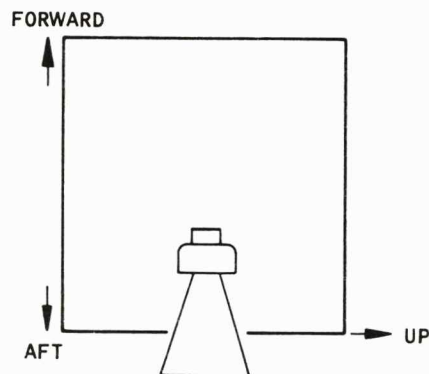
NOTE: (1) The "area" or third digit of the Group number may be "0" when area designation is not desired or required, or when two or more areas are involved. In GSE the area code is not applicable.

DRAWING NUMBERING

APOLLO ONLY (CONT)



COMMAND MODULE



SERVICE MODULE

DRAWING NUMBERING

SATURN II ONLY

FUNCTION (XX-48XXXX) FIRST 2 DIGITS OF GROUP NUMBER

00XXXX	GENERAL
01	MODELS
03	HANDBOOK DRAWINGS
10	OPEN
20	OPEN
30	BODY GROUP
31	STRUCTURE
32	BALLAST
40	PROPULSION SYSTEM
41	ENGINE INSTALLATION
42	SYSTEMS TEST
43	RETROULLAGE SYSTEM
44	BALLAST
48	PROPELLANT UTILIZATION SYSTEM
49	PRESSURIZATION SYSTEM
50	CONTROL SYSTEM
52	FLIGHT CONTROL
53	INSULATION TEMPERATURE CONTROL SYSTEM
54	ELECTRICAL SYSTEMS
55	SEALS & JOINTS
56	BALLAST
58	HYDRAULIC SYSTEM
60	OPEN
70	ELECTRONIC SYSTEMS
71	BALLAST
75	INSTRUMENTATION SYSTEM
76	INSTRUMENTATION SYSTEM
77	INSTRUMENTATION SYSTEM
80	GROUND SUPPORT EQUIPMENT
81	HANDLING
82	AUXILIARY EQUIPMENT
83	SYSTEMS TEST
84	SERVICE
85	CHECKOUT & CONTROL
86	TRAINING
87	CHECKOUT & CONTROL

AREA (XXX-001XXX) 3RD DIGIT OF GROUP NUMBER

XX0XXX	(1)
XX1XXX	FORWARD SKIRT
2	LH2 TANK
3	LO2 TANK
4	INTERMEDIATE SKIRT
5	THRUST STRUCTURE - AFT SKIRT
6	SYSTEM TUNNEL
7	INTERSTAGE
8	TULSA FACILITY (S&ID)
9	TULSA FACILITY (S&ID)

NOTE: (1) The "area" or third digit of the Group number may be "0" when area designation is not desired or required, or when two or more areas are involved. In GSE, the area code is not applicable.

DRAWING NUMBERING

PARAGLIDER ONLY

FUNCTION	(XX-48XXXX) FIRST 2 DIGITS OF GROUP NUMBERS
00XXXX	GENERAL
01	WIND TUNNEL MODELS
03	HANDBOOK DRAWINGS
10	WING INSTALLATIONS
14	WING ASSEMBLY
30	BODY GROUP INSTALLATION
31	STRUCTURE
32	HEAT SHIELD
33	EQUIP. SUPPORT STRUCTURE
34	(OPEN)
40	POWER SYSTEMS
41	ENGINE INSTALLATION
43	ENGINE CONTROL
45	ELECTRICAL POWER SYSTEMS
48	FUEL SYSTEMS
50	VEHICLE MECHANISMS
51	INSTRUMENT INSTALLATION
52	ATTITUDE CONTROL EQUIP.
53	CREW FURNISHINGS
54	ELECTRO-MECHANICAL EQUIP.
55	MISCELLANEOUS MECHANISMS
56	LAUNCH EQUIP.
57	PYROTECHNICS
58	HYDRAULIC EQUIP.
59	PNEUMATIC EQUIP.
60	LIFE SUPPORT SYSTEMS
61	ENVIRONMENTAL CONTROL
62	BIO-INSTRUMENTATION
63	FOOD-&-WASTE SYSTEM
70	ELECTRONIC CONTROL SYSTEM
71	COMMUNICATION SYSTEMS
72	NAVIGATION EQUIP.
73	STABILIZATION EQUIP.
74	RADAR EQUIP.
75	INSTRUMENTATION
79	MISCELLANEOUS EQUIP.
80	GROUND SUPPORT AND CONTROL EQUIPMENT
	COMPLETE
81	HANDLING EQUIP.
82	AUXILARY EQUIP.
83	FLIGHT TEST EQUIP.
84	SERVICE EQUIP.
85	CHECKOUT EQUIP.
86	TRAINING EQUIP.
87	GLOBAL OPERATIONS SUPPORT SYSTEMS
88	MOCKUP SUPPORT FIXTURES

NOTE: (1) The "area" or third digit of the Group Number is not applicable and shall be "0" in all drawing numbers.

DASH NUMBERS

Dash numbers are used to avoid preparation of separate drawings for every part or assembly. They are assigned to the drawing, as applicable, by the draftsman.

Odd dash numbers are always used for neutral parts or neutral assemblies; consecutive odd and even dash numbers are always for left hand and right hand parts or assemblies respectively.

Dash one (-1) and dash two (-2) respectively shall be used for left hand and right hand basic detail parts, and basic assemblies and installations only.

Dash numbers may be used as applicable for tabulated detail parts. They shall not be used for springs, molded plastic parts, or purchased parts. Dash numbers shall not be used for machined parts, castings, or forgings, except as specifically described in other appropriate subjects.

Dash numbered details of assemblies or subassemblies, and dash numbered subassemblies shall not be called out on any other drawing. Left hand and right hand basic parts or assemblies (dash numbered -1 and -2), and tabulated dash numbered detail parts and assemblies, however, are called out on other drawings. When showing RH and LH dash numbers, it will be noted as follows: LH Shown RH Opposite or LH Shown RH Opposite and noted.

DRAWING TITLE BLOCK

The title is located in the title block in the lower right hand corner of the drawing. Title will be the name of the part plus assembly or installation (if applicable), followed by the group name of which it is a part, its position in the missile, and the description of the part.

NORTH AMERICAN AVIATION, INC. SPACE & INFORMATION SYSTEMS DIVISION 7211 WATKINS BLVD., BOWLING GREEN, CALIF. 92401			
FITTING - PYLON TO MISSILE, FORWARD ATTACHMENT, STA207.000			
CODE IDENT NO. 03953	SIZE D	XXXX-123456	
SCALE 1/1	SHEET		

Bulkhead	Angle	FWD	Fuel	Tank	Sta 437	Ass'y. of
Basic Noun		Noun modifier for type, grade, variety, etc.			Location Modifier	Permanent Assembly

The drawing title is read from the last modifier to the next, etc. The example is read:

Assembly of Station 437 Forward Fuel Tank Bulkhead Angle

Example of other Drawing Titles

Hoist Assembly - Ammunition Loader, 20MM.

Read as: 20MM, Ammunition Loader Hoist Assembly.

Control Assy - Bomb Release, Internal, RH.

Read as: RH Internal Bomb Release Control Assembly.

Line, Scavenge - FWD Fuel Tank, Assy of.

Read as: Assembly of Forward Fuel Tank Scavenge Line.

Example of Drawing Title Abbreviations:

Clamp Ass'y. - (Elect.) MN. LDG. GR. DN. POS. IND. SW.

Read as: Electrical Main Landing Gear Down Position Indicator Switch

Clamp Assembly.

COMPANY NAME AND ADDRESS BLOCK

This space provides the name and address of the company and varies with the various divisions and facilities from which the drawing originates. This division uses the "M" designated drawing forms, e.g., Form M110-N-

RTS	LIST
NORTH AMERICAN AVIATION, INC. SPACE and INFORMATION SYSTEMS DIVISION 12214 LAKEWOOD BLVD., DOWNEY, CALIFORNIA	

DRAWING SIZE BLOCK

Several types and sizes of vellums are used to clearly depict a part, assembly, installation, etc. Among these, the most commonly used are the standard cut-size and roll-size vellums. Two standard cut-size vellums are designated as "C", "D", and "J" sizes and have preprinted Title Block, Usage Block, Revision Block, and borders. For convenience in handling, many prints are reprinted as Blue Line Drawings one-half the size of the original prints. Such drawings carry a special seal located just above the Title Block.

IDENT NO.	SIZE	IDENT NO.	SIZE	IDENT NO.	SIZE
1953	C	1953	D	1953	J

HALF _____ Sht _____ of _____ Frm _____ of _____	SIZE Chg _____
---	-------------------

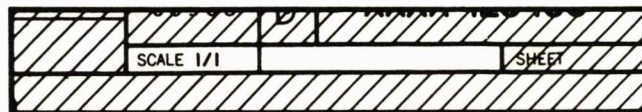
SCALE BLOCK

The scale to which the drawing is made will be indicated in the Scale space of the Title block by fractional method.

When the nature of a drawing is such that no scale can be used (i.e., wiring diagrams, schematics, isometrics, tabulated, and similar drawings) the word "NONE" will be placed in the Scale space.

When main drawing, and other views or sections differ in scale the word "NOTED" shall be placed in the Scale space in the Title block and the correct scale will be noted by each view or section.

Changes, additions, and corrections subsequent to the completion of the drawing may require that certain dimensions be shown out of scale. Such dimensions shall be indicated by a wavy underline, e.g., 500.



TOLERANCE BLOCK

Tolerances for decimal dimensions, angles, and holes noted "DRILL" are given in the Tolerance block. Tolerances which differ from those listed are noted on the drawing field or by a general note. The drill hole tolerance applies to holes that are specified as DRILL on the field of the drawing. Hole tolerances required to be different from those listed would be noted on the drawing field or by a general note and the term DRILL not used.

Tolerances are assumed to be applied to every dimension unless otherwise specified. When no tolerance or other indication appears on the field

of the drawing, the general tolerances in the drawing Title block shall apply.

Title block tolerances are $\pm .03$ for two-place decimals and $\pm .010$ for three-place decimals. These tolerances are preprinted on all drawing forms which show the full Title block.

All dimensions shall be expressed in the same number of places as the tolerance. Any tolerances other than those indicated shall be so noted preferably in line and directly with the dimension; and both dimensions and tolerances shall be in the same number of decimal places.

1-5, 6-7 AT COND PER XXXX-00X 5	UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES. TOLERANCES ON: DECIMALS ANGLES .XX = $\pm .03$.XXX = $\pm .010$ $\pm 30'$ HOLES NOTED "DRILL" .013 THRU .040 : $+.001$ $-.001$.041 THRU .130 : $+.002$ $-.001$.131 THRU .229 : $+.003$ $-.001$.230 THRU .500 : $+.004$ $-.001$.501 THRU .750 : $+.005$ $-.001$.751 THRU 1.000 : $+.007$ $-.001$ 1.001 THRU 2.000 : $+.010$ $-.001$	DR BY J. DOE CHK BY J. DOE APPROVED BY H. E. DOE N. O. DOE
	DO NOT SCALE PRINT	

Angles shall be expressed in units of degrees ($^{\circ}$) and minutes ($'$). Where more accurate work is required, seconds ($"$) may be used. The subdivisions of degrees may be omitted on even angles, for example, 30° .

Angular dimensions and their tolerances shall be expressed in the same units, e.g.,

$$30^{\circ} \pm 1^{\circ}$$

$$30^{\circ} 10' \pm 15'$$

$$30^{\circ} 10' \pm 1^{\circ} 0'$$

$$30^{\circ} 10' 30'' \pm 5' 30''$$

QUIZ

HEAT TREAT	<p>UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES. TOLERANCES ON:</p> <p>DECIMALS ANGLES</p> <p>.XX = $\pm .03$ $\pm 30'$</p> <p>.XXX = $\pm .010$</p> <p>HOLES NOTED "DRILL"</p> <p>.013 THRU .040 : $+.001-.001$.041 THRU .130 : $+.002-.001$.131 THRU .229 : $+.003-.001$.230 THRU .500 : $+.004-.001$.501 THRU .750 : $+.005-.001$.751 THRU 1.000 : $+.007-.001$ 1.001 THRU 2.000 : $+.010-.001$</p>
FINISH	
G 7 - 000024	
	DO NOT SCALE PRINT

Use this example to answer the questions listed below:

1. What heat treat requirements are called for on the example shown above? *None*

2. What are the finish requirements? *G 7 - 000024*

3. What is the maximum angle allowed for a 30° 10' call-out, according to the tolerances listed above?

$\frac{+10}{-10}$

4. What is the largest diameter a hole marked "Drill" .375 may be?

largest +.004 - .001 smallest

5. List the maximum and minimum size the following dimensions may be.

+28 a. $\frac{.25}{+.3} - .22$
 +760 b. $\frac{.750}{.010} - .740$

QUIZ

DR BY*	J SMITH	6-6-66	NORTH AMERICAN AVIATION, INC. SPACE and INFORMATION SYSTEMS DIVISION 12214 LAKEWOOD BLVD., DOWNEY, CALIFORNIA		
CHK BY	J DOE	6-7-66			
APPROVED BY			BRACKET ASSY - HYD FILTER SUPPORT		
A DOCKS 7-3-66					
			CODE IDENT NO.	SIZE	V7-314045
			03953	D	
			SCALE 1/4		SHEET 1 OF 3

Use this example to answer the questions below:

- Who drew this drawing and when was it drawn?

J. Smith - 6-6-66

- To what scale is it drawn?

1/4 (drawn on drawing - Part)

- How many sheets does this drawing consist of?

1 of 3

- What size is this drawing?

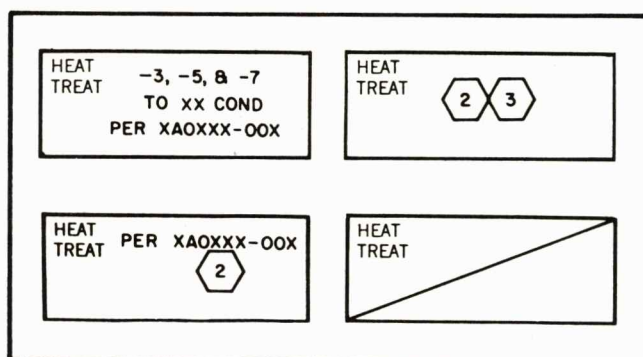
D

- To what project does it apply?

*7 - (Saturn - S-II)
Space Vehicle*

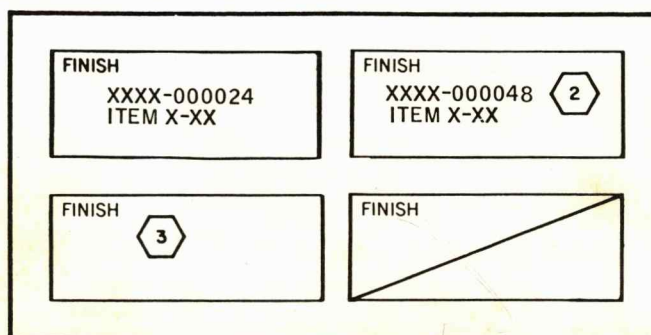
HEAT TREAT BLOCK

Heat treatment specified in this block shall be applicable to the part or individual parts of an assembly that may be given along with the appropriate specification number. If space is insufficient, a code symbol is used and complete heat treatment information is shown as a general note. When heat treat information is not required, other than those inherent with the material specified, a diagonal line is drawn from the lower left to the upper right-hand corner of the block.



FINISH BLOCK

The Finish block shall contain the proper finish specification for the part (preferably an NAA specification number) and any applicable item within the specification. If the space is insufficient, a code number is used and complete finish information shown as a general note. When finish information is not required, other than those inherent with the material called out, a diagonal line is drawn from the lower left to the upper right-hand corner of the block.



DATE AND SIGNATURE BLOCK

The initial (or initials) and surname, in full, of the draftsman shall be printed in the proper space. The date shall indicate the completion date of the drawing, filled in by the draftsman. The "CHK BY" line is reserved for Document Verification Group use only. The responsible engineer shall print his first initial and last name in the approval block. Supervisory or management approval of the drawing is established by approval signatures on all EO's relative to the drawing. However, supervisory approvals may be placed in the Signature block "APPROVED BY" area of the drawing as applicable.

The two spaces below the "APPROVED BY" spaces are used as follows: the top one may be used for additional administrative approvals or notes, but the bottom one must be left blank as it is reserved for customer use.

OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES UNLESS OTHERWISE INDICATED ANGLES ± 0.2 ± 0.10 ± 30° IS NOTED "DRILL" RU 040 + 0.01 0.01 RU 120 + 0.02 0.01 RU 229 + 0.03 0.01 RU 308 + 0.04 0.01 RU 750 + 0.05 0.01 RU 1,000 + 0.07 0.01 RU 2,000 + 0.10 0.01 NOT SCALE PRINT	DR BY	I. DOE	X-XX-XX	NORTH 92° 45' 00" E 192' 4" L
	CHK BY	U. DOE	X-XX-XX	
	APPROVED BY			
	H.E. DOE		PYLON AT	
	N.O. DOE			
	(ADMINISTRATIVE)			CODE IDENT NO. 03953
	(CUSTOMER)			
				SCALE 1/1

CODE IDENTIFICATION NUMBER BLOCK

The manufacturer's "CODE IDENT NO.," which is 03953 for this Division, is preprinted in this block.

DRAWN BY CHECKED BY DATE	FITTING - PYLON TO MISSILE, FORWARD ATTACHMENT, STA 207.000	
CODE IDENT NO. 03953	SIZE 1	XXXX-123456
SCALE 1/1		SHEET

APPLICATION (USAGE) DATA BLOCK

The Application or Usage block is a supplementary block located to the left of the Title block. It contains information regarding the usage of the part, assembly, installation, etc., depicted on the drawing.

The column headings and five lines of the block are preprinted on all standard drawing vellums.

							REQD
							HEAT TREAT
							FINISH
ITEM	QTY	MODEL	NEXT USING DRAWING		END ITEM NO.	THRU	
REQD PER END ITEM					EFFECTIVE ON		
APPLICATION (USAGE) DATA							

REQD PER END ITEM COLUMNS

ITEM COLUMN: The word "BASIC" or the applicable dash number shall be listed in the Item column. The parts (or items) listed are those which are delineated on the drawing and used on other drawings

QUANTITY COLUMN: The Quantity column is used to indicate the total number of parts or assemblies which are required to produce one complete end item, e.g., missile, console, etc. The number shown is the quantity of the parts which are used on the indicated next assembly, multiplied by the number of times the next assembly is used on a single end item.

When a neutral part or assembly has only one next using drawing (next assembly), the quantity shown can mean;

- (1) Four parts are used on the next assembly and only one of the next assembly is required per end item.

(2) Two parts are used on the next assembly (N/A) and two of the N/A are required per end item.

(3) One part is used on the N/A and four of the next assembly are required per end item.

In any case, four units are required to satisfy the demands of a single end item.

BASIC	4	X2-3	2222-456783	1	8 SUBS
ITEM	QTY	MODEL	NEXT USING	END ITEM NO.	THRU
		REQD PER END ITEM	DRAWING		EFFECTIVE ON
APPLICATION (USAGE) DATA					

When a neutral part or assembly has more than one next using drawing but only one end item, the quantities shown can mean;

(1) Two parts are used in connection with next assembly 3333-123452.

(2) Four parts are used in connection with next assembly 3333-234563.

(3) Six parts are used in connection with next assembly 3333-345674.

Therefore, a total of twelve parts must be produced in order to satisfy the requirements of a single end item.

BASIC	6	Y3-2	3333-345674	1	8 SUBS
BASIC	4	Y3-2	3333-234563	1	8 SUBS
BASIC	2	Y3-2	3333-123452	1	8 SUBS
ITEM	QTY	MODEL	NEXT USING	END ITEM NO.	THRU
		REQD PER END ITEM	DRAWING		EFFECTIVE ON
APPLICATION (USAGE) DATA					

For left-hand and right-hand assemblies having more than one next using drawing and more than one end item, the quantities shown indicate;

- (1) One left-hand (-1) and one right-hand (-2) parts are used on each 2222-543213 and 2222-453214 for the Z2-3 end item.
- (2) One left-hand (-1) and one right-hand (-2) part are used on next assembly 3333-345215 for the X3-5 end item.

The total requirements for a single Z2-3 end item are two left-hand (-1) assemblies and two right-hand (-2) assemblies. The total requirements for a single X3-5 end item are one left-hand (-1) assembly and one right-hand (-2) assembly.

-2	I	X3-5	3333-345215	/	R 9085
-1	I	X3-5	3333-345215	/	R 9085
-2	I	Z2-3	2222-453214	/	R 9085
-1	I	Z2-3	2222-453214	/	R 9085
-2	I	Z2-3	2222-543213	/	R 9085
-1	I	Z2-3	2222-543213	/	R 9085
ITEM	QTY	MODEL	NEXT USING	END ITEM NO.	THRU
REQD PER END ITEM			DRAWING	EFFECTIVE ON	
APPLICATION (USAGE) DATA					

For tabulated left-hand and right-hand assemblies having more than one next using drawing but the same end item, the quantities shown indicate that;

- (1) One each of assemblies -1, -2, -11 and -12 are used on next assembly 4444-654321.
- (2) Two each of assemblies -21 and -22 are used in connection with next assembly 4444-765433.

In order to satisfy the total requirements of a single end item, it is necessary to produce one each of assemblies -1, -2, -11, and -12, and two each of assemblies -21 and -22.

-22	2	Y4-I	4444-765433	1	8 SUBS
-21	2	Y4-I	4444-765433	1	8 SUBS
-12	1	Y4-I	4444-654321	1	8 SUBS
-11	1	Y4-I	4444-654321	1	8 SUBS
-2	1	Y4-I	4444-654321	1	8 SUBS
-1	1	Y4-I	4444-654321	1	8 SUBS
ITEM	QTY	MODEL	NEXT USING DRAWING	END ITEM NO.	THRU
REQD PER END ITEM				EFFECTIVE ON	
APPLICATION (USAGE) DATA					

MODEL COLUMN: The Model column will contain the designation of the end item. The applicable end-item designation shall be indicated for each entry of a part with different next assemblies, or for different parts, i.e., dash numbers with the same or different next assemblies.

-01	1	Z4-3	4444-34563	10	8 SUBS
-31	1	Z4-3	4444-34563	1	9
-21	1	Y3-1	3333-234561	6	8 SUBS
-11	1	Y3-1	3333-234561	1	5
BASIC		X2-2	2222-123452	1	8 SUBS
ITEM	QTY	MODEL	NEXT USING DRAWING	END ITEM NO.	THRU
REQD PER END ITEM				EFFECTIVE ON	
APPLICATION (USAGE) DATA					

NEXT USING DRAWING COLUMN: The Next Using Drawing column shall contain an entry for each using drawing for which the part or assembly is a requirement. Only the basic number shall be listed regardless of whether the next assembly is a neutral assembly, a left-hand or right-hand assembly, or a tabulated assembly. The next using drawing number is only a reference number and does not indicate necessarily an assembly as such, but rather the next usage of the part in question.

-41	1	Z4-3	4444-34563	10	8 SUBS
-31	1	Z4-3	4444-34563	1	9
-21	1	Y3-1	3333-234561	6	8 SUBS
-11	1	Y3-1	3333-234561	1	5
BASIC		X2-2	2222-123452	1	8 SUBS
ITEM	QTY	MODEL	NEXT USING DRAWING	END ITEM NO.	THRU
REQD PER END ITEM				EFFECTIVE ON	
APPLICATION (USAGE) DATA					

QUIZ

-5	7	Y3-1	V7-403002	21	33
-3	7	Y3-1	V7-403002	21	33
-5	5	Y4-1	V7-325001	1	20
-3	5	Y4-1	V7-325001	1	20
ITEM	QTY	MODEL	NEXT USING DRAWING	END ITEM NO.	THRU
REQD PER END ITEM				EFFECTIVE ON	
APPLICATION (USAGE) DATA					

Use this example to answer the questions listed below:

- How many -3 are required to satisfy the needs of the V7-32 5001 drawing? 100
- How many -3 are required to satisfy all requirements? ~~340~~ 191
- How many parts must be made to satisfy all requirements for the Y3-1 model? ~~140~~ 182
- How many -5 are required to satisfy the needs for the Y3-1 model? 99
- What is the total number of parts that must be made? ~~380~~ 382

NOTES

EFFECTIVE ON COLUMN: The Effect On columns of the Application (Usage)

Data block are used to indicate the end-item (Model) serial number and change point effectivity of the listed parts. Space is provided for listing the AF serial numbers when applicable. A single end item effectivity is shown by listing the specific end-item number followed by the word "only".

Full contract effectivity is shown by listing "1 & SUBS" in the "End Item No/Thru" columns.

Limited effectivity is shown by listing the applicable model serial number in the appropriate columns. This accomplishes the same purpose as the former "serial number coding" method, and indicates non-interchangeability of listed parts. This is also known as "firm coding".

(2)	{	(3)	-401	1	X5-7	XXXX-XXXXX5	22	ONLY
		-501	1	X3-7	3333-345678	21, 23	& SUBS	
		-201	1	X3-7	3333-234567	!!	20	
		-101	1	X5-7	3535-234567	!	10	
(1)		BASIS	1	22-6	2222-123456	!	& SUBS	
			ITEM QTY	MODEL	NEXT USING	END ITEM NO.	THRU	
			REQS PER END ITEM		DRAWING	EFFECTIVE ON		
APPLICATION (USAGE) DATA								

NOTES: (1) Contract effectivity notation

(2) Firm serial number coding. Non-interchangeable items

(3) Single end item notation

LIST OF MATERIALS OR PARTS LIST

The list of Material (L/M) or Parts List (P/L) shall show all materials and parts which are necessary to produce the part or assembly. All parts or components which are called out as requirements on the field of the drawing shall be shown in the list of Material and, conversely, all entries in the List of Material must be called out as requirements on the field of the drawing except:

"Conventional" rivets that are called out by use of Design Standards are not to be listed in the L/M but will only be called out on the field of the drawing. The Design standard lists those rivets classed as "conventional".

Certain items classed as "burden" such as paint, putty, grease, non-electrical wire, etc., are not listed on production drawings.

								020
								019
4	UG-XXX/U	ADAPTER	ZZZZZ	KV-XX-XX	KING ELEC CO TUCKHOE, NY	3		018
8	NMC-GXXH-A	GROMMET	YYYYY		NYLON MOLDING CORP.(ONLY) GARWOOD, N.J.	5		017
2	MEXXX-XXXX-XXXX	CAPACITOR			COML PART - SEE SPEC CONTROL DWG	4		016
4	NASXX-X-XXA	SPACER				4		015
1	MRXXWXOACMA	AMMETER			MIL-X-X	3		014
4	MSXXXXX-XXXX	MOUNT			GFE GOVT INSTL AT TAC STA	5		013
4	MDXXX-XXXX	NUT				4		012
4	555-654321	BOLT				4		011
1	333-543210	BRACKET				3		010
2	444-345678	FITTING, ASSY				4, 6		009
3	444-234567	FITTING, AFT				4 6, 7		008
1	-11	SPACER		PLASTIC LAMINATE	MIL-P-XXXXTPXCLX .062 x 10.00 x 14.00	8		007
1	-9	SEAL		ACRYLIC SHEET	MIL-P-XXXX 1/8 x 10.00 x 12.00	4		006
1	-7	COVER		AL PL	QQ-X-XXX, 2024-T42 .250 x 10.00 x 12.00	5		005
4	-5	BEAM		AL SHAPE	QQ-X-XXX, 7075-T6 XE5XX x 12.00	2, 4 6, 8		004
1	-4	FITTING, RH		ALCLAD SH	QQ-X-XXX, 7075-T6 .090 x 10.00 x 14.00	7		003
1	-3	FITTING, LH		ALCLAD SH	QQ-X-XXX, 7075-T6 .090 x 10.00 x 14.00	7		002
	444-123456	ASSEMBLY						001
QTY REQD	QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	CODE IDENT	MATERIAL	DATA: SPECIFICATION SIZES, NOTES, SUPPLIERS	ZONE	LINE NO.
LIST OF MATERIAL OR PARTS LIST								

PART OR IDENTIFYING NUMBER COLUMN

The first line of the Part Number column shall contain the drawing number.

The second and succeeding lines shall contain:

- A. The dash numbers of parts which are detailed on the drawing except -1 and -2.
- B. The part number of all parts and components used on neutral, left-hand and right-hand assemblies, tabulated assemblies, installations, etc.

When a drawing is first released or redrawn completely for re-release, parts used on an assembly will be grouped starting from the bottom, according to the following sequence:

- (1) Dash numbers of parts that are detailed on the drawing.
- (2) Parts generated at this Division under the same Model, General Order or Project number.
- (3) Parts generated at this Division under other Model, General Order or Project numbers than the basic model number of the drawing on which they are used.
- (4) Corporate or any NAA Division Standard Part number.
- (5) Military standard parts (MS, AN, etc.).
- (6) Parts governed by a military specification.
- (7) Industry standard parts (NAS, NASA, etc.).
- (8) Controlled commercial parts (SCD's).

- (9) Other NAA Division production parts.
- (10) Uncontrolled commercial parts.
- (11) Bulk items covered by military specifications.
- (12) Bulk items covered by NAA specifications.
- (13) Bulk items covered by commercial specifications.

The sequential group listing given can be divided into three main divisions. Numbers 1 thru 4 are NAA parts, numbers 5 thru 10 are classed as Outside parts, and numbers 11, 12, and 13 are considered Bulk items, i.e., items such as wire, sleeving, insulation, etc., that do not have part numbers.

						4	UG-XXX/U	ADAP
						8	NMC-GXXH-A	GROM
						2	MEXXX-XXXX-XXXX	CAPA
						4	NAS XX-X-XXA	SPAC
						1	MRXXWXOOACMA	AMM
						4	MSXXXXX-XXXX	NL
						4	MDXXX-XXXX	NL
						4	5555-65432I	BOI
						1	3333-5432IO	BRAC
						1	2222-432IO6	CLJ
						2	4444-345678	FITTING
						3	4444-234567	FITTING
						1	-II	SUB A
						1	-9	SEA
						1	-7	BEA
						4	-5	COV
						1	-4	FITTING
						1	-3	FITTING
							4444-123456	ASSEM
QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD		PART OR IDENTIFYING NO.	NOMENCL OR DESC.
								LIST OF MATERIALS

NOMENCLATURE OR DESCRIPTION COLUMN

The Nomenclature or Description column shall contain the noun name of all parts appearing in the List of Material, including dash-numbered details.

If a drawing is a Detail, the noun name shall be shown in the Nomenclature column adjacent to the basic part number. If the drawing falls in the category of an Assembly, Installation, Diagram, etc., then one of the above captions shall be shown on the first line of the column as applicable.

If a dash-numbered sub-assembly or an Assembly Of is listed above the first line of the column, as a component part then the noun name of the component drawing shall be shown.

If sub-assemblies are used the words SUB-ASSY shall be listed in this column.

The noun name of standard parts as they appear on the standard drawings shall be used in the L/M of the using drawings.

1	UG-KXX/U	ADAPTER	ZZZZ	WV-XK-KX	
2	NMC-6XXH-A	GROMMET	YVYV		
3	WENTY-KXX-KXX	CAPACITOR			
4	NAS XX-X-KXA	SPACER			
1	MRKXWDOAEMA	AMMETER			
4	MSXXXXX-KXX	NUT			
4	MDKXN-KXX	NUT			
4	8558-6643E1	BOLT		100 STEEL BAR	
1	3353-543210	BRACKET	KXKX		
1	2222-432106	CLIP			
2	4444-345678	FITTING, ASSY			
3	4444-234567	FITTING, AFT			
1		SUB ASSY			
1		SEAL		ACRYLIC SHEET	
1		BEAM		2024-T42 ALCLAD PL	
4		COVER		7075-T6 AL SHAPE	
1		FITTING, RH		7075-T6 ALCLAD SH	
1		FITTING, LH		7075-T6 ALCLAD SH	
	4444-123456	ASSEMBLY			
QTY	QTY	PART OR	NOMENCLATURE	CODE	MATERIAL
REQD	REQD	IDENTIFYING NO.	OR DESCRIPTION	IDENT	
LIST OF MATERIAL OR PARTS LIST					

CODE IDENTIFICATION NUMBER COLUMN

The Code Identification column shall show the manufacturer's code identification number on all "commercial items".

	ADAPTER	ZZZZZ	KV-XX-XX	RING ELEC RD TUCKHOE, NY	3
	BROWNET	YYYYY		NYLON MOLDING CORR GARWOOD, NJ	2
XXXX	CAPACITOR			COML PART - SEE SPEC CONTROL DWG	4
XX	NUT			GEAR, 60MT INSTL AT TAC STA	4
	NUT				4
	BOLT		1018 STEEL BAR	MAY BE MADE FROM MSXXXX-XX-XX	4
	BRACKET	XXXXX		MADE FROM 195XXB BIRCHER CORP. CA, CAL	3
9	SEAL		ACRYLIC SHEET	1/8" x 10'00" x 12'00"	4
-7	BEAM		2024-T42 ALCLAD PL	80-A-362 280 x 10'00" x 12'00"	2
-5	COVER		7075-T6 AL SHAPE	80-A-277 XESXX x 12'00"	2
-4	FITTING, RH		7075-T6 ALCLAD SH	80-A-287 880 x 10'00" x 14'00"	7
-3	FITTING, LH		7075-T6 ALCLAD SH	80-A-287 880 x 10'00" x 14'00"	7
8	ASSEMBLY				1
NO	NOMENCLATURE OR DESCRIPTION	CODE IDENT	MATERIAL	DATA, SPECIFICATION SIZES, NOTES, VENDORS	ZON

LIST OF MATERIAL OR PARTS LIST

MATERIAL COLUMN

The Material column shall contain the name and configuration description of the raw-stock material for all parts which are detailed on the drawing.

	ADAPTER	ZZZZZ	KV-XX-XX	RING ELEC RD TUCKHOE, NY	3
	BROWNET	YYYYY		NYLON MOLDING CORR GARWOOD, NJ	2
XXXX	CAPACITOR			COML PART - SEE SPEC CONTROL DWG	4
XX	NUT			GEAR, 60MT INSTL AT TAC STA	4
	NUT				4
	BOLT		1018 STEEL BAR	MAY BE MADE FROM MSXXXX-XX-XX	4
	BRACKET	XXXXX		MADE FROM 195XXB BIRCHER CORP. CA, CAL	3
9	SEAL		ACRYLIC SHEET	1/8" x 10'00" x 12'00"	4
-7	BEAM		2024-T42 ALCLAD PL	80-A-362 280 x 10'00" x 12'00"	2
-5	COVER		7075-T6 AL SHAPE	80-A-277 XESXX x 12'00"	2
-4	FITTING, RH		7075-T6 ALCLAD SH	80-A-287 880 x 10'00" x 14'00"	7
-3	FITTING, LH		7075-T6 ALCLAD SH	80-A-287 880 x 10'00" x 14'00"	7
8	ASSEMBLY				1
NO	NOMENCLATURE OR DESCRIPTION	CODE IDENT	MATERIAL	DATA, SPECIFICATION SIZES, NOTES, VENDORS	ZON

LIST OF MATERIAL OR PARTS LIST

DATA COLUMN

Material specifications, material sizes, applicable notes and vendor information in that order and as required for each item shall be shown in the Data column. The listings are explained in the following paragraphs:

MATERIAL SPECIFICATION: The applicable government, NAA, or commercial specification for all raw stock which is used for parts that are detailed on the drawing shall be listed. In addition, the material composition, condition and type (if applicable) shall be included to fully describe the desired material.

MATERIAL SIZE: The material raw-stock size will be given for all parts which are detailed on the drawing.

APPLICABLE NOTES: Such notes as apply shall be placed with specific items or coded to a general note as required. The governing subject, as listed below, will determine the application of each listing.

- (1) Specification Control drawing notes.
- (2) Government furnished equipment notes.
- (3) Kit drawing notes.
- (4) Modification drawing notes.
- (5) Service notes.
- (6) Master Lines notes.
- (7) Material substitution notes.
- (8) Altered and selected part notes.

VENDOR INFORMATION: A manufacturer's or vendor's address is given for all commercial items. Only the company name and home office is required. A local supplier for a company is not specified unless such a source has been indicated in the DM or SPM.

If it becomes necessary to establish sole source procurement of a commercial part, the word (ONLY) in parenthesis is inserted following the manufacturers name when it is in the general notes or in the data column of the L/M. Otherwise equivalent parts may be substituted when authorized.

If a note is required more than once, coding to a general note is usually recommended in order to avoid repetition.

					027
					028
					025
					024
					023
					022
					021
					020
ADAPTER	ZZZZ	KV-XX-XX	KING ELEC CO TUCKHOE, NY	3	019
GROMMET	YYYY		NYLON MOLDING CORP GARWOOD, NJ	5	018
CAPACITOR			COML PART - SEE SPEC CONTROL DWG	4	017
SPACER				5	016
AMMETER			MIL - M - 6	5	015
NUT			GFAE GOVT INSTL AT TAC STA	4	014
NUT				4	013
BOLT		1018 STEEL BAR	MAY BE MADE FROM MSXXXXX-XX-XX	1	012
BRACKET	XXXXX		MAKE FROM 195XXB BIRTCHE CORP, LA, CAL	1	011
CLIP				2	010
FITTING, ASSY				4,6	009
FITTING, AFT				4,6,7	008
SUB ASSY				4,5	007
SEAL		ACRYLIC SHEET	MIL - P - 6886 1/8 x 10.00 x 12.00	4	006
BEAM		2024-142 ALCLAD PL	QQ-A-362 250 x 10.00 x 12.00	5	005
COVER		7075-T6 AL SHAPE	QQ-A-277 XE5XX x 12.00	2,4	004
FITTING, RH		7075-T6 ALCLAD SH	QQ-A-287 090 x 10.00 x 14.00	7	003
FITTING, LH		7075-T6 ALCLAD SH	QQ-A-287 090 x 10.00 x 14.00	7	002
ASSEMBLY					001
NUMERICAL REF OR DESCRIPTION	CORE IDENT	MATERIAL	DATA, SPECIFICATION SIZES, NOTES, VENDORS	ZONE	LINE NO
OF MATERIAL OR PARTS LIST					

							019
							018
							017
							016
							015
							014
	6	2543	EXTRUSION		RUBBER	MIL-R-6855 - CLASS 1 50 DUROMETER 3.0 LONG	013
	6	2542	EXTRUSION		RUBBER	MIL-R-6855 - CLASS - 1 50 DUROMETER 1.5 LONG	012
	20	NAS 221-19	SCREW				011
	5	NAS 686 A4	NUT PLATE				010
	5	NAS 1068 A3	NUT PLATE				009
	20	2W18-10 M	WASHER				008
	2	- 11	STRAP		2024-T4 CLAD ALY SHT	QQ-A-362 TEMP-T4 .050 X .75 X 5.31	007
	2	- 9	BLOCK		PHENOLIC SHT	MIL-P-8059 GRADE AA .625 X .750 X 3.25	006
	8	- 7	CLAMP		2024-T4 CLAD ALY SHT	QQ-A-362 TEMP-T4 .025 X .75 X 4.75	005
	2	- 5	PLATE		2024-T4 CLAD ALY SHT	QQ-A-362 TEMP T4 .032 X 3.375 X 4.750	004
	1	- 4	BRACKET		2024-T4 CLAD ALY SHT	QQ-A-362 TEMP T4 .063 X 9.25 X 10.125	003
	1	- 3	BRACKET		2024-T4 CLAD ALY SHT	QQ-A-362, TEMP T4 .063 X 9.25 X 10.12	002
		V7-314045	ASSY				001
QTY REQD	QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	CODE IDENT	MATERIAL	DATA: SPECIFICATION SIZES, NOTES, SUPPLIERS	LINE NO.

LIST OF MATERIAL OR PARTS LIST

QUIZ

Use the list of materials on the preceding page to answer these questions:

1. What is the full part number for the clamp? *V7-3140-5-7*
2. What is the material specification for the -9 block?
mil - P-8059 - Grade AA - .625 X .750 X 3.25
3. How many nutplates are needed to fabricate one assembly? *10*
4. What are the material dimensions for the plate? *2024-T4*
5. What material is used to make the 2542 extrusion? *Rubber*
6. What is the total number of parts required to make one assembly? *13*
7. What is the part number for the screw? *NAS 221-19*
8. What is the number of the drawing? *V7-3140-45*
9. On what line does the 2W18-10M washer entry appear? *008*
10. What is the length of the 2543 extrusion? *3.0 long*

ZONE COLUMN

The Zone column shall list the zone or zones where the part is called out on the field of the drawing. Zoning is not used on "C", "D" or "E" size drawings.

				023
				022
				021
				020
ZZZZ	KV-XX-XX	KING ELEC CO TUCKAHOE, NY	3	019
YYYY		NYLON MOLDING CORP BARWOOD, NJ	5	018
		CONL PART - SEE SPEC CONTROL DWG	4	017
			3	016
		MIL - M-6	5	015
		G.A. GOMT INSTL AT TAC STA	4	014
			4	013
	1018 STEEL BAR	MAY BE MADE FROM MSXXXX-XX-XX	4	012
XXXX		MAKE FROM 195X18 BIRCHER CORP, LA, CAL	3	011
			2	010
			4,6	009
			4,6,7	008
			4,5	007
	ACRYLIC SHEET	MIL - P-6806 1/8 x 10.00 x 12.00	4	006
	2024-T42 ALCLAD PL	80-A-262 280 x 10.00 x 12.00	5	005
	7075-T6 AL SHAPE	80-A-277 XESXX x 12.00	2,4 6,8	004
	7075-T6 ALCLAD SH	80-A-287 800 x 10.00 x 14.00	7	003
	7075-T6 ALCLAD SH	80-A-287 890 x 10.00 x 14.00	7	002
				001
CODE IDENT	MATERIAL	DATA SPECIFICATION SIZES, NOTES, VENDORS	ZONE	LINE NO.
OR PARTS LIST				
NORTH AMERICAN AVIATION, INC. SPACE AND INFORMATION SYSTEMS DIVISION 14274 EASTWOOD BLVD, POWELL, CALIFORNIA				

LINE NUMBER COLUMN

A sequence item number, as preprinted in the Line Number Column, shall be assigned for each item listed in the List of Material or Parts List, beginning with number one (001) for the first item listed.

QUANTITY REQUIRED COLUMNS

The use of the "Quantity Required" columns will vary according to the type of parts or drawing.

Basic dash number variations are noted on line 001. The quantity of "1" shall never be shown on this line, i.e., the quantity required for one part (detail, assembly, etc.) is always implied as "1", on line 001. On details, this line is reserved for indicating LH (-1) and RH (-2) parts, if the part is a "shown and "opposite" configuration. Line 001 on assemblies would similarly indicate by appropriate dash number(s) any neutral assemblies and sub-assemblies. If there are no dash number variations the QTY REQD blocks on line 001 are left blank.

Quantities required of parts listed in a L/M start on line 002, tabulated details excepted.

On assembly drawings the quantity required of each component listed is shown in the QTY REQD column(s). This "unit quantity" notation directs the procurement and assembly of the listed definitive part numbers, regardless of the fact that the part number may define a single item, an assemblage of items, etc.

NEUTRAL DETAIL PARTS: The QTY REQD columns shall be left vacant on drawings of neutral detail parts.

[illegible]

A NEUTRAL DETAIL PART

LEFT-HAND AND RIGHT HAND DETAIL PARTS: For left-hand and right-hand detail parts, a dash one (-1) shall be inserted on the first line of the first column (to the left of the Part or Identifying Number column) and a dash two (-2) shall be inserted on the first line of the second column. LH and RH are printed in below the words QTY REQD as applicable.

LH SHOWN RH OPPOSITE												
										-2	-1	666
						QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	IDE
										RH	LH	
						HEAT						UNLESS OTHERWISE SPECIFIED

LH & RH DETAIL PARTS

TABULATED DETAIL PARTS: For tabulated detail parts, the dash numbered parts shall be listed one above the other in the Part or Identifying Number column, but no requirements shall be listed in the QTY REQD columns.

							-11	CLIP	
							-9	↑	
							-7	↓	
							-5		
							-3	CLIP	
							777-891234		
	QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION	CODE IDENT

TABULATED DETAIL PARTS

						4	UG-XXX/U	ADAPTER
						8	NMC-GXXH-A	GROMMET
						2	MEXXX-XXXX-XXXX	CAPACITOR
						4	NAS XX-X-XXA	SPACER
						1	MRXXWX00ACMA	AMMETER
						1	-9	SEAL
						1	-7	BEAM
						4	-5	COVER
						1	-4	FITTINGS,R
						1	-3	FITTINGS,LH
							444-123456	ASSEMBLY
QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD		PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION
						LIST OF MATERIALS		

41

SUB-ASSEMBLIES: Groups of parts which are fastened together permanently by riveting, welding, soldering, brazing, etc., normally are drawn as an individual unit and termed an "Assembly Off" in the title, but not in the Nomenclature column.

The detailed parts of the sub-assembly are assigned dash numbers of the main assembly. The complete sub-assembly will be assigned a dash number in the same sequence as tabulated assemblies. The Nomenclature and Description column shall show the term SUB-ASSY for these assembly listing.

LH SHOWN RH OPPOSITE								
	6	6			6	6	MSXXXX-XXXX	NUT
	6	6			6	6	MSXXXX-XXXX	BOLT
	1						555-777112-2	CLIP AFT
		1					555-777112-1	CLIP FWD
					1		555-777111-2	ARM RH
						1	555-777111-1	ARM LH
	1				1		-12	SUB-ASSY
		1				1	-11	SUB ASSY
			2	2			-9	SEAL
			1	1			-7	BEAM
			1	1			-5	COVER
			1				-4	FITTING RH
				1			-3	FITTING LH
	-22	-21	-12	-11	-2	-1	555-567891	ASSEMBLY
	QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	PART OR IDENTIFYING NO.	NOMENCLATURE OR DESCRIPTION
	RH	LH	RH	LH	RH	LH	LIST OF MATERIAL	
HEAT TREAT						UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES. TOLERANCES ON:		OR BY
								CHK BY
SUB-ASSEMBLY REQUIREMENTS LISTED								

SUB-ASSEMBLY REQUIREMENTS LISTED

REVISIONS BLOCK

The Revisions Block is located in the upper right-hand corner of the drawing form. The column headings are preprinted on all standard drawing vellums. The revision block is used as a permanent record of all changes made to the drawing. Drawing revisions originate from a variety of sources and may be made for many reasons. Design changes, manufacturing and assembly difficulties, additions, deletions and changes to mating parts, and many more, may all culminate in a drawing revision. Until such time that a revision is incorporated to the print, the Engineering Order issued effecting the change will be attached to the back of the print. Under the present system, revisions are listed on a revisions record attached to the drawing.

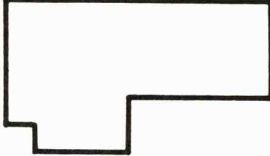
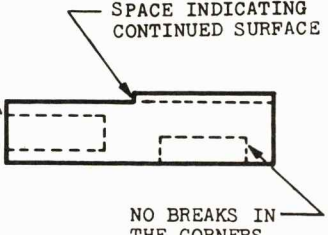
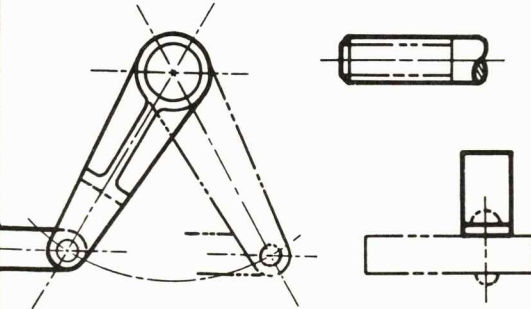
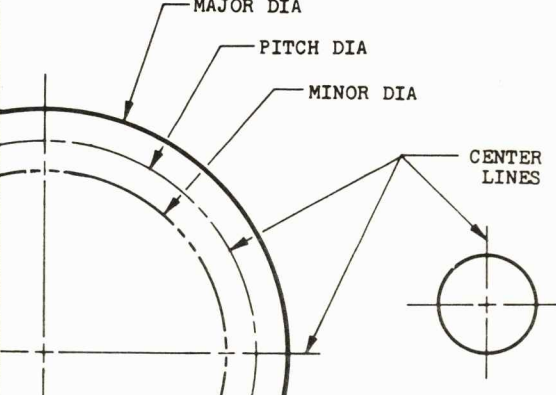
REVISIONS				
SYM	ZONE	DESCRIPTION	DATE	APPROVED
①		1. MAY BE REWORKED 3. RECORD CHANGE 2. CANNOT BE REWORKED 4. NOW SHOP PRACTICE 5. PARTS MADE O.K.	DIS	
②	11	③	⑤	⑥
A		④ SEE REVISIONS RECORD		X-XX-XX J. SMITH
				⑦
		⑨		⑧
		⑩		

1. Symbol column for revision letters
2. Enter the revision letter of each revision, A, B, etc., in the Symbol column opposite the first entry.
3. Enter the first entry opposite the revision letter. Normally the first entry is item number "1"; in cases of redraws, the first entry is unnumbered, and the second entry becomes item number "1".

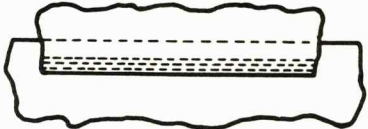
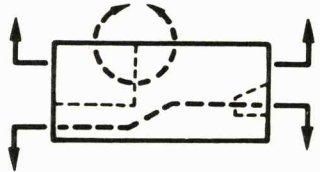
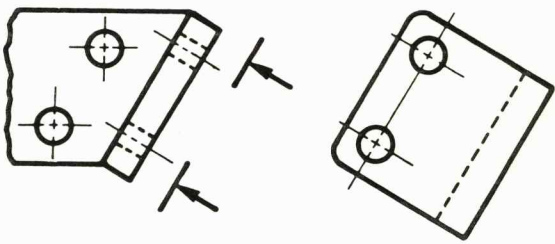
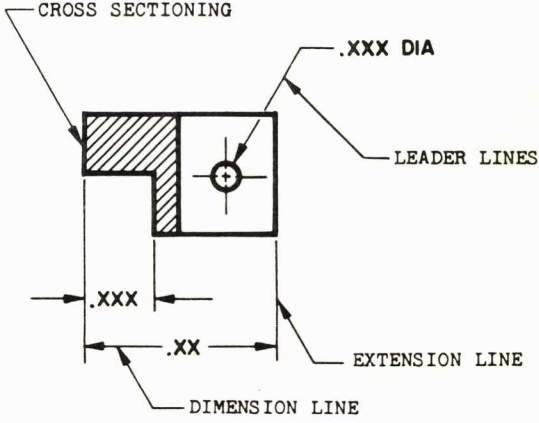
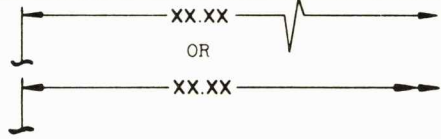
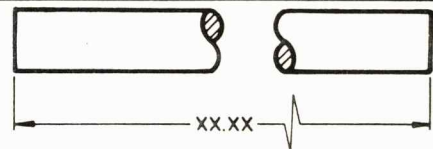
- ④ Enter succeeding item numbers 2, 3, etc. opposite the first line of the corresponding entry.
- ⑤ DISPOSITION COLUMN for the code number of the parts made disposition for each entry. The disposition code number shall be on the same line as the corresponding item number.
- ⑥ Enter numbers of incorporated, superseded, or rework EO's, RDC's and MCR's relative to the revision entry; these entries shall begin opposite the first line of the corresponding entry unless bracketed.
- ⑦ DATE COLUMN for the date of the revision.
- ⑧ SIGNATURE COLUMN for the signature of the engineer (s) making the drawing revision. The date and signature entries shall be made opposite the "Effect On" entry.
- ⑨ The effectivity, or "Effect On," of each revision having a code number of 1 or 5 disposition shall be entered below the last numbered item.
- ⑩ Scheduling will draw the line closing out the particular lettered revision after all effectivity entries are made. Engineering will draw the close-out line when the complete revision is code 3 RECORD.
- ⑪ ZONE COLUMN appears in the format for "J" size drawings only. Enter the zone number where the particular revision is made on the field of the drawing. Enter the applicable abbreviation if a revision affects the L/M, G/N, T/B, and U/B.

LINEWORK


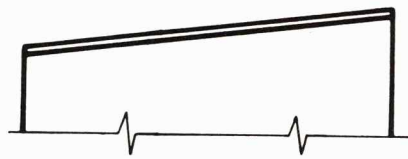

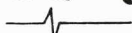
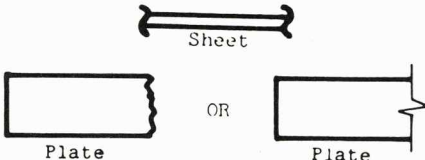

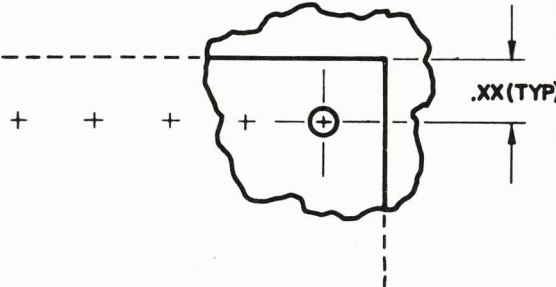

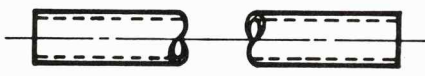
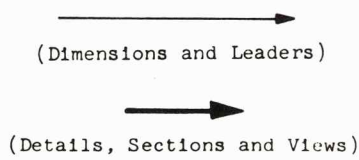
The types of lines and symbols shown in the following figures are standards and must be used on all drawings. Line weight may vary to suit the drawing or size of part. However weights should provide contrast from thick to medium to thin as indicated in this section.

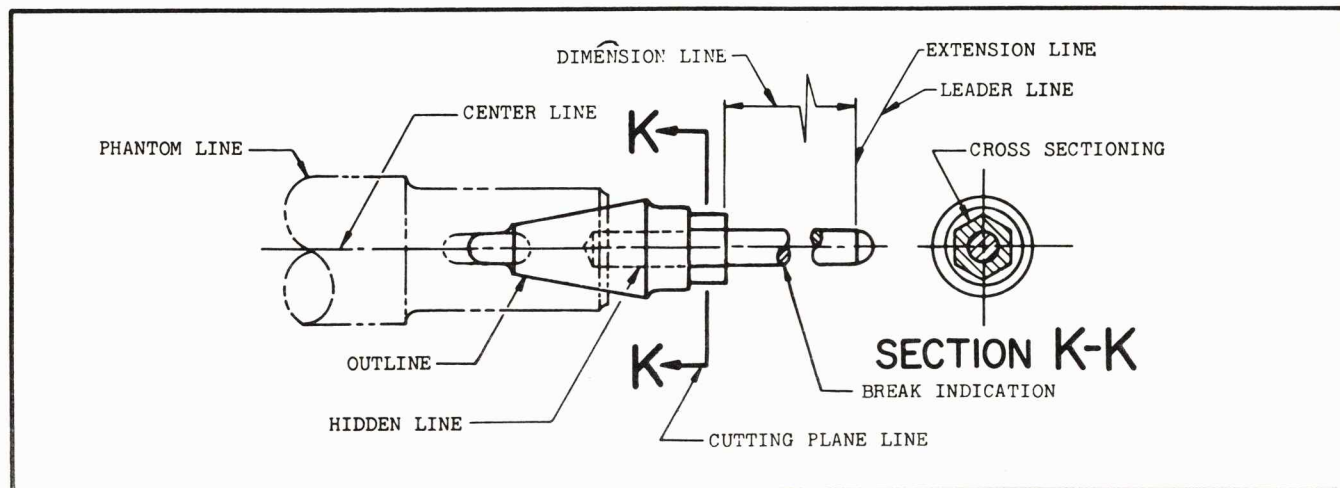
<p>OUTLINE (VISIBLE)</p>	<p>Outline of part. Width may vary slightly to suit part size, but must show contrast to distinguish entire outline from supplementary lines.</p> <p style="text-align: center;">————— THICK</p>	
<p>OUTLINE (HIDDEN)</p>	<p>Lines of parts not visible in view shown. Short, uniform dashes and spaces, length of dash may vary to suit size of part.</p> <p style="text-align: center;">----- MEDIUM</p>	<p>NO SPACE WHEN HIDDEN LINE STARTS AT A SURFACE</p> <p>SPACE INDICATING CONTINUED SURFACE</p> <p>NO BREAKS IN THE CORNERS</p> 
<p>DATUM, PHANTOM OR REFERENCE</p>	<p>Indicates parts shown in reference only, such as absent parts, alternate positions, machine allowance and threads; reference planes, lines and positions; bend, parting and mold lines; minor diameters of gears, splines and serrated shafts; and repeated detail and movement. See section 10-7514 for installation drawing usage.</p> <p style="text-align: center;">----- MEDIUM</p>	
<p>CENTER</p>	<p>For all center lines and pitch diameters of gears. One long and one short, uniform, evenly spaced dash.</p> <p style="text-align: center;">----- THIN</p>	<p>MAJOR DIA</p> <p>PITCH DIA</p> <p>MINOR DIA</p> <p>CENTER LINES</p> 

LINEWORK

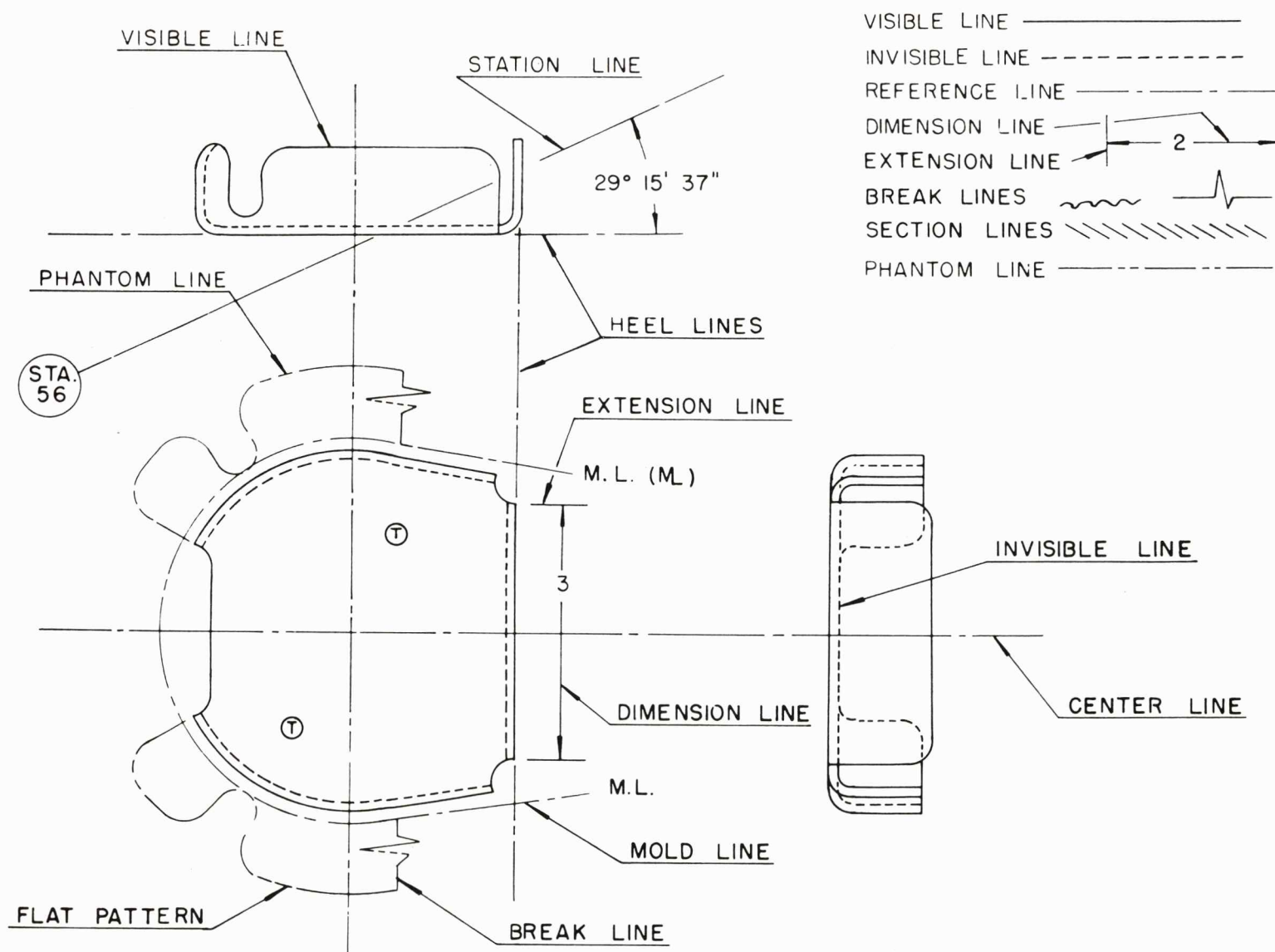
STITCH	Indicates sewing. Very short, uniform dashes and spaces. ----- MEDIUM	
CUTTING PLANE	Cutting plane location or detail indicator. A straight cutting plane is a solid line not intersecting the outline. Offset or complex cutting planes and detail indicators are a series of uniform, evenly spaced dashes. See section 10-7130. ----- THICK	
VIEWING PLANE	Viewing plane location indicators. Solid line with the arrow pointing to the center. See section 10-7110. ——— THICK	
DIMENSION	Dimensions. Thin unbroken lines, except at dimensions, ——— THIN	
EXTENSION	Indicates dimension limits. ——— THIN	
LEADER	Notes, part circles, etc. Leader lines shall change direction only once, and when drawn to symmetrical features, shall be in line with the center. ——— THIN	
CROSS SECTION	Indicates exposed cut section of material. Evenly spaced lines. ////// THIN	
CONFINED DIMENSION	Used when the area to the reference or extension line is blocked by other dimensions, parts, etc. or when a part is shortened by a break. ——— THIN	
		

LINEWORK

B R E A K I N D I C A T O R S	LONG	Large parts.  THIN	
	SHORT	Small parts.  THICK  THIN	
	BREAKAWAY	Breakaway for access to solid lines.  THICK	
	CYLINDRICAL	Solid	
		Tube, Pipe, Etc.	
	ARROWHEAD	Designates line or object intended for callout. Head length approximately three times the width. Length, usually .12 inch, should not vary on any one drawing except that arrows for Details, Sections and Views are made extra large	

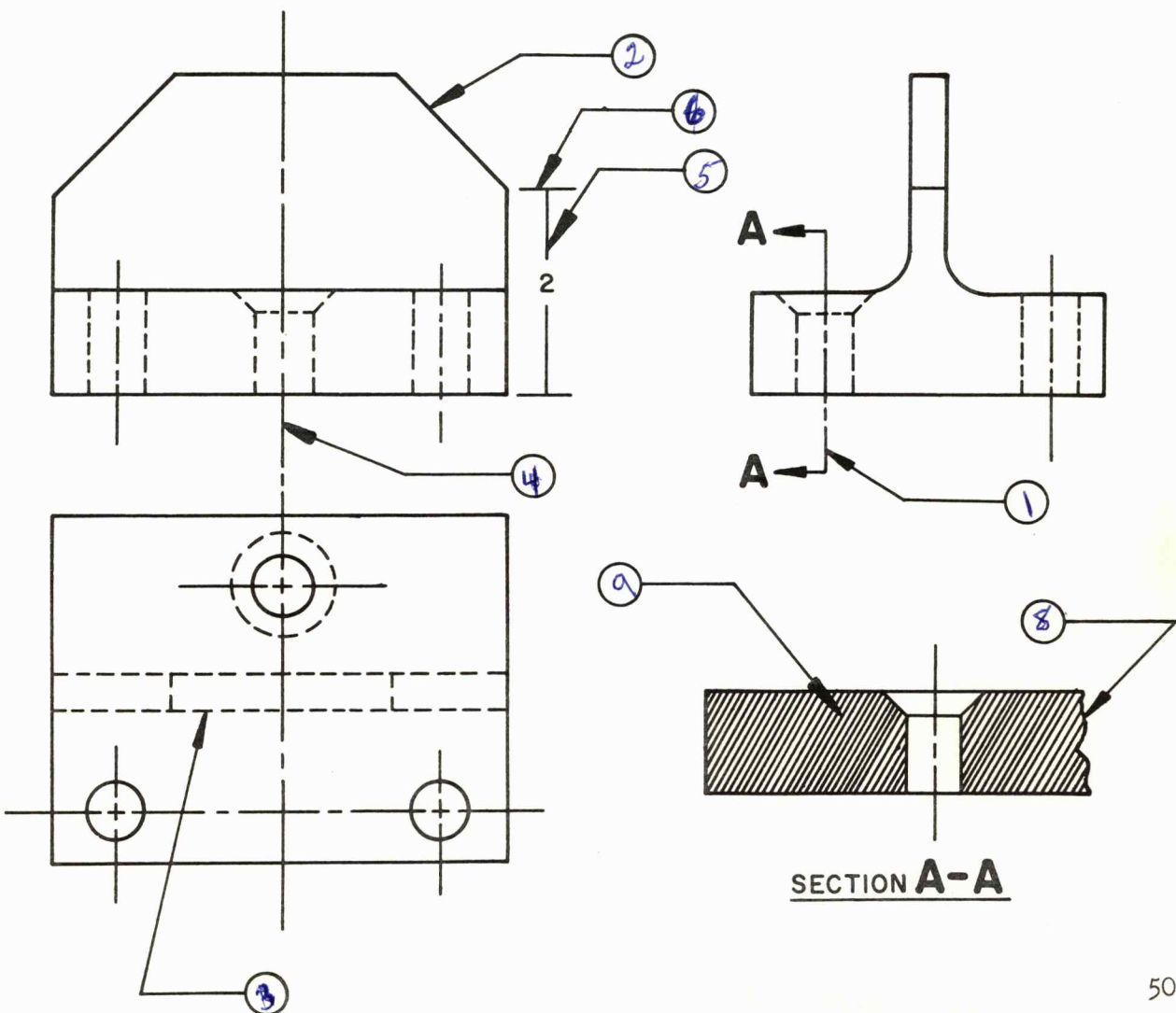


TYPICAL USE OF LINES



- 1 CUTTING PLANE LINE
- 2 VISIBLE LINE
- 3 INVISIBLE LINE
- 4 REFERENCE LINE
- 5 DIMENSION LINE
- 6 EXTENSION LINE
- 7 PHANTOM LINE
- 8 BREAK LINE
- 9 SECTION LINE

Find **and** match the correct number corresponding to the description of the indicated lines.

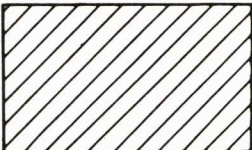
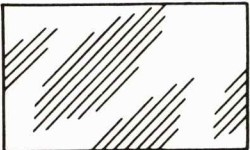
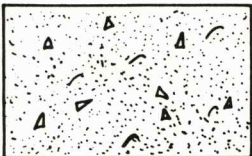

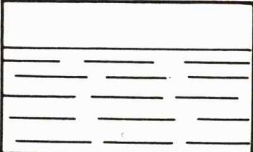
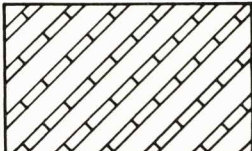
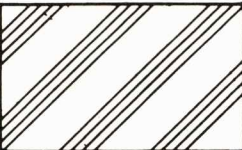
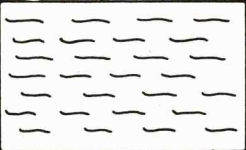
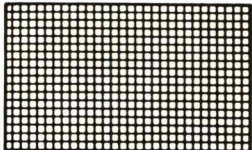


SECTION LINES

Cross-section conventions are used to distinguish the individual components of an assembly on the exposed surfaces of a sectional view.

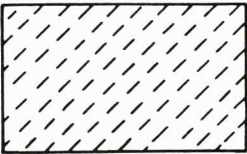
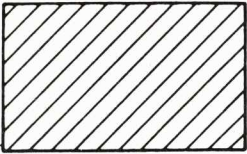
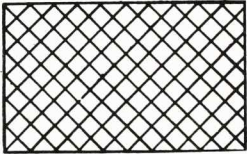
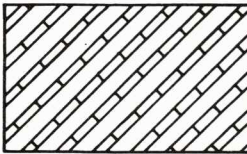
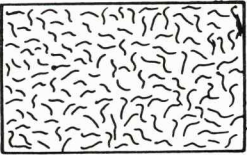
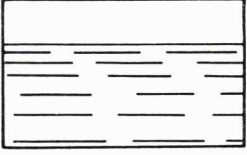
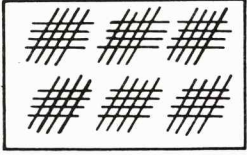
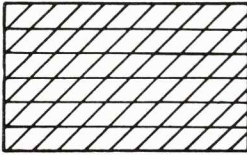
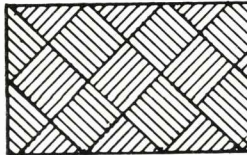
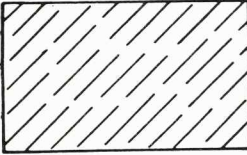
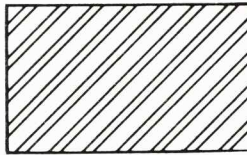
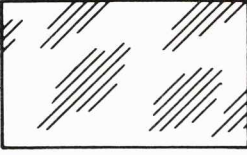
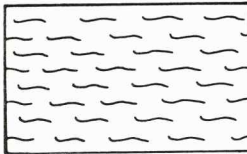
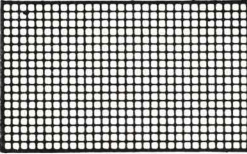
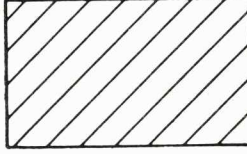

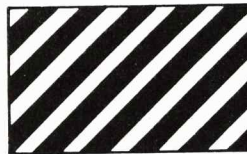
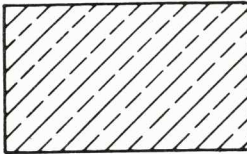
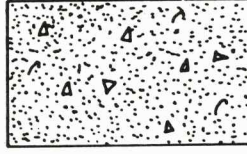
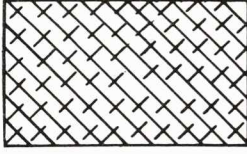
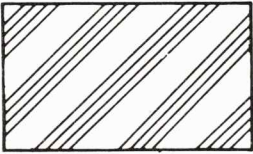
Detail drawings and all drawings showing only one material shall be sectioned as metal regardless of the material.

The simplified sectioning conventions shown are the preferred forms and should be used wherever practical.

		
METALS AND DETAIL DRAWINGS	GLASS, CERAMICS, AND PLASTIC	CONCRETE MASONRY, TILE, CINDER BLOCK
		
METIALLOIDS AS GRAPHITE, BORON SULFHUR, SILICON, MARBLE, PORCELAIN, AND SLATE	LIQUIDS AND FLUIDS	SPECIAL OR OTHER MATERIAL (IDENTIFY ON DRAWING)
		
INSULATING MATERIALS- ELECTRIC, SOUND, AND HEAT, MICA, RUBBER	FIBRE, FABRIC AND COMPOSITIONS, CORK, FELT, LEATHER, PACKINGS, AND GASKET	ELECTRIC WINDINGS, TRANSFORMERS MAGNETS, ETC.

SIMPLIFIED CONVENTIONS

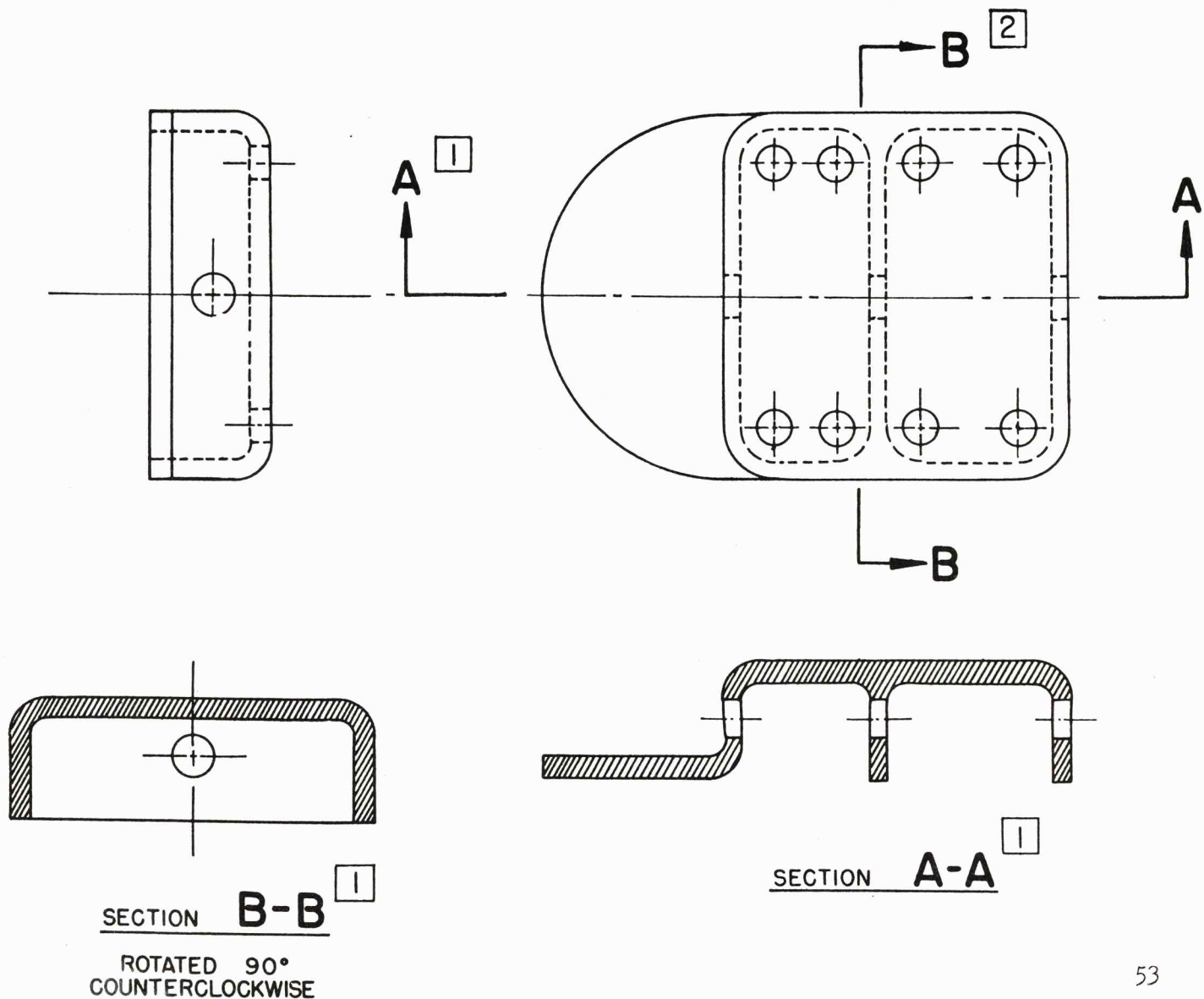
CROSS SECTIONING

			
METALLOIDS, AS GRAPHITE BORON, SILICON, ETC	CAST IRON MALLEABLE IRON AND DETAIL DRAWINGS	ZINC, LEAD, BABBITT, AND SIMILAR ALLOYS	SPECIAL OR OTHER MATERIAL (IDENTIFY ON DRAWING)
			
SOUND AND HEAT INSULATION, CORK	LIQUIDS AND FLUIDS	COMPOSITION FIBRE BOARDS, MASONITE, ETC.	MICA, OPAQUE PLASTICS, PHENOLICS
			
GROUND OR EARTH	MARBLE, SLATE, PORCELAIN, CERAMICS	STEEL AND WROUGHT IRON	TRANSPARENT MATERIAL AS GLASS, LUCITE, PLEXIGLASS, ETC.
			
FLEX MATERIAL, FABRIC, FELT, LEATHER. ETC.	ELECTRICAL WINDINGS, TRANSFORMERS, MAGNETS ETC,	BRICK, MASONRY, TILE	WOOD ACROSS GRAIN (TOP) WITH GRAIN (BOTTOM)
			
RUBBER NATURAL AND SYNTHETIC	COPPER, BRASS, AND COPPER ALLOYS	CONCRETE CINDER BLOCK	ALUMINUM, MAGNESIUM, AND ALLOYS.
			
ELECTRIC INSULATION			

COMPREHENSIVE CONVENTIONS

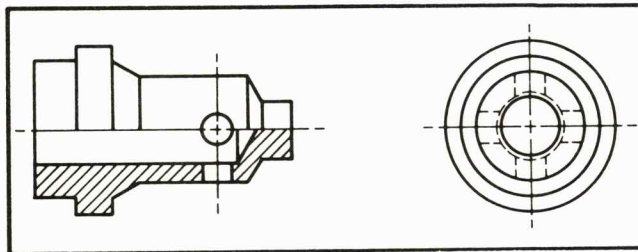
SECTIONAL VIEWS

Cross-sectional views or sections are used when the inside construction of a part cannot be clearly shown by the other views. The section is taken from the part at the cutting plane. The view may be rotated when the section applies to more than one cutting plane. The note, VIEW ROTATED X° will be placed below the sectional view. Visible and invisible outlines beyond the cutting plane are not shown unless necessary for the description of the part. The zone number from which the sectional view is taken, is cross-referenced with the zone where the view is located.

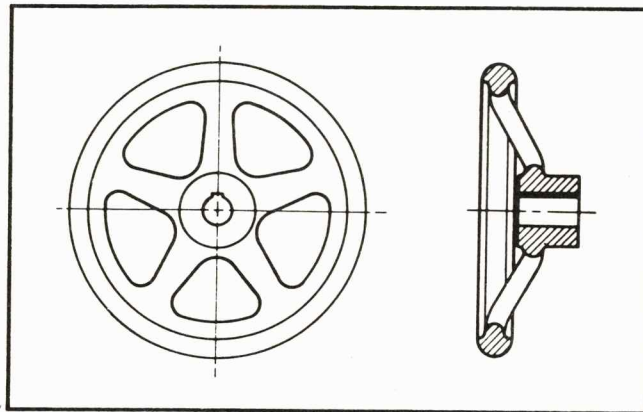


SECTIONAL VIEWS

A half section is a view of a symmetrical object which shows the internal and external features. This is accomplished by passing two cutting planes at right angles to each other along the center lines or symmetrical axes. Thus, one quarter of the object is considered removed and the interior exposed to view. The cutting plane indications and section titles are omitted.














When the true projection of a part may be misleading, parts such as ribs, spokes, and similar elements will be shown as if rotated into the cutting plane.





SYMBOLS FOR GENERAL USE

The following general symbols will be used where applicable on drawings. The usage of additional symbols is described or illustrated in those sections of the Drafting Room Manual devoted to the specific subject with which the symbols are associated (e.g., surface finish, welding, etc.)

SYMBOLS FOR GENERAL USE

NOMENCLATURE	SYMBOL	DESCRIPTION
CODE SYMBOL	 OR 	A 3/8 HEXAGON WITH A VARIABLE 1/8 NUMBER ENCLOSED IS USED FOR CODING OR CROSS REFERENCING NOTES, CALLOUTS, ETC. ON DRAWINGS. IN GENERAL NOTES AND THE REVISIONS BLOCK AREA A 1/4 HEX MAY BE USED FOR A SINGLE DIGIT.
EO CODE SYMBOL		A 1/4 DIAMETER CIRCLE WITH A VARIABLE 1/8 NUMBER ENCLOSED USED FOR CODING ON ENGINEERING ORDERS ONLY. SEE ABOVE FOR DRAWING CODING.
DASH NUMBER CALLOUT CIRCLE		A 1/2 DIAMETER CIRCLE WITH A VARIABLE 1/8 DASH NUMBER ENCLOSED. TO BE USED FOR ALL DASH NUMBER CALLOUTS USED ON THE FIELD OF DRAWINGS EXCEPT THOSE PRECEDED BY A PART NUMBER.
REVISION ITEM SYMBOL		A 9/16 BY 60° ELLIPSE WITH A VARIABLE 1/8 LETTER AND NUMBER ENCLOSED. THIS INDICATES THE DRAWING REVISION LETTER AND ITEM NUMBER UNDER THAT REVISION LETTER.
STATION AND PLANE (MASTER LINES) LOCATION SYMBOL	 OR 	A 3/4 DIAMETER CIRCLE OR A 7/8 BY 45° (APPROXIMATE) ELLIPSE WITH 1/8 STATION (STA) OR PLANE (BP, WP, ETC) NUMBER ENCLOSED. USED TO IDENTIFY WING, FUSELAGE, EMPENNAGE STATIONS OR PLANES.
ZONE REFERENCE BLOCK	 OR 	A 3/8 SQUARE WITH A VARIABLE 1/4 NUMBER (& LETTER IF REQD) ENCLOSED. TO BE USED FOR ZONE REFERENCING ON J SIZE DRAWINGS.
TOOLING POINT SYMBOLS	 OR 	A 1/4 SQUARE WITH DIAGONAL LINES, SHOWN (SOLID LINES) AND HIDDEN (DASHED LINES). USED TO INDICATE TOOLING POINTS ON CASTING DRAWINGS.

SYMBOLS FOR GENERAL USE

NOMENCLATURE	SYMBOL	DESCRIPTION
CENTER LINE SYMBOL		TO IDENTIFY A CENTER LINE WHEN NOT CLEARLY DEFINED.
HEEL LINE SYMBOL	H	SYMBOL NOT RECOMMENDED; GENERAL NOTE REQUIRED IF USED. USE OF ABBREVIATION "HL" PREFERRED. SYMBOL H DENOTES HEEL LINE
MOLD LINE SYMBOL	M	SYMBOL NOT RECOMMENDED; GENERAL NOTE REQUIRED IF USED. USE OF ABBREVIATION "ML" PREFERRED. SYMBOL M DENOTES MOLD LINE
EQUAL SPACES SYMBOL		SYMBOL NOT RECOMMENDED; GENERAL NOTE REQUIRED IF USED. USE OF ABBREVIATIONS "EQ SP" PREFERRED. SYMBOL f DENOTES EQUAL SPACES
"AND" SYMBOL	& OR &	FOR USE IN PLACE OF THE WORD "AND" WHEN DESIRED.
"BY" SYMBOL	x	USED WHEN CALLING OUT MULTIPLE DIMENSIONS, e.g., 2 x 4 x 6
DEGREES, MINUTES AND SECONDS SYMBOLS	° ' "	USED WITH NUMERICAL VALUES TO DENOTE DEGREES, MINUTES, AND SECONDS, e. g., 15° 10' 30" OR 30° 10' ± 1° 0'
PLUS OR MINUS SYMBOLS	±	USED IN COMBINATION OR INDIVIDUALLY WITH NUMERICAL VALUES, e.g. 1.250 ^{+0.005}/_{-0.000} OR 1.250 ± .005
NUMBER & GAGE SYMBOL	#	FOR USE WITH SCREW & DRILL SIZE AND WIRE GAGE CALLOUTS ONLY, e.g. DR #10(.1935) OR #20 WIRE GAGE
DASH NUMBER REFERENCE	-3 (REF)	A 1/8 DASH NUMBER (WITHOUT THE CALLOUT CIRCLE) FOLLOWED BY (REF) IN PARENTHESIS. USED FOR A DASH NUMBER REFERENCE CALLOUT ON ITS OWN ASSEMBLY DRAWING.
GFAE CONTRACTOR INSTALLED	NONE	"GFAE CONTR INSTL" IS NOTED IN DATA COLUMN OF THE L/M OR IF INSUFFICIENT ROOM IT IS CODED TO A GENERAL NOTE. GFAE IS THE ABBREVIATION FOR "GOVERNMENT FURNISHED AIRCRAFT EQUIPMENT."
GFAE TEMPORARILY INSTALLED	NONE	"GFAE TEMPORARILY INSTL" IS NOTED IN THE DATA COLUMN OF THE L/M OR P/L. IF THERE IS INSUFFICIENT ROOM IT IS CODED TO A GENERAL NOTE. TEMPORARY INSTALLATION IS FOR CHECKING.
GFAE GOVT INSTL AT TACTICAL STA	NONE	"GFAE GOVT INSTL AT TAC STA" IS NOTED IN THE DATA COLUMN OF THE LIST OF MATERIAL OR PARTS LIST. IF THERE IS INSUFFICIENT ROOM IT IS CODED TO A GENERAL NOTE.

PROJECTIONS AND VIEWS

Blueprints are copies of mechanical drawings, and most mechanical drawings are orthographic projections. There are three simple views in orthographic projections: all the dimensions are shown, the proportions are true, and there is no distortion. The draftsman has "taken the object apart", showing one principle face and one or more adjoining faces. Drawings of the adjoining faces are not connected to the principle face, but are directly above, to the left, or to the right of the principle face.

Third angle orthographic projections are the standard for engineering drawings as illustrated; however, there are six views of a third-angle projection; top, front, bottom, left side, right side, and rear. Of the six possible views, only those are used which are necessary to depict the object for purposes of manufacturing, inspection, assembly, erection, maintenance, etc.

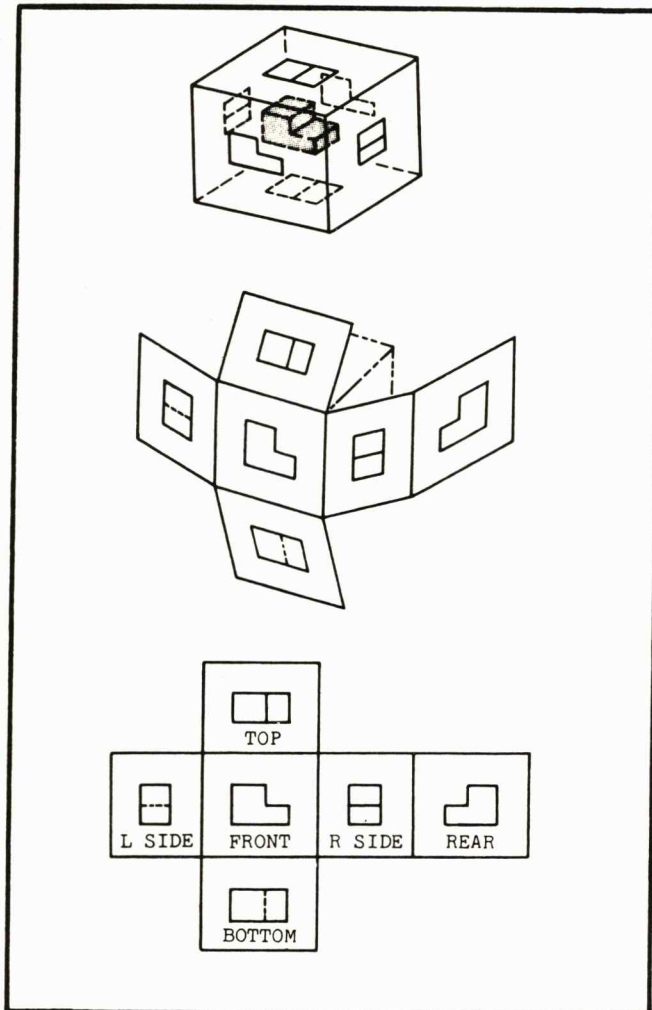
When the direction in which the view is taken is not obvious from the picture, it must be designated as:

VIEW LOOKING FORWARD

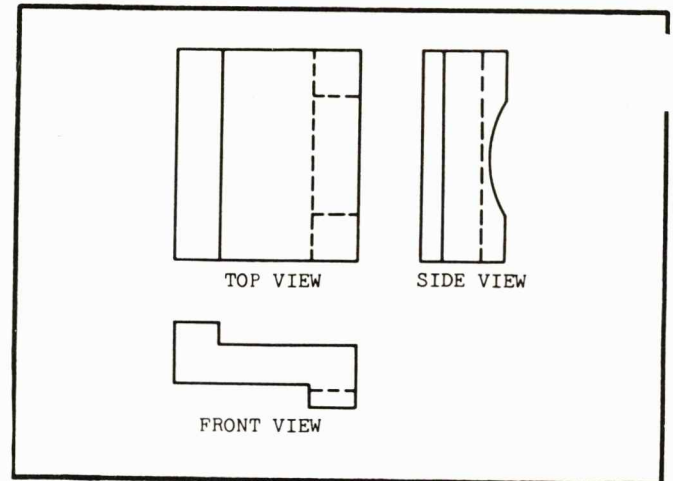
or

VIEW LOOKING AFT

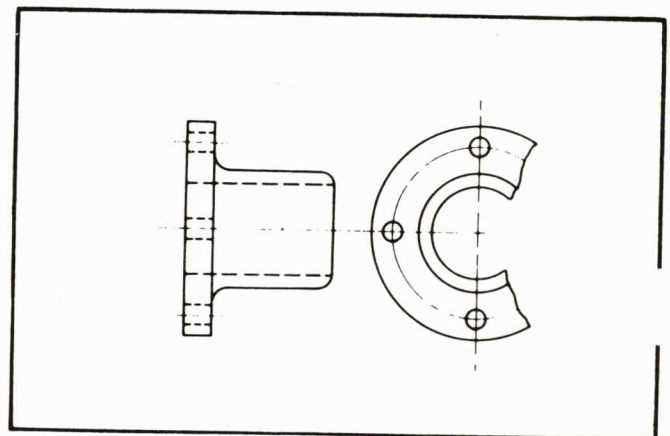
Three-view drawings shall be arranged as any three adjacent views in the relation shown. When space is limited, or the part can be indicated more clearly, the side view may be placed beside the top view.



ARRANGEMENT OF VIEWS



THREE VIEW DRAWING

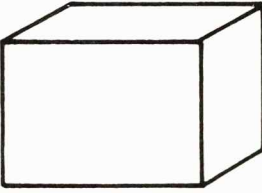
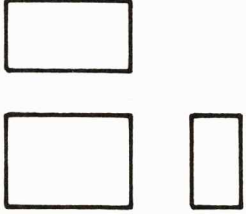
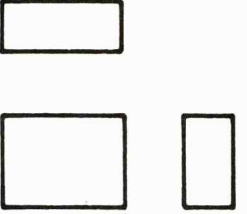
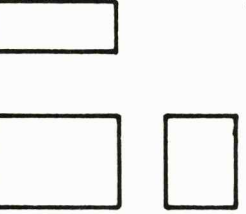
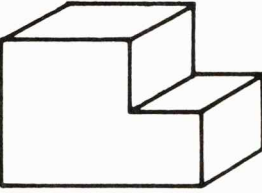
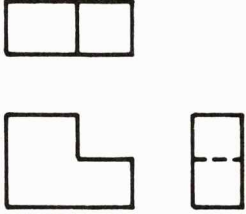
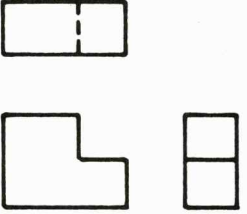
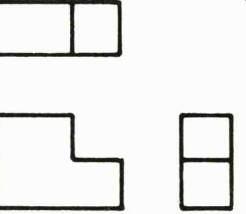
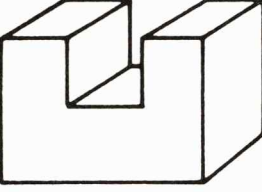
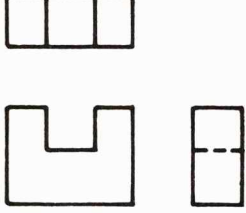
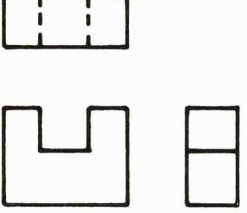
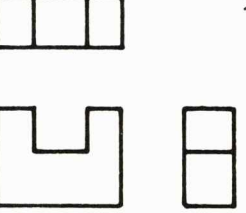
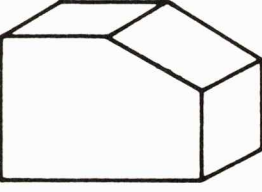
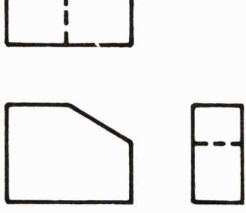
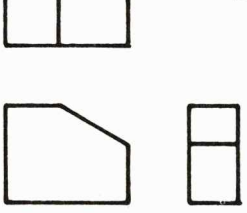
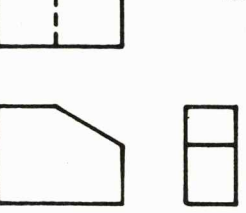
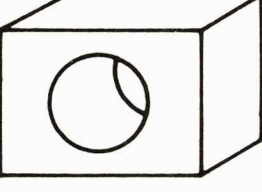
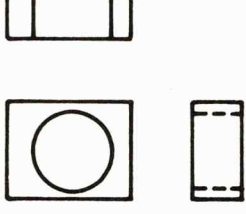
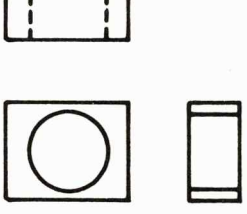
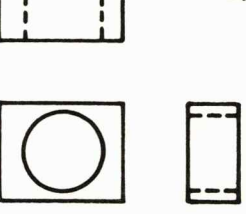
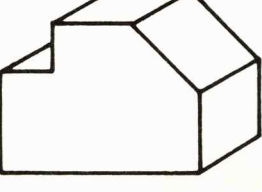
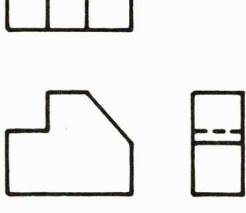
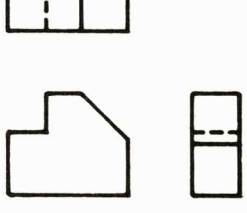
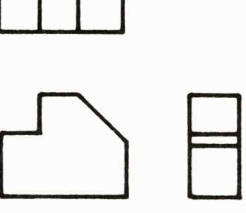


TWO-VIEW DRAWING

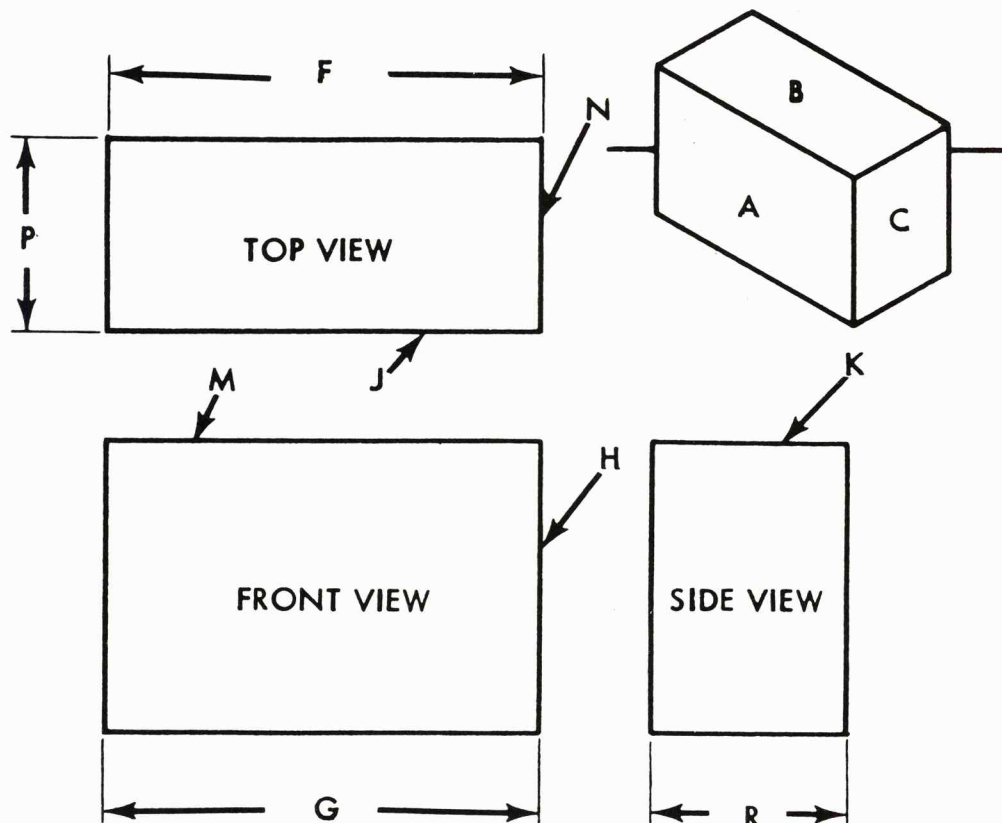
TWO-VIEW DRAWINGS may be arranged as any two adjacent views in the relation shown. When space is limited, it is permissible to represent symmetrical objects by half-views. The half-views may extend slightly beyond the center line of symmetry and terminate with a break line. If the adjacent view is an exterior view, the near half of the symmetrical view shall be drawn.

PROBLEMS IN ORTHOGRAPHIC DRAWING

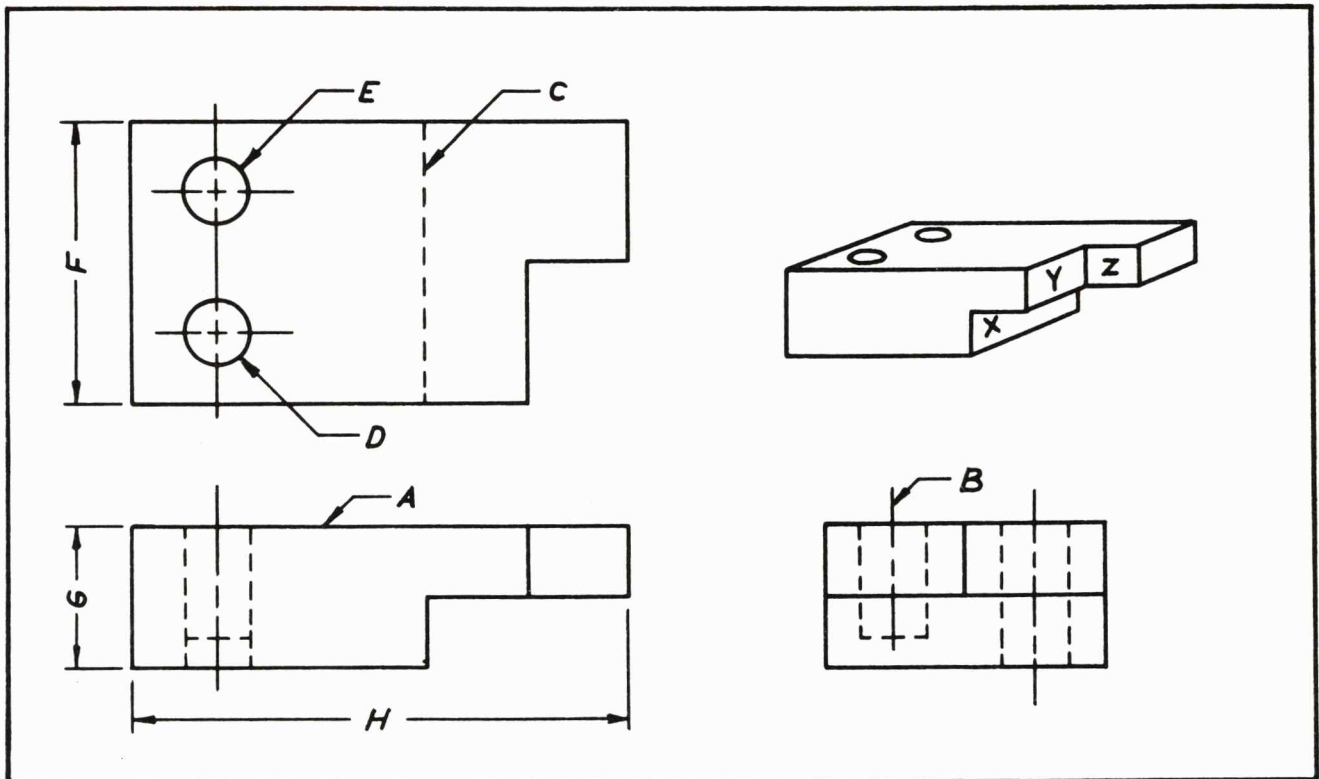
From among the sets of three-view drawings opposite the six blocks pictured, find the set which correctly describes the block. Draw a circle around its number in the answer column.

A 	1 	2 	3 	Ans. 1 2 3
B 	4 	5 	6 	4 5 6
C 	7 	8 	9 	7 8 9
D 	10 	11 	12 	10 11 12
E 	13 	14 	15 	13 14 15
F 	16 	17 	18 	16 17 18

SURFACES and VIEWS



1. Surface A is shown in what view? front
2. Surface B is shown in what view? top
3. Surface C is shown in what view? side
4. What line in the top view represents Surface A? F ✓ J
5. What line in the front view represents Surface C? P ✓ H
6. What line in the side view represents Surface B? K ✗
7. What line in the top view represents Surface C? N
8. What line in the front view represents Surface B? G ✓ M
9. Is dimension F equal to dimension G? no yes
10. Is dimension P equal to dimension R? no yes

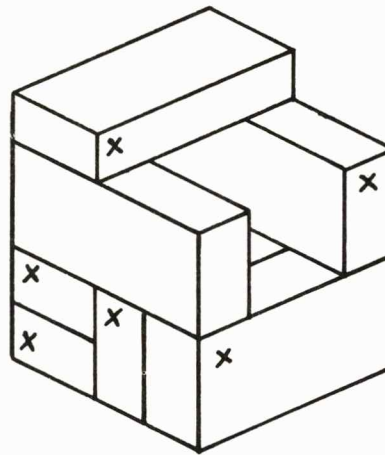
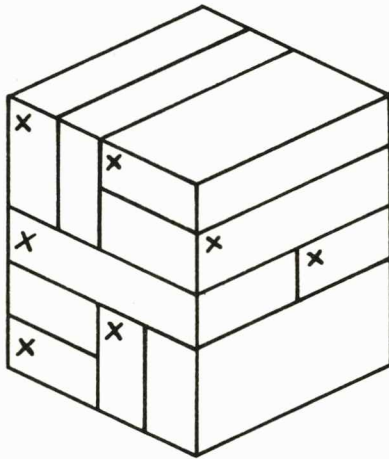


1. What kind of line is indicated by A?
2. What kind of line is indicated by B?
3. What kind of line is indicated by C?
4. Which view shows surface X?
5. Which view shows surface Y?
6. Which view shows surface Z?
7. Which hole is drilled "through" (E or D)?
8. What letter represents the length?
9. What letter represents the width?
10. What letter represents the thickness?

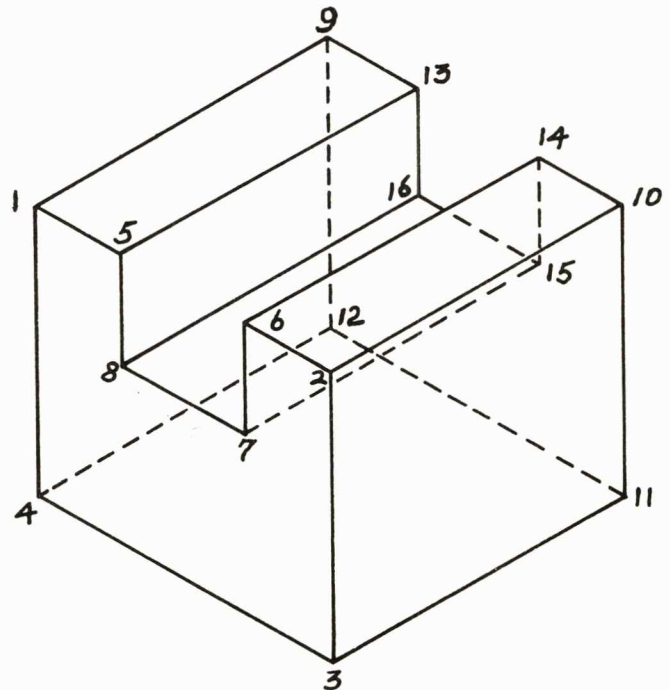
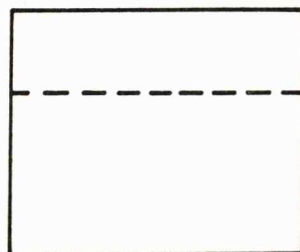
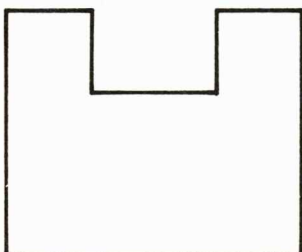
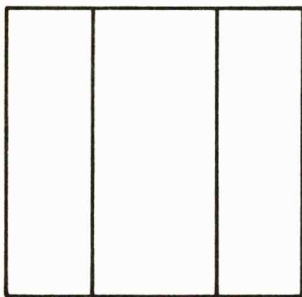
Visible
 Center
 Hidden
 Side view
 " "
 Front
 Center "E"
 "H"
 "F"
 "6"

Drawing Worksheet

All blocks are equal. How many touch the blocks marked "X"?
Indicate by number to the right of or below each "X" how many blocks it touches.

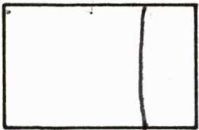

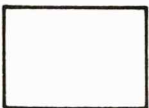
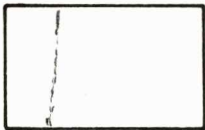

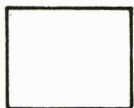
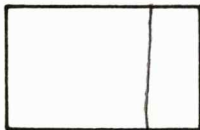

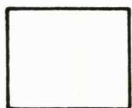
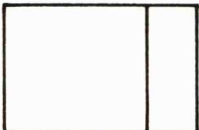

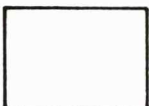
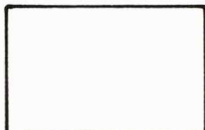
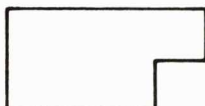
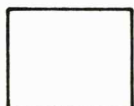
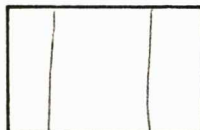
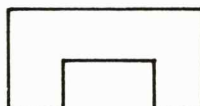
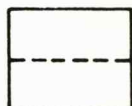
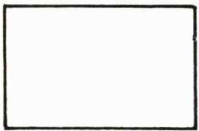
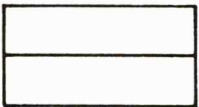
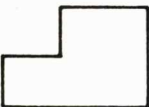
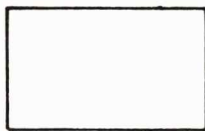
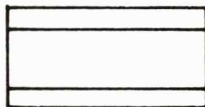
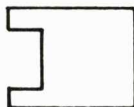
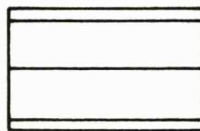
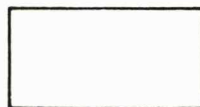

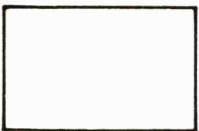
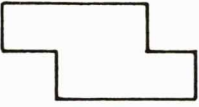
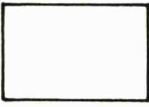
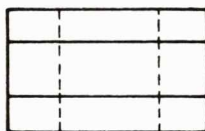
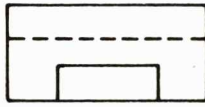
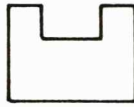
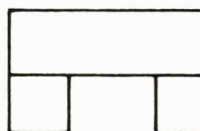
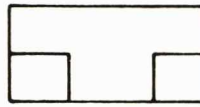
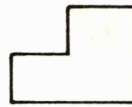
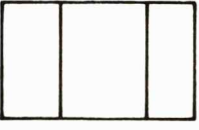
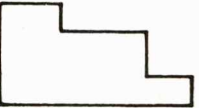
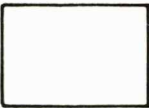
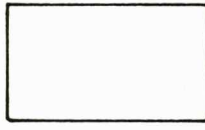
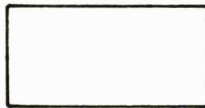

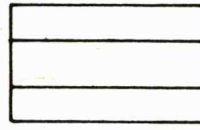
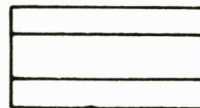



2. Place on the orthographic views the numbers showing the position of all of the corners marked on the picture on the right.



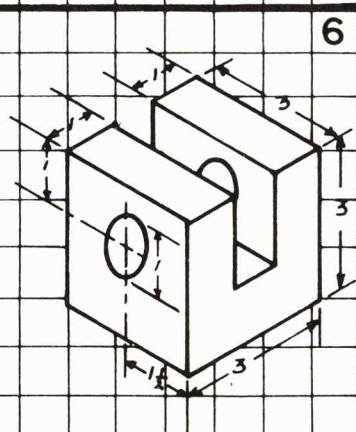
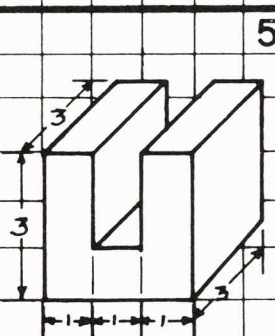
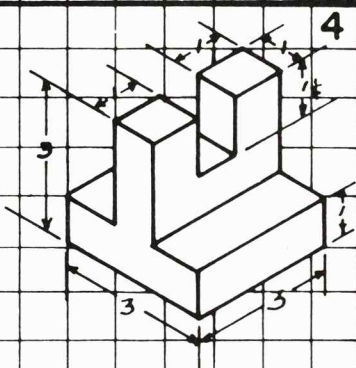
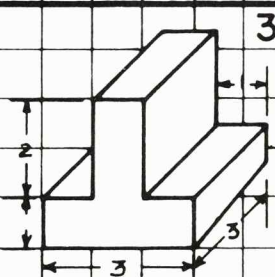
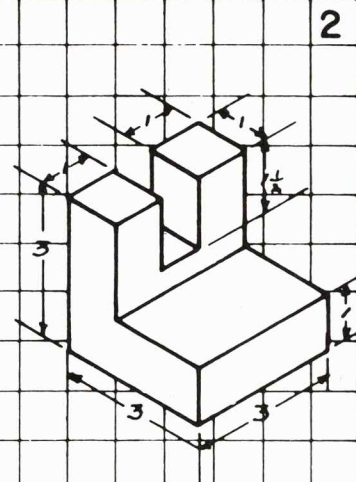
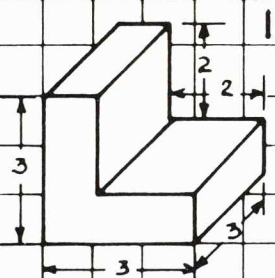
ORTHOGRAPHIC DRAWING

ADD THE MISSING LINE OR LINES

ORTHOGRAPHIC DRAWING

DRAW 3 VIEWS OF EACH OF THE FOLLOWING PROBLEMS
LET 1 SQUARE EQUAL 1 INCH



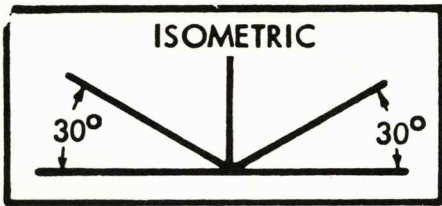
ORTHOGRAPHIC DRAWING

DRAW THE THIRD VIEW IN THE ACCOMPANYING PROBLEMS

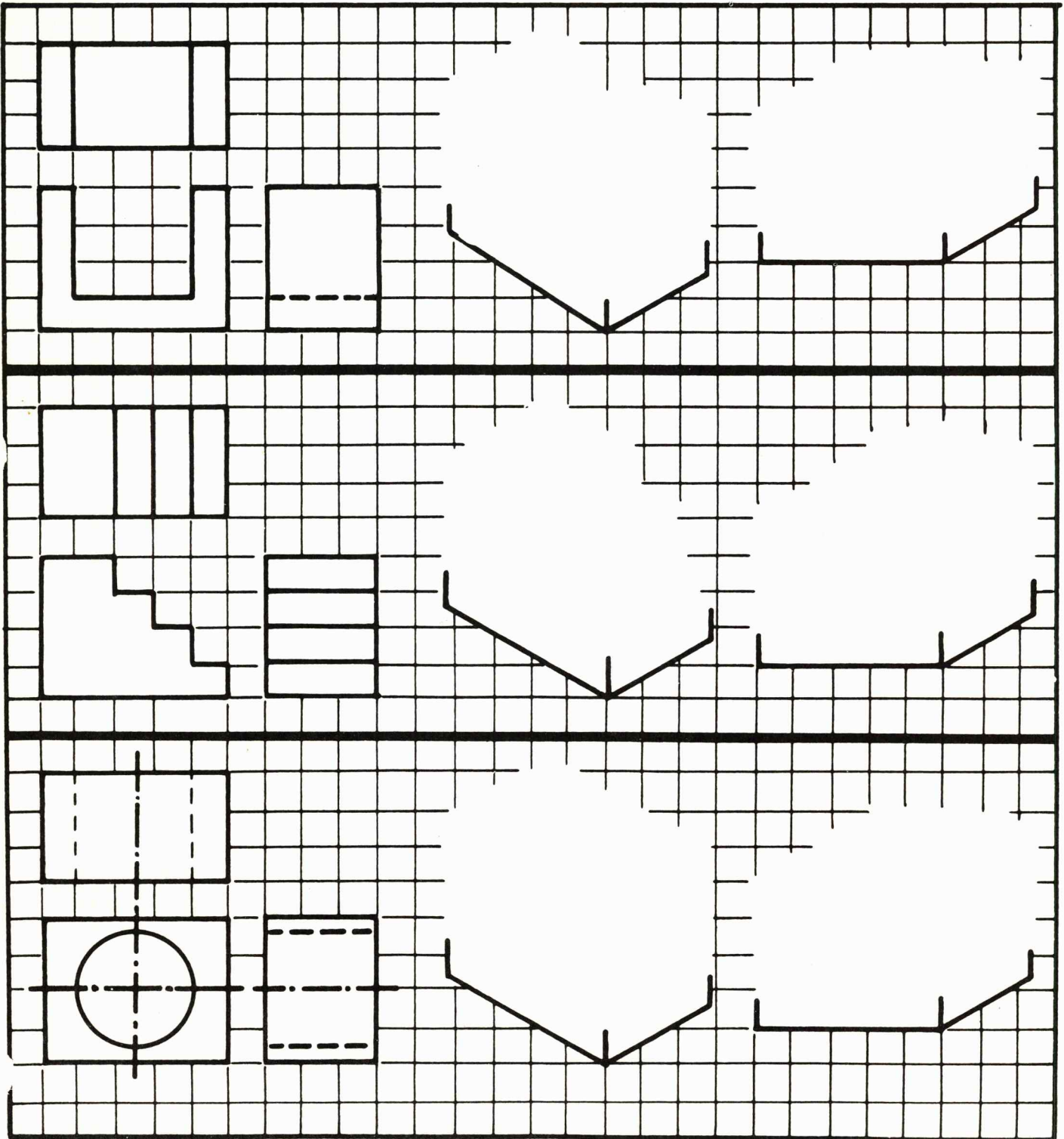
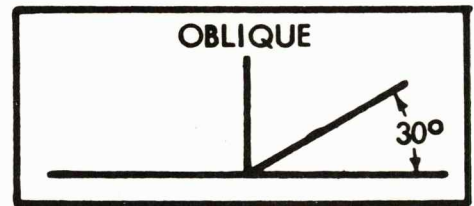
USE THE SQUARED LINES TO GET THE SIZE
AND LOCATION OF THE MISSING VIEW

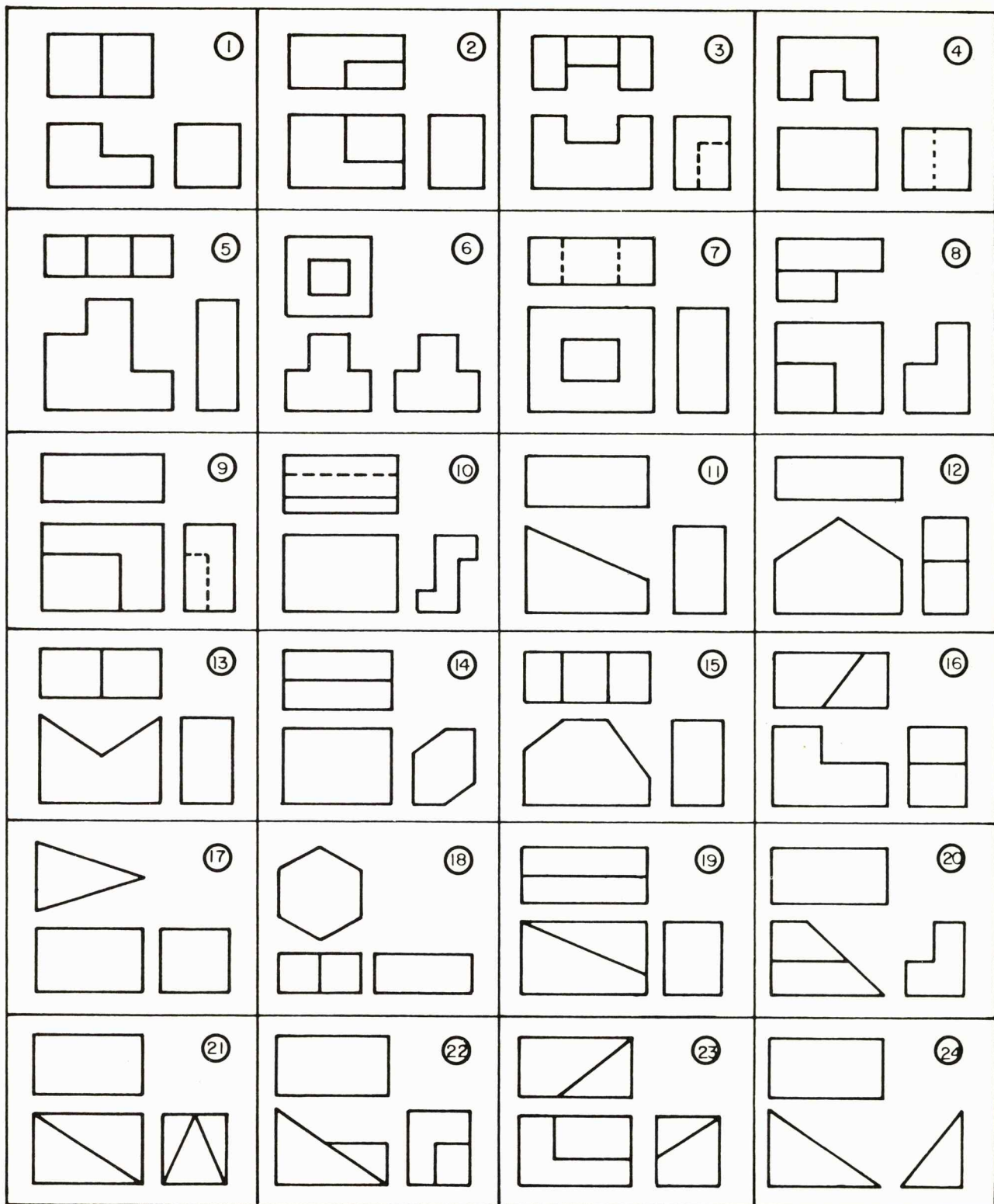
<p>1</p>	<p>2</p>	<p>3</p>
<p>4</p>	<p>5</p>	<p>6</p>
<p>7</p>	<p>8</p>	<p>9</p>
<p>10</p>	<p>11</p>	<p>12</p>

THE ORTHOGRAPHIC DRAWINGS DESCRIBE THREE OBJECTS

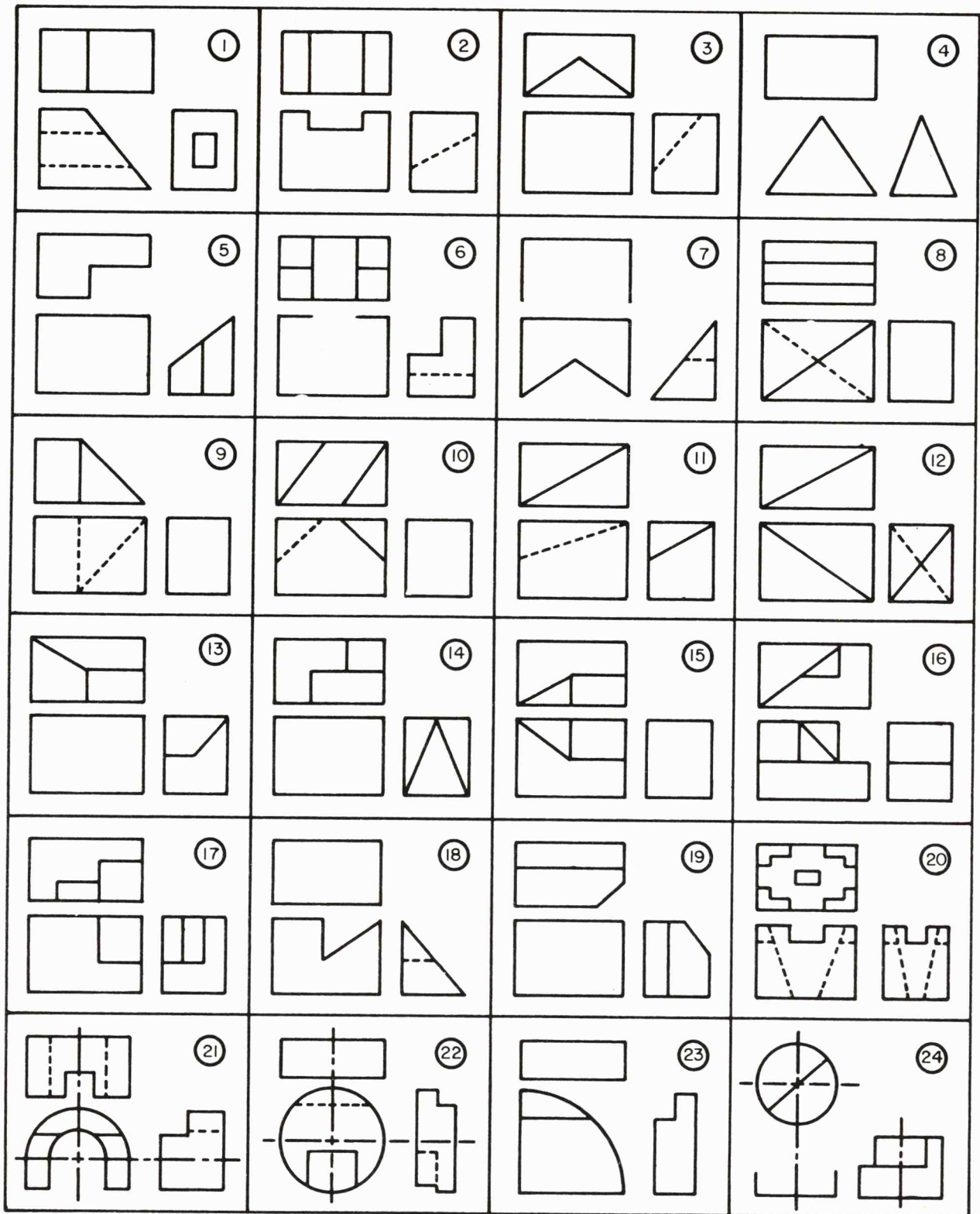


Make an isometric and an oblique drawing for each. Use base lines already drawn.





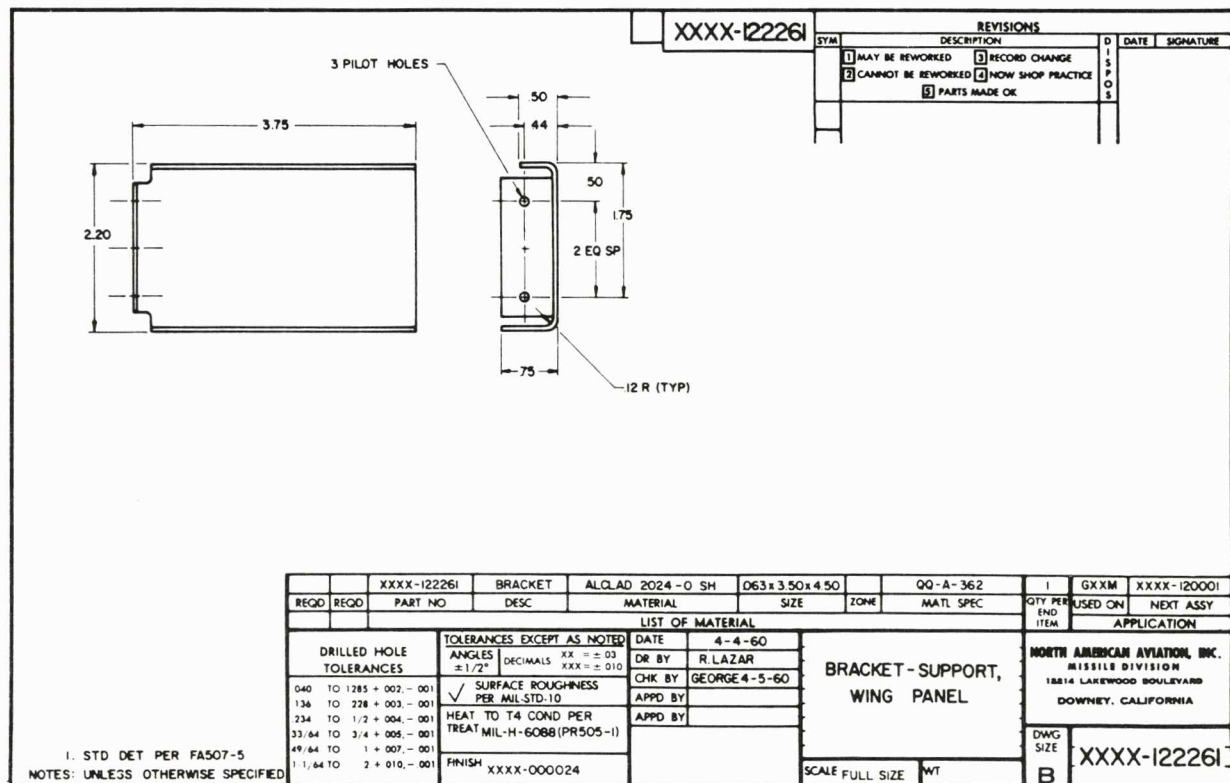
In each problem one or more lines have been omitted intentionally. Sketch the given views, enlarged as required, and add the missing lines.



In each problem one or more lines have been omitted intentionally. Sketch the given views, enlarged as required, and add the missing lines.

DETAIL DRAWING

A detail drawing represents a single part and shall specify all the dimensions, material, and information required for its manufacture, either directly on the drawing or by reference. Assembly information is not shown on a detail print, since these prints are not used in an assembly department. One to seven different views of the part may be used on the print, depending how simple or complex the part may be.



ASSEMBLY DRAWING

An assembly drawing is a drawing showing two or more parts put together to form an assembly. It shows the true relationship of the detail parts to one another. It shows as many views as are necessary to build the assembly and usually has a number of sectional and detail views to clarify portions of the drawing. It calls out such parts as nuts, bolts, screws, rivets, etc., that are used to hold the assembly together. Dash

numbering of the details of an assembly is sometimes used to save drafting time and the expense of making separate drawings for every part; however, they shall not be called out on any other drawing. Sub-assemblies are also called out by dash numbers on an assembly print when other parts are shown on the print.

		A XXXX-122261		<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="2">REVISIONS</th> <th>DATE</th> <th>SIGNATURE</th> </tr> <tr> <th>SYM</th> <th>DESCRIPTION</th> <th></th> <th></th> </tr> <tr> <td>1</td> <td>MAY BE REWORKED</td> <td>2</td> <td>RECORD CHANGE</td> </tr> <tr> <td>2</td> <td>CANNOT BE REWORKED</td> <td>3</td> <td>NOW SHOP PRACTICE</td> </tr> <tr> <td>3</td> <td>PARTS MADE OK</td> <td></td> <td></td> </tr> <tr> <td>A</td> <td>1. EXPAND BASIC INTO -II</td> <td>3</td> <td></td> </tr> <tr> <td>F/D</td> <td>2. ADDED "ASSY OF"</td> <td>3</td> <td></td> </tr> <tr> <td>U/B</td> <td>3. 1(-II) WAS 1 REQD</td> <td>3</td> <td></td> </tr> <tr> <td colspan="2"></td> <td colspan="2" style="text-align: right;">J BEAM 4-10-60</td> </tr> </table>				REVISIONS		DATE	SIGNATURE	SYM	DESCRIPTION			1	MAY BE REWORKED	2	RECORD CHANGE	2	CANNOT BE REWORKED	3	NOW SHOP PRACTICE	3	PARTS MADE OK			A	1. EXPAND BASIC INTO -II	3		F/D	2. ADDED "ASSY OF"	3		U/B	3. 1(-II) WAS 1 REQD	3				J BEAM 4-10-60																															
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INSTALLATION DRAWING

The term Installation, as used in the section, refers only to the positioning and attachment of completed units into major assemblies or end items. It is not intended to mean launching sites or other facilities, commonly referred to as installations. An installation print provides all of the information necessary to locate parts and assemblies in their final position in the missile. All of the attaching bolts, nuts, screws, etc., necessary for attaching the various parts together are

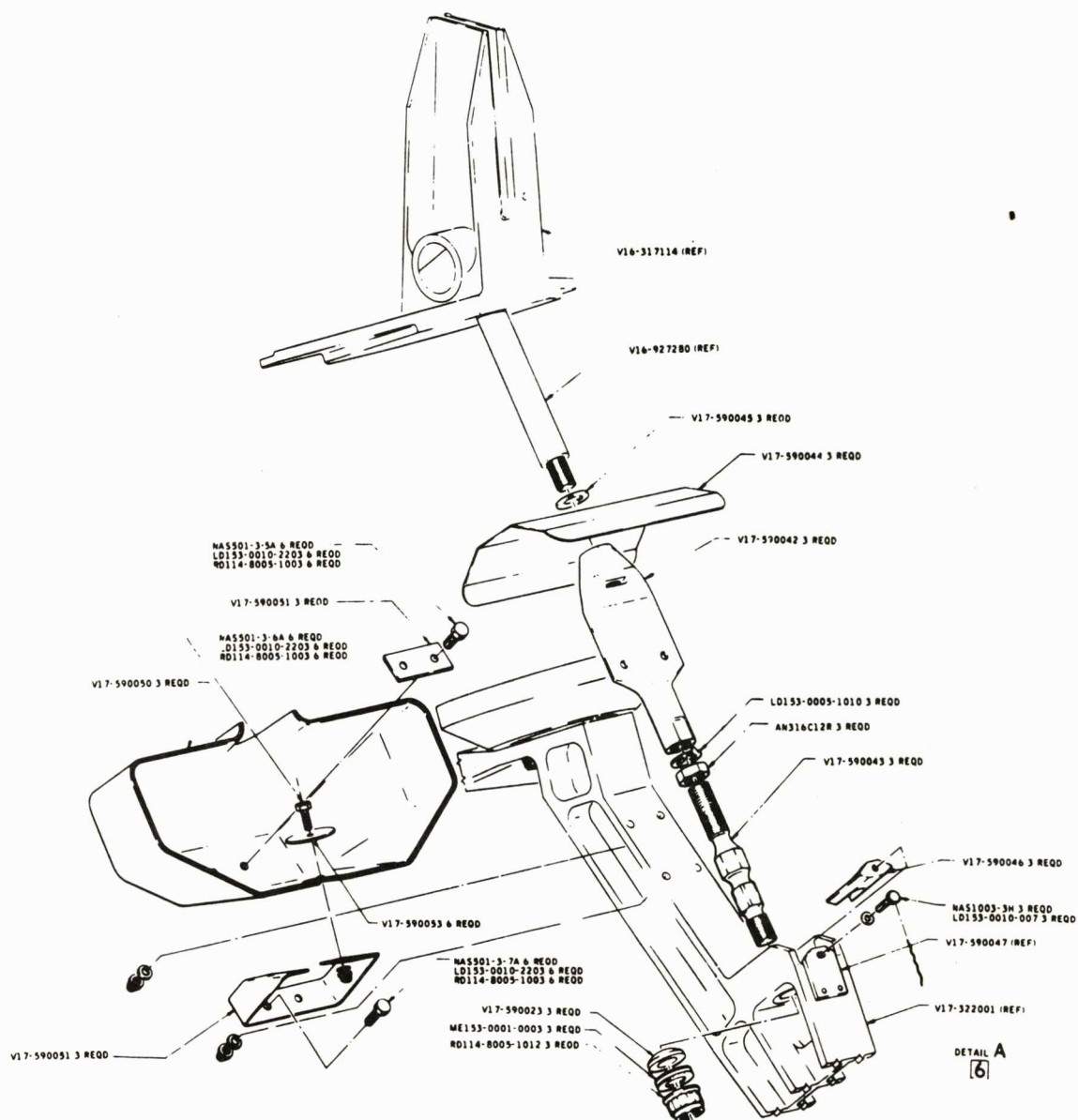
QUIZ

Use the drawing on the preceding page to answer the following questions:

1. How is the 2C12-4 clip attached to the bracket? *Installed per spec.
LA0101-004*
2. What is the distance between any two of the pilot holes? *1.25"*
3. What is the material specification for the bracket? *Q8-A-362
~~ALCLAD-2024-0~~
-5A*
4. What is the maximum length the bracket may be? *3.78*
5. What is the complete part number for the assembly? *xxxx-122261-11
~~000024-H~~*

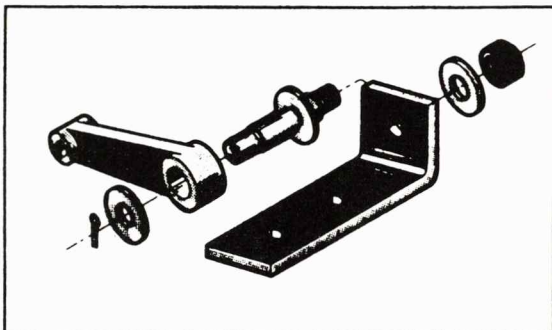
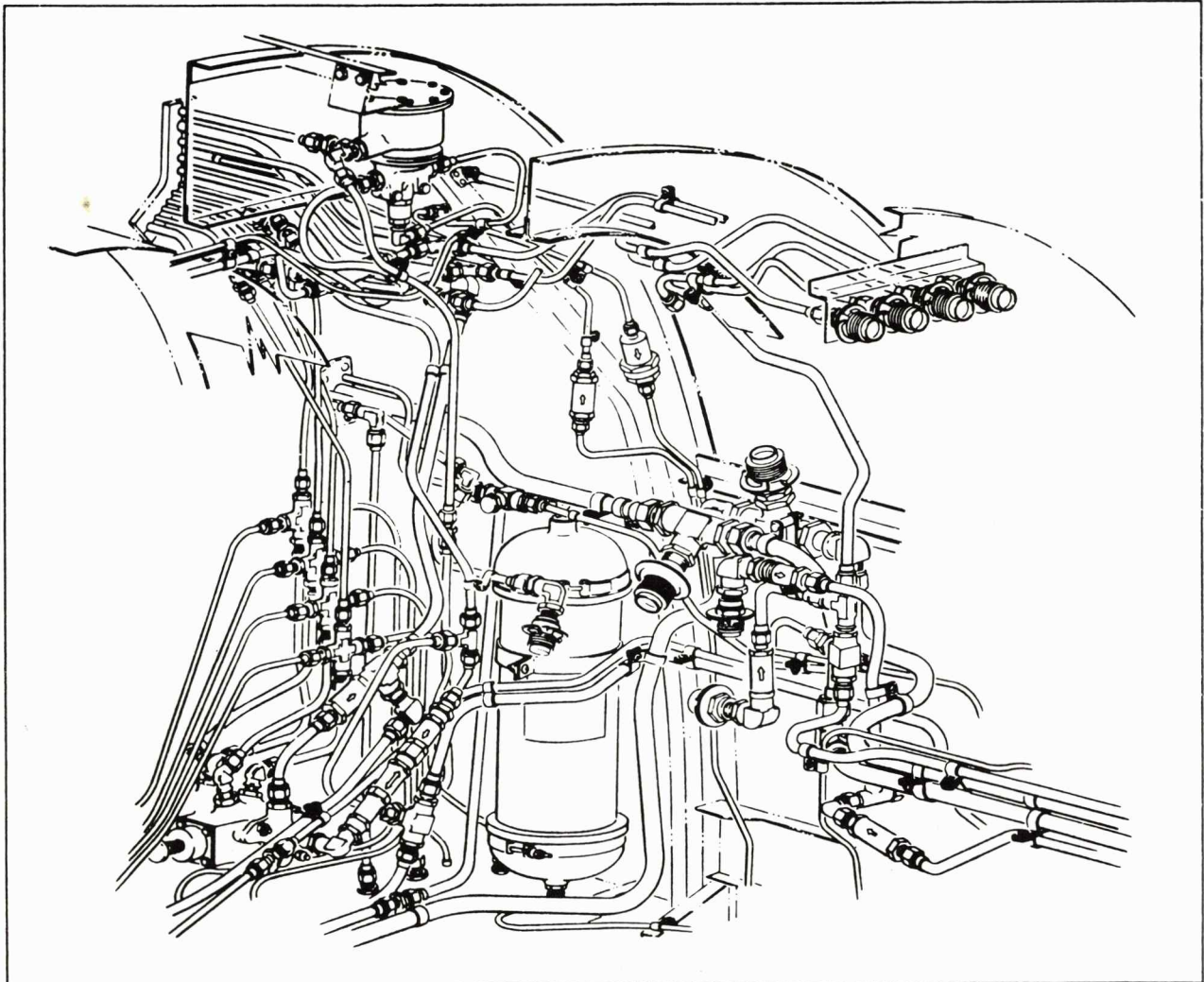
NOTES

called out. An installation print is sometimes serial number coded to show the effectiveness of its different parts and assemblies.

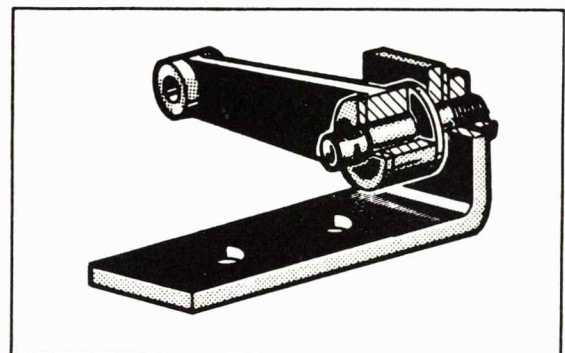


PERSPECTIVE DRAWING

Perspective drawings are sometimes used in conjunction with orthographic projections. They are usually limited to large assemblies, installations, and castings, to help the mechanic to visualize the finished part. Generally, parts will be called out, but locating dimensions will not be shown.



EXPLODED



CUTAWAY

LEFT HAND, RIGHT HAND, AND NEUTRAL PART DESIGNATIONS

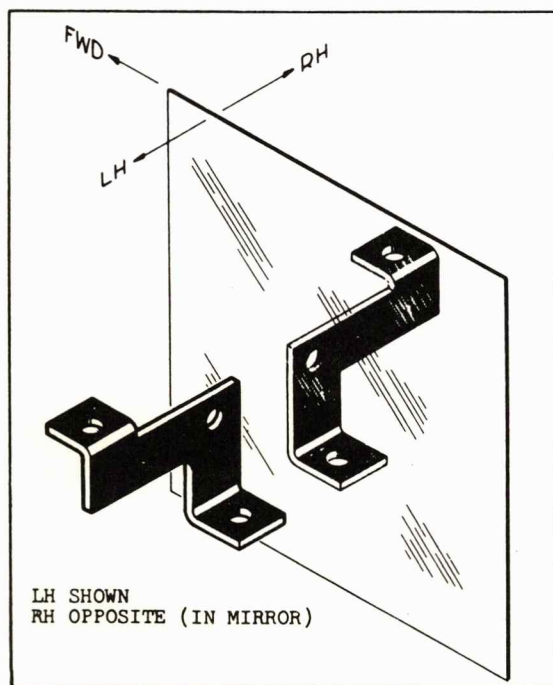
For two parts to be considered left and right hand they must be symmetrically opposite, i.e., mirror images of each other. The left-hand part always is pictured on a drawing and the right-hand part is indicated as being opposite.

The designations "LH" and "RH" are used for all symmetrically opposite parts even though they are not truly on the left and right sides of the end item. For example, an "upper" part may have a symmetrically opposite "lower" part; for convenience, the "upper" part is termed "LH" and the "lower" part is termed "RH".

A neutral part is one which has no symmetrically opposite counterpart, or which is symmetrical within itself.

Deviations from this procedure will be plainly noted on the drawing.

When the direction in which the view is taken is not obvious from the picture, it will be designated as: View Looking Forward, or View Looking Aft.

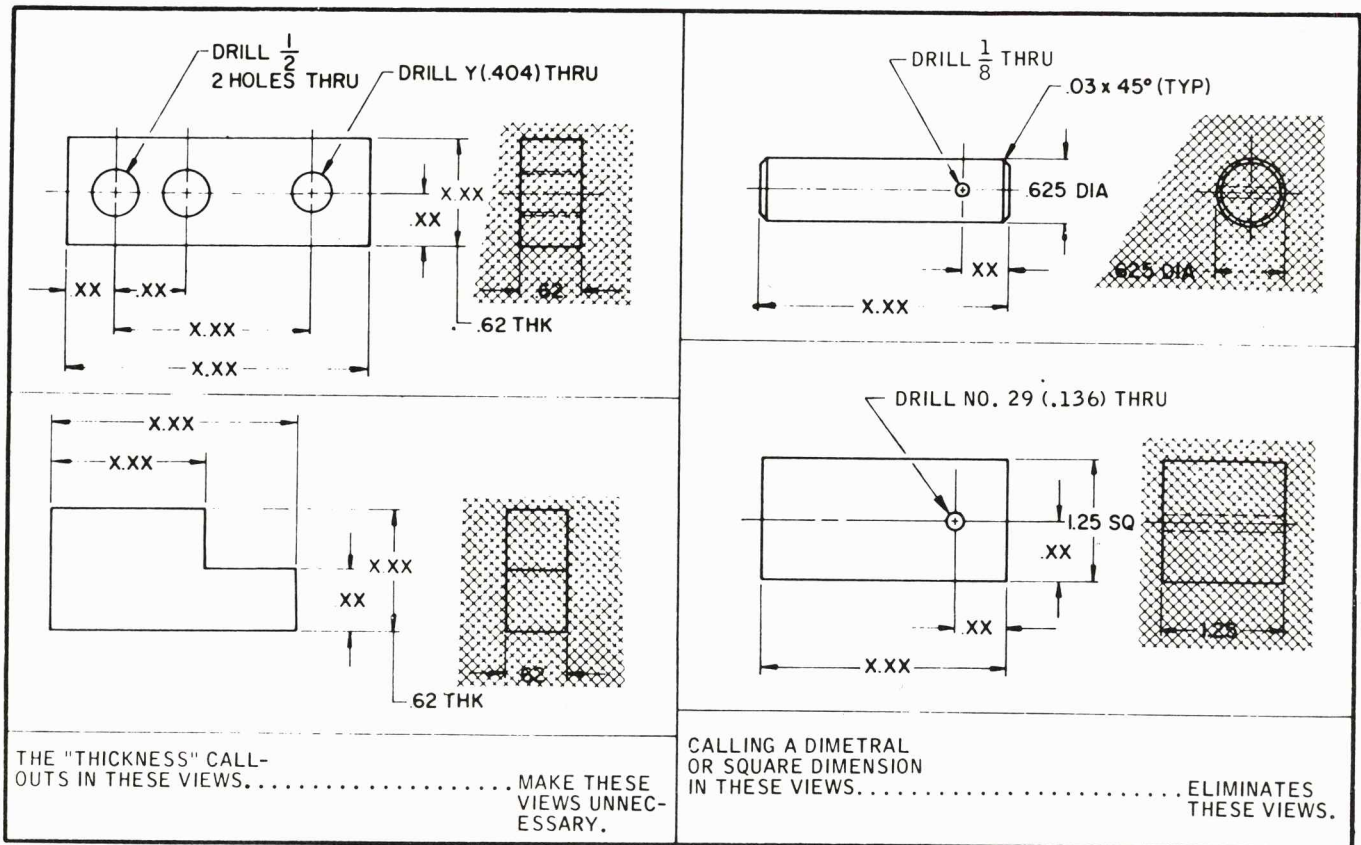


LH AND RH PARTS ARE MIRROR IMAGES
(SYMMETRICALLY OPPOSITE) OF EACH OTHER

SINGLE VIEWS

Simple one-view drawings may be made when such features as thickness, shape (DIA, SQ, HEX, etc.), or holes (THRU) may be indicated by notes.

Even complex parts may be drawn in one view without sacrificing clarity.



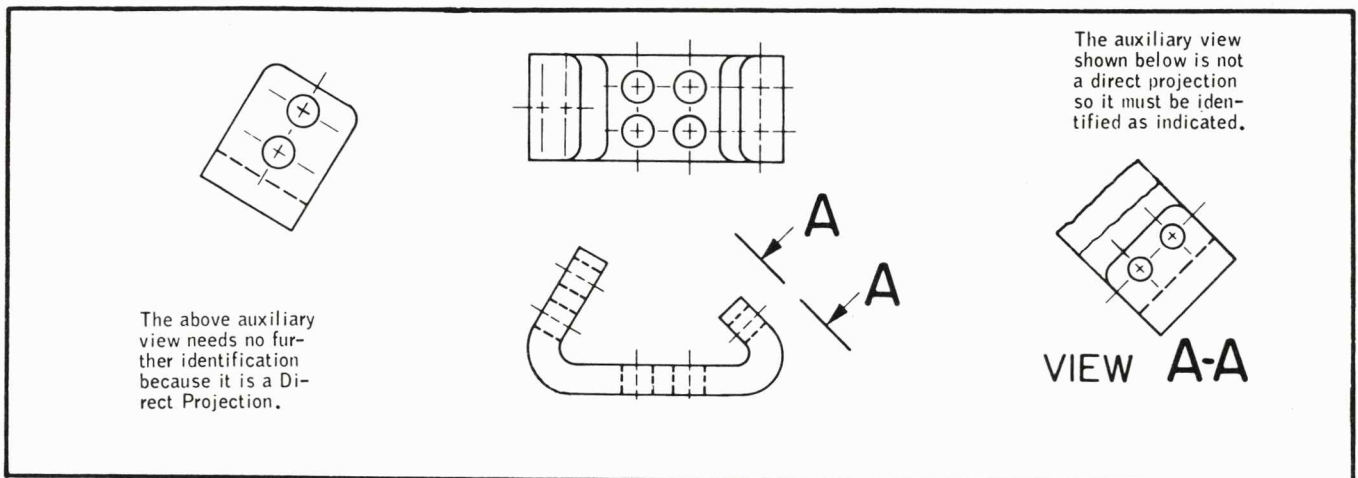
TYPICAL ONE-VIEW PRESENTATION

AUXILIARY VIEWS

Auxiliary views are used for objects having inclined faces or other features which are not parallel to any of the three principal planes of projection, in order to show the true shape of such features. In many cases, partial auxiliary views which show only the pertinent features may be employed to illustrate features not clearly shown by the principal views. The auxiliary views shall be arranged as though the auxiliary plane were revolved into the plane of the paper, by consid-

ering it hinged to the plane to which it is perpendicular.

When an auxiliary view is a direct projection from another face or feature, it does not require the use of viewing plane location indicators and labels. However, if the auxiliary view is not projected in the manner described above, viewing plane indicators shall be utilized and the view labeled.



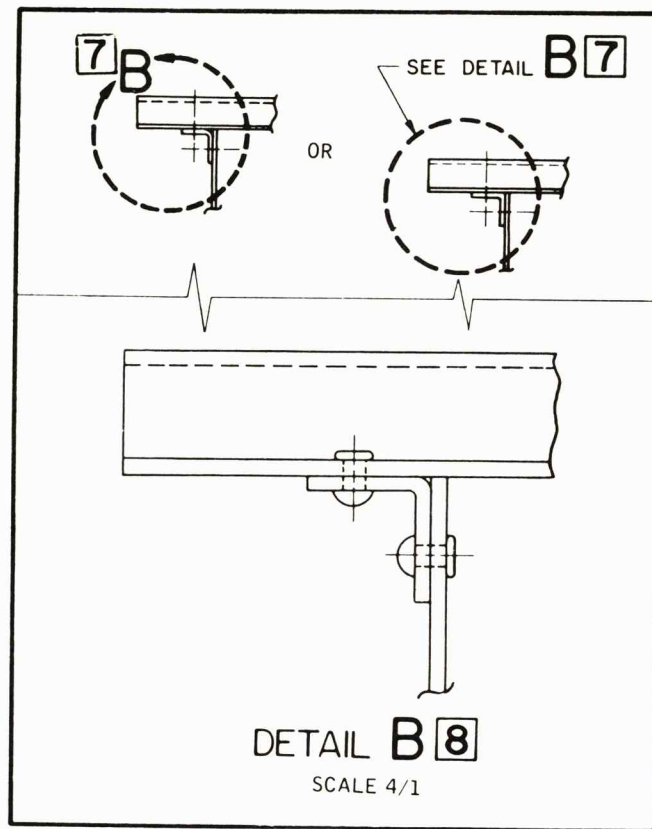
TYPICAL AUXILIARY VIEWS

DETAIL VIEWS

Detail views are used when it is desirable to show enlarged views of parts for dimensioning purposes or clarity.

Detail indicator lines are preferably circular. However, they may be any reasonable shape to surround a desired area, such as elliptical, square (with rounded corners), etc. Because a detail is not a true projection, it shall always be given an identifying letter even if only one is shown on a drawing. If the scale of the view varies from the main scale of the drawing, it will be noted. The zone number from which the detail view is taken, is cross-referenced with the zone number where the view is located. The part to be detailed is circled except for a small gap that shows the detail letter designation.

Next to the detail letter, the referenced zone number is shown.



TYPICAL DETAIL VIEW

GENERAL AND LOCAL NOTES

GENERAL NOTES: General notes refer to the part as a whole. Notes which affect a large majority of the part should be included in the general notes.

General notes are usually located along the lower border of the drawing and to the left of the Application (Usage) Data block. The notes will be preceded by the statement:

NOTES: UNLESS OTHERWISE SPECIFIED

The above wording eliminates the necessity of using the word ALL with any notes listed above it, e.g., a bend radius or a roughness listed

in the General Notes applies to all unless shown otherwise in a specific place on the drawing.

General notes should be employed whenever it is necessary to specify information such as:

- (1) Installation instructions such as process and fabrication specifications.
- (2) Tolerancing notes such as those for concentricity or normality. These notes are coded to the applicable dimensions or areas on the Field of the Drawing.
- (3) Machining, inspection, or fabricating instructions or notes.
- (4) Surface roughness designation.
- (5) Bend, fillet or corner radii which may apply to numerous places on the drawing.
- (6) Casting and forging notes.
- (7) Any pertinent information regarding the item depicted on the drawing such as test requirements, serviceability, etc.
- (8) Coded notes when space is inadequate in the areas provided in the L/M, U/B, T/B or drawing field, e.g., if there is insufficient room in the Data column for listing of a manufacturer's name and address for a commercial part, this note may be coded to the applicable item(s) in that column. Similarly if the callout of numerous zones, overcrowds the Zone column, they may be coded to a general note.

Notes are to be numbered consecutively beginning at the bottom and

located in line without indentation.

When a general note is no longer needed, it should be removed from the drawing. An entry is then made in the Revision block indicating the removal of the note. Note and code numbers, removed in this manner, may be reused for a new note either at the time of removal or at a subsequent date.

NOTE THAT ALL ENTRIES IN THIS FIGURE ARE FOR ILLUSTRATIVE PURPOSES ONLY AND DO NOT REPRESENT AN ACTUAL DRAWING.

4	4	UG-XXX/U	ADAPTER	ZZZZ	KV-XX-XX	KING ELEC CO TUCKHOE, NY	3	016
8	8	NMC-GXXH-A	GROMMET	YYYY		NYLON MOLDING CORP GARWOOD, NJ	5	015
2	2	MEXXX-XXX-XXXX	CAPACITOR			COML PART - SEE SPEC CONTROL DWG	4	014
4	4	NAS XX-X-XXA	SPACER				3	013
1	1	MRXXWXXOACMA	AMMETER			XX-X-XXX	5	012
4	4	MSXXXX-XXXX	NUT			GFAE GOVT INSTL AT YAC STA	4	011
4	4	MDXXX-XXXX	NUT				4	010
4	4	5555-654321	BOLT		STEEL BAR	MAY BE MADE FROM 1018 MSXXXX-XX-XX	4	009
1	1	3333-543210	BRACKET	XXXX		MAKE FROM 195X18 BIRCHER CORP, L.A., CAL	3	008
1	1	2222-432106	CLIP				2	007
1	1	-9	SEAL		ACRYLIC SHEET	XX-X-XXX 1/8 x 10.00 x 12.00	4	006
1	1	-7	BEAM		AL PL	XX-X-XXX 2024-Y42 250 x 10.00 x 12.00	5	005
4	4	-5	COVER		AL SHAPE	XX-X-XXX 7075-T6 XESXX x 12.00	2, 4	004
1	1	-4	FITTING, RH		AL SH	XX-X-XXX 7075-T6 090 x 10.00 x 14.00	7	003
1	1	-3	FITTING, LH		AL SH	XX-X-XXX 7075-T6 090 x 10.00 x 14.00	7	002
-2	-1	4444-123456	ASSEMBLY					001
QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD	QTY REQD
RH	LH							
LIST OF MATERIAL OR PARTS LIST								
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES								
TOLERANCES: ANGLES DECIMALS								
XX ± .03 XX ± .010 ± .007 HOLES NOTED "DRILL"								
011 THRU 940 ± .001 001 041 THRU 130 ± .002 001 131 THRU 229 ± .001 001 230 THRU 500 ± .004 001 501 THRU 750 ± .005 001 751 THRU 1000 ± .007 001 1001 THRU 2000 ± .010 001								
DO NOT SCALE PRINT								
HEAT TREAT -3, -4, -5, -7 TO XX COND PER XAOXX-00X								
FINISH XXXX-000024 (2) (3)								
ITEM QTY MODEL NEXT USING DRAWING END ITEM NO THRU EFFECTIVE ON								
-2 1 Y4-1 4444-654321 1 B SUBS								
-1 1 Y4-1 4444-654321 1 B SUBS								
APPLICATION (USAGE) DATA								
UNLESS OTHERWISE SPECIFIED								
7. SEAM WELD PER XXXX-XX								
6. FINISH COLOR INSIGNIA READ 509, ANA BUL 166 ONE COAT MIL-E-7729 ENAMEL XXXX-XX								
5. CADMIUM PLATE PER XXXX-XX TYPE II CLASS 3								
4. CAST FILLET RADII, 19								
3. MACHINE PER XXXX-XX								
2. CONCENTRIC WITHIN .006 TIR								
1. INSTALL FASTENERS PER XXXX-XX								

7. SEAM WELD PER XXXX-XX
6. FINISH COLOR INSIGNIA READ 509, ANA BUL 166 ONE COAT MIL-E-7729 ENAMEL XXXX-XX
5. CADMIUM PLATE PER XXXX-XX TYPE II CLASS 3
4. CAST FILLET RADII, 19
3. MACHINE PER XXXX-XX
2. CONCENTRIC WITHIN .006 TIR
1. INSTALL FASTENERS PER XXXX-XX
- NOTES: UNLESS OTHERWISE SPECIFIED

In the above examples of general notes:

Notes 1, 3 and 4 are applicable to the Field of the Drawing or the drawing as a whole.

Note 2: Is a machining note and is coded to specific dimensions on the part.

Notes 5 and 6: These finish notes were too large to be placed in the finish block; therefore, they were placed in the general notes and coded to the finish block. If such notes apply to specific areas only, they would be coded to the Field of the Drawing or the data column as required.

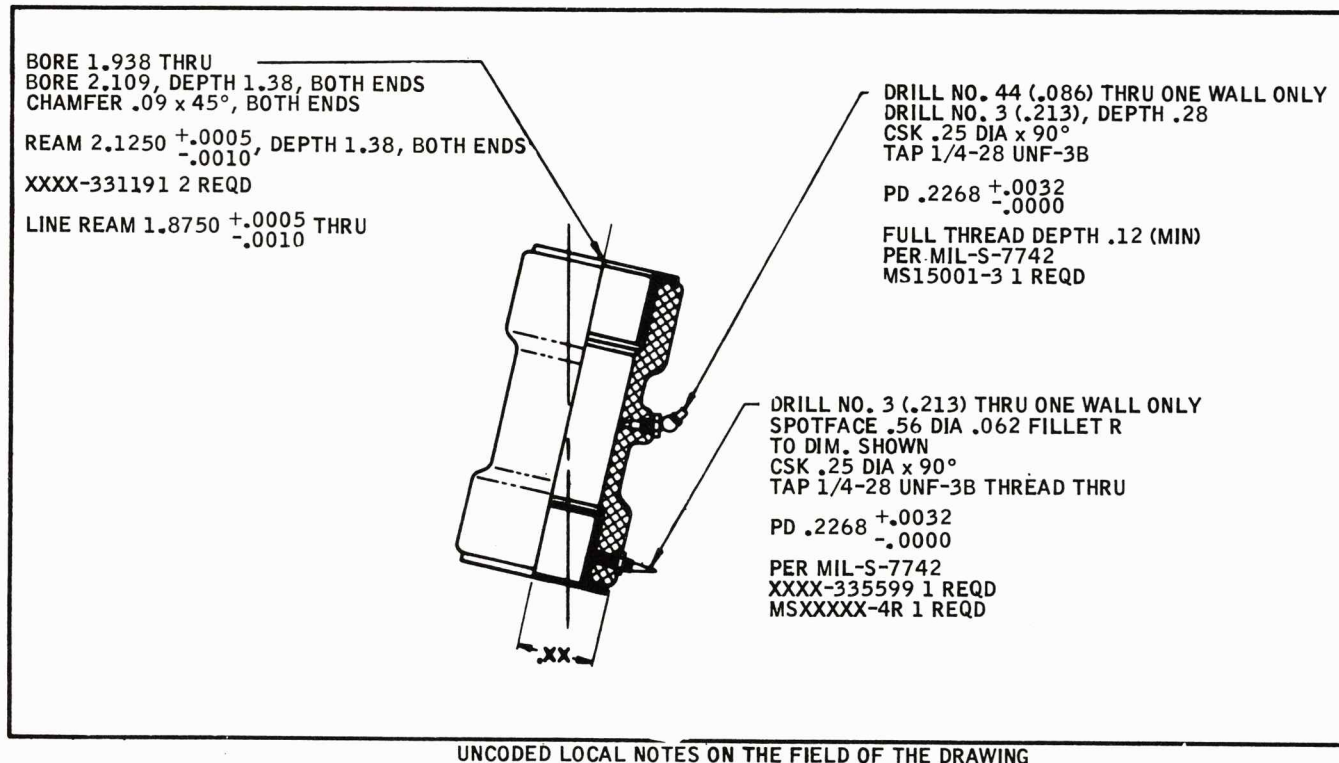
Note that coding numbers run consecutively but are independent of the general note numbers.

FORMAT AND TYPICAL EXAMPLES OF GENERAL NOTES

UNCODED LOCAL NOTES: Local notes are callouts which appear on the face of the drawing. They apply to specific operations or instructions. They are placed adjacent to the point which such operations are to be performed.

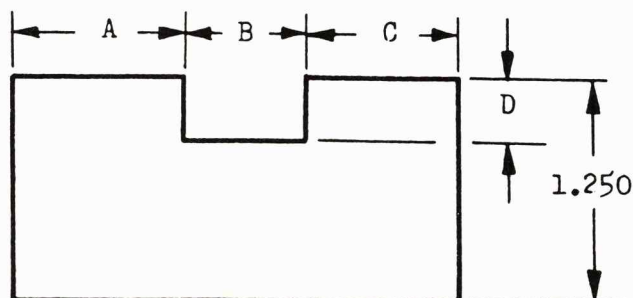
The callout leader line shall be taken from one end or the other of the top line to the part to which the note applies. If a note refers to more than one place, arrows shall indicate each one unless the ap-

plication is clear without extra arrows. A repeated callout, however, is always given as a reference (REF).



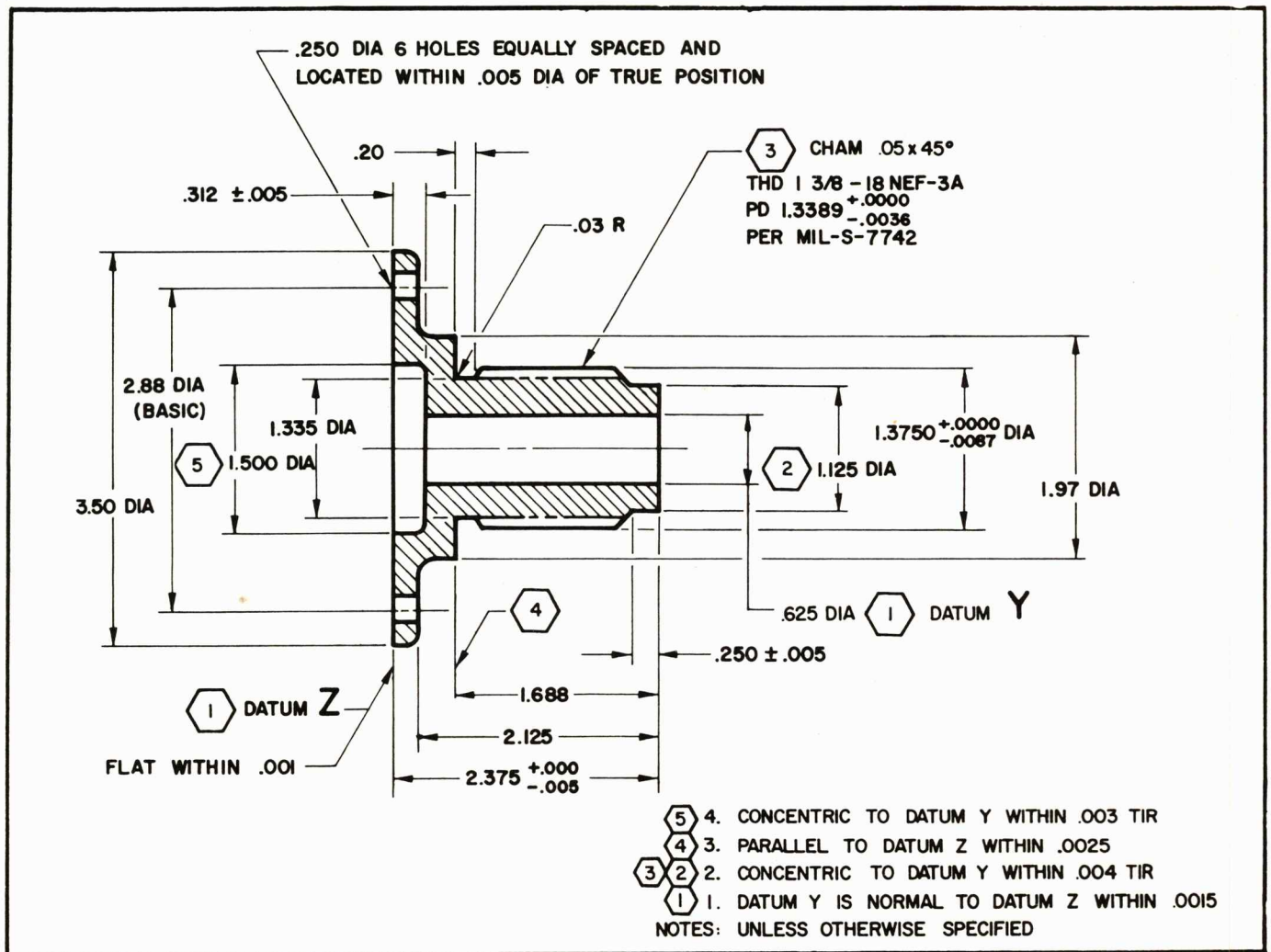
To identify different parts on a tabulated drawing:

Tabulated drawings usually show a number of parts basically the same except for size on one drawing and usually from one view. If two or more dimensions differ at the same point, a letter (A, B, C, etc.) will be substituted and the dimensions will be shown in the tabulation block.



	A	B	C	D
-1	.750	.250	.375	.250
-2	.875	.375	.125	.250
-3	.625	.500	.250	.375

CODED LOCAL NOTES: When required, local notes may be coded to applicable general notes. A common application is with tolerancing features.



CODED LOCAL AND GENERAL NOTES

RIVET CODING AND CALLOUT

The rivet code symbol is based on a cross (+). Rivet type, size, installation requirements, and direction of the manufactured head are indicated by letter-numeral coding placed in quadrants formed by the cross. The cross may be located at the center of a rivet or off to one side with an arrow pointing to the center of the rivet.

The quadrants are identified as

NW	NE
SW	SE

The rivet coding applicable to each of the quadrants is defined as follows:

RIVET TYPE: is indicated by two basic code letters placed in the NW quadrant, for example:

CY

 = MS20426DD countersunk head, aluminum alloy,
2024-T31 rivet.

RIVET DIAMETER: is indicated by a number placed in the NE quadrant.

This number equals the number of 32nds of an inch in the rivet diameter.

The direction of the manufactured head is also indicated by either the placement of, or omission of, the letter "F" in the NE quadrant. The letter "F" placement indicates the manufactured head is on the far side.

For example:

CY	6F
----	----

 = MS20426DD6 countersunk head, aluminum alloy 2024-T31 rivet, 3/16 (6/32) inch diameter, manufactured head on far side.

$\begin{array}{c|c} \text{CY} & 6 \\ \hline & \end{array}$ = The same MS20426DD6 rivet but with the manufactured head on near side.

RIVET LENGTH OR GRIP: is indicated by a number placed in the SE quadrant. This number is the dash number portion of the rivet standard part number which signifies either the rivet length or grip.

For example:

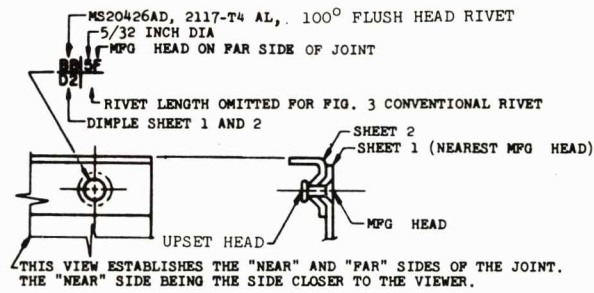
$\begin{array}{c|c} \text{RL} & 6 \\ \hline & \end{array}$ = NAS1398D - Pull type, locked spindle, blind rivet 2017 aluminum alloy, 3/16 inch diameter, 3/8 inch maximum grip, universal head, manufactured head on near side. The SE quadrant of the symbol is left blank when callout is for conventional rivets.

FLUSH RIVETING OPERATIONS: are indicated by a letter-number code placed in the SW quadrant.

For example:

$\begin{array}{c|c} \text{CY} & 6 \\ \hline \text{D2C} & \end{array}$ = MS20426DD6 countersunk head, aluminum alloy 2024-T31 rivet, 3/16 inch diameter, manufactured head on near side. First and second sheets adjacent to manufactured head are dimpled, the third sheet is sub-countersunk.

The rivet code symbol shall always be placed horizontally on a drawing, never vertically or at an angle. The symbol is applicable only to the field of the drawing and is not to be placed in the List of Materials.



CONVENTIONAL RIVETS				
BASIC CODE	BASIC PART NUMBER	SHANK MATERIAL	HEAD TYPE	REMARKS
BH	MS20470A	1100-F AL	PROTRUDING	
BJ	MS20470AD	2117-T4 AL		
BK	MS20470B	5056-F AL		
CX	MS20470DD	2024-T31 AL		
LL	MS20613-()P	STL, CAD PL		
LN	MS20615-()M	MONEL	100° FLUSH	
MM	NAS1198	A-286 CRES		
BA	MS20426A	1100-F AL		
BB	MS20426AD	2117-T4 AL		
BC	MS20426B	5056-F AL		
CY	MS20426DD	2024-T31 AL		
CL	MS20427	STL, CAD PL		
BF	MS20427M	MONEL		
MN	NAS1199	A-286 CRES		

BLIND RIVETS				
BASIC CODE	BASIC PART NUMBER	SHANK MATERIAL	HEAD TYPE	REMARKS
AA	MS20600AD	2117-T4 AL		MECHANICAL EXPANDING
JS	MS20600M	MONEL		MECHANICAL EXPANDING
RL	NAS1398D	2017 AL	PROTRUDING	LOCKED SPINDLE
RR	NAS1398B	5056 AL		LOCKED SPINDLE
TL	NAS1399MS	MONEL, SIL PL		LOCKED SPINDLE
RM	NAS1398M	MONEL, SIL PL		LOCKED SPINDLE
TN	NAS1398CS	A286 CRES, SIL PL		LOCKED SPINDLE
AP	MS20602B()P	2017 T4 AL		EXPLOSIVE (1)
AW	69516	CRES		MECHANICAL EXPANDING (DEUTSCH)
AC	MS20601AD	2117-T4 AL		MECHANICAL EXPANDING
JT	MS20601M	MONEL		MECHANICAL EXPANDING
RP	NAS1399D	2017 AL	100° FLUSH	LOCKED SPINDLE
RO	NAS1399B	5056 AL		LOCKED SPINDLE (1)
TP	NAS1399MS	MONEL, SIL PL		LOCKED SPINDLE
RR	NAS1399M	MONEL, SIL PL		LOCKED SPINDLE
TS	NAS1399CS	A286 CRES, SIL PL		LOCKED SPINDLE
AH	MS20603B()P	2017 T4 AL		EXPLOSIVE
AV	69508	CRES		MECHANICAL EXPANDING (DEUTSCH)
DR	P (2)	STEEL	HEX	THREADED
DK	F (3)	STEEL	100° FLUSH	THREADED

(2) ME128-0002 IS EQUAL AND PROVIDES CONTROL AND ALTERNATE SOURCE.

(3) ME128-0001 IS EQUAL AND PROVIDES CONTROL AND ALTERNATE SOURCE.

HI-SHEAR RIVETS						
BASIC CODE	BASIC PART NO.	MATING COLLAR	SHANK MATERIAL	COLLAR MATERIAL	HEAD TYPE	REMARKS
CB	HS48	NAS528	STEEL	2024-T4AL	PROT G.	HIGH H/T
HO	HS48	HS32	STEEL	STEEL		HIGH H/T
HR	HS63	HS60M	CRES	MONEL		HIGH H/T & TEMP
ON	HS92	HS60M	A-286 CRES	MONEL		CL TOL SHANK HIGH H/T & TEMP
CA	HS47	NAS528	STEEL	2024-T4AL	100° FLUSH	CL TOL HEAD HIGH H/T
HN	HS47	HS32	STEEL	STEEL		CL TOL HEAD HIGH H/T
HP	HS67	HS60M	CRES	MONEL		CL TOL HEAD HIGH H/T & TEMP
OH	HS91	HS60M	A-286 CRES	MONEL		CL TOL SHANK HIGH H/T & TEMP

The "flush riveting operation" code designations are listed
In this code, the sheets are numbered away from the rivet's manufactured head; sheet one being nearest to the head.

D	• DIMPLE SHEET 1
D2	• DIMPLE SHEET 1 & 2
D3	• DIMPLE SHEET 1, 2, & 3
D4	• DIMPLE SHEET 1, 2, 3, & 4
C	• COUNTERSINK SHEET 1
DC	• DIMPLE SHEET 1; SUB-CSK SHEET 2
D2C	• DIMPLE SHEET 1 & 2; SUB-CSK SHEET 3
D3C	• DIMPLE SHEET 1, 2, & 3; SUB-CSK SHEET 4

QUIZ

$\begin{array}{c|c} BB & 5F \\ \hline D2 & \end{array}$
 Example #1

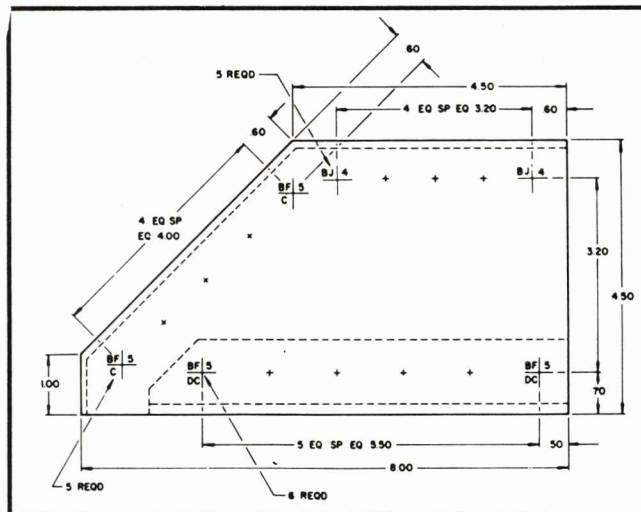
$\begin{array}{c|c} CL & 6 \\ \hline D2C & \end{array}$
 Example #2

$\begin{array}{c|c} LL & 7F \\ \hline & \end{array}$
 Example #3

- What kind of rivet is Example #1? *3/32" Far Side*
MS20426AD - 2117-T4 AL - Simple Sheet 1, 2
- What is the diameter of the rivet in Example #2? *6/32" 3/16"*
- How should the sheets be prepared prior to installing the rivet in Example #2?
- On which side is the manufactured head located in Example #1? *Far Side*
- What is the head type for the rivet in Example #3? *Buttressing head*

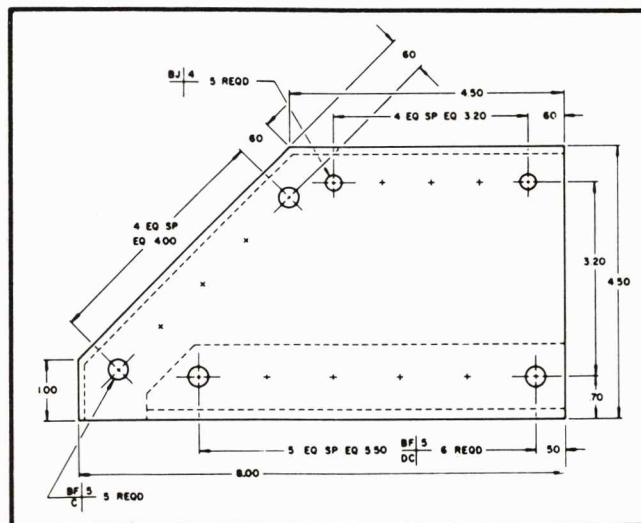
RIVET CODING AND CALLOUT

In applications where space permits, the code symbol shall be shown at the location of the rivet. For clearly defined rivet groups (3 rivets or more) only the end rivets need be coded. For mixed groups, each change in rivet size or type must be clearly defined either by showing a code at each rivet location or a code at the end of each rivet group.



PREFERRED METHOD OF RIVET CODING

In applications where space is limited, the code symbol should be shown off to the side (preferably not on the view) and the location of the rivet indicated by an arrow. The arrow should point to the first rivet on the left side of the group. Each change in rivet size or type must be clearly indicated. Show the end rivets of each group as circles equal to twice the shank diameter drawn to scale.



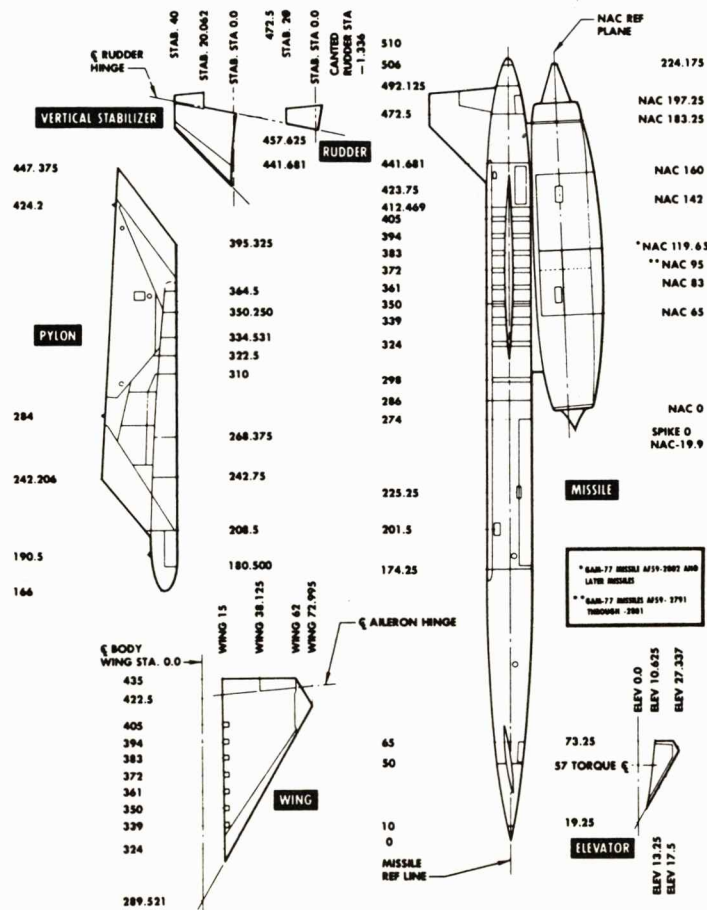
LIMITED SPACE METHOD OF RIVET CODING

STATIONING

Station 0 on the fuselage is usually the nose of the Missile and all frames, bulkheads, etc., which are located in the fuselage are located on a station point. The station will be the number of inches aft of Station 0. For instance, if a frame is to be located on Station 27.500, it will be exactly $27\frac{1}{2}$ inches back from Station 0.

Station 0 on the wings is usually located at the root section of the wing and goes outboard.

Flap and Aileron station points usually start (Station 0) at a point near the inboard edge of the assembly.





CARTESIAN COORDINATES

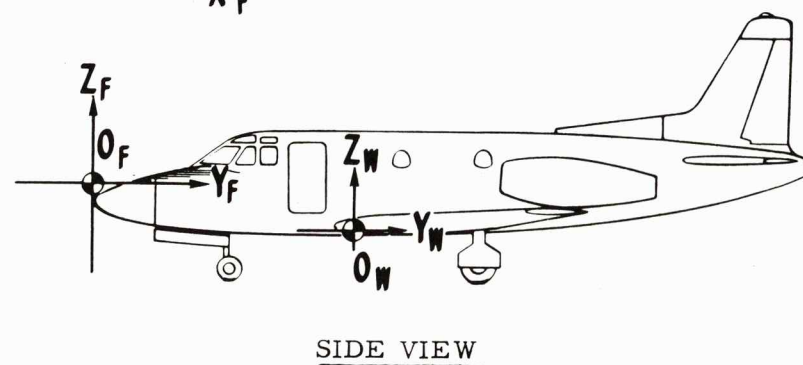
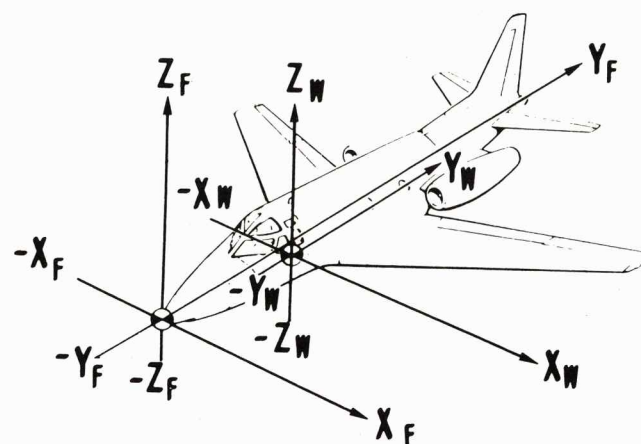
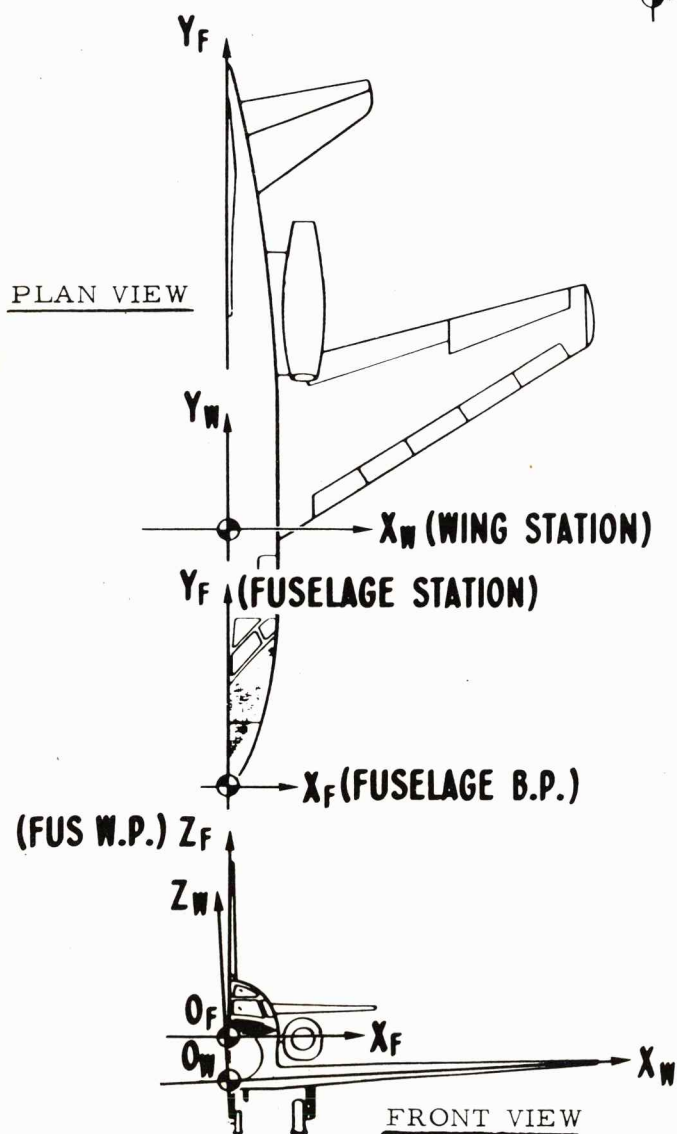
A system of dimensioning known as "Cartesian Coordinates" is used on some N.A.A. drawings. The dimensions are identified by the "X", "Y", and "Z" coordinates.

It should be remembered that these coordinates indicate a direction rather than a station, buttock line, water line, percent plane, etc.

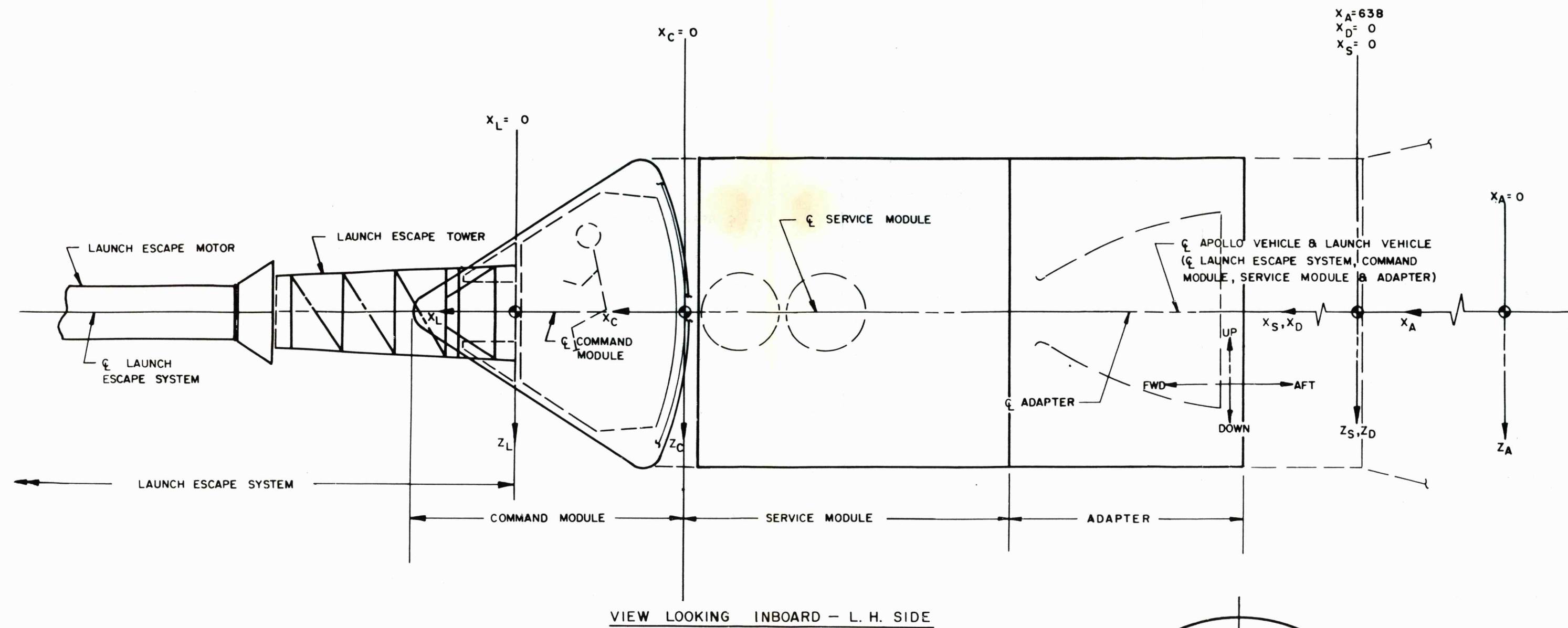
The sketch on the following page illustrates in detail this method of airframe dimensioning.

CARTESIAN COORDINATES

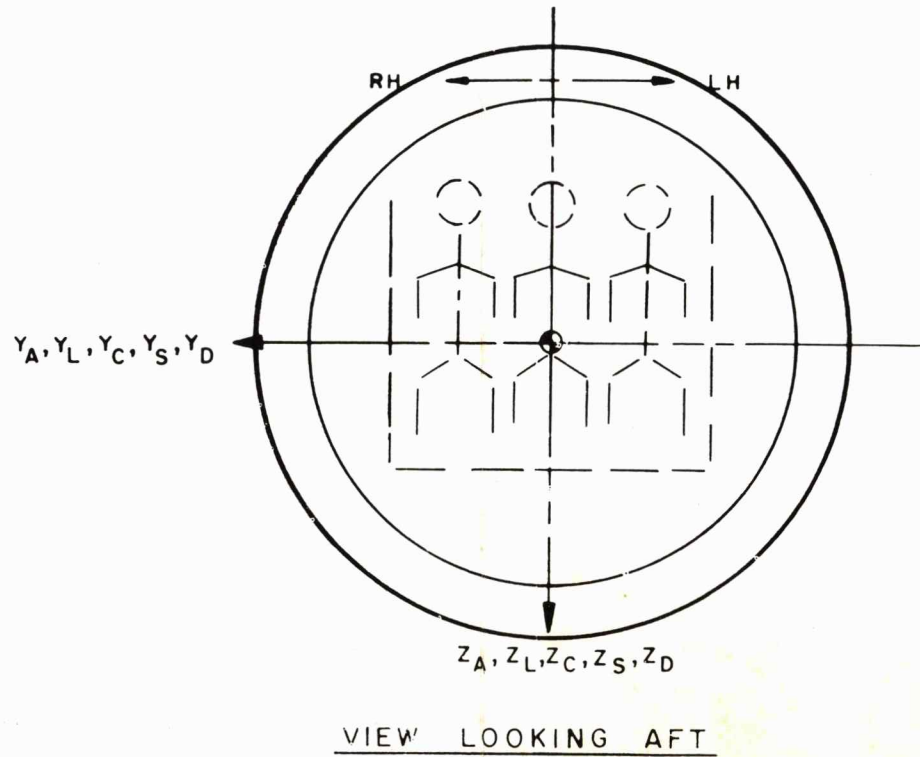
-  DESIGNATES POINT OF ORIGIN OF ANY REFERENCE SYSTEM FOR X, Y, & Z VALUES.
 ARROWS ON ENGINEERING DRAWINGS AND IN THE MASTER DIMENSION BOOKS. INDICATE (PLUS) DIRECTIONS ONLY.
 +X - DIM'S. - ARE L. H. OUTBOARD FROM POINT OF ORIGIN.
 -X - DIM'S. - ARE R. H. OUTBOARD FROM POINT OF ORIGIN.
 +Y - DIM'S. - ARE AFT FROM POINT OF ORIGIN.
 -Y - DIM'S. - ARE FWD. FROM POINT OF ORIGIN.
 +Z - DIM'S. - ARE UPWARD FROM POINT OF ORIGIN.
 -Z - DIM'S. - ARE DOWNWARD FROM POINT OF ORIGIN.



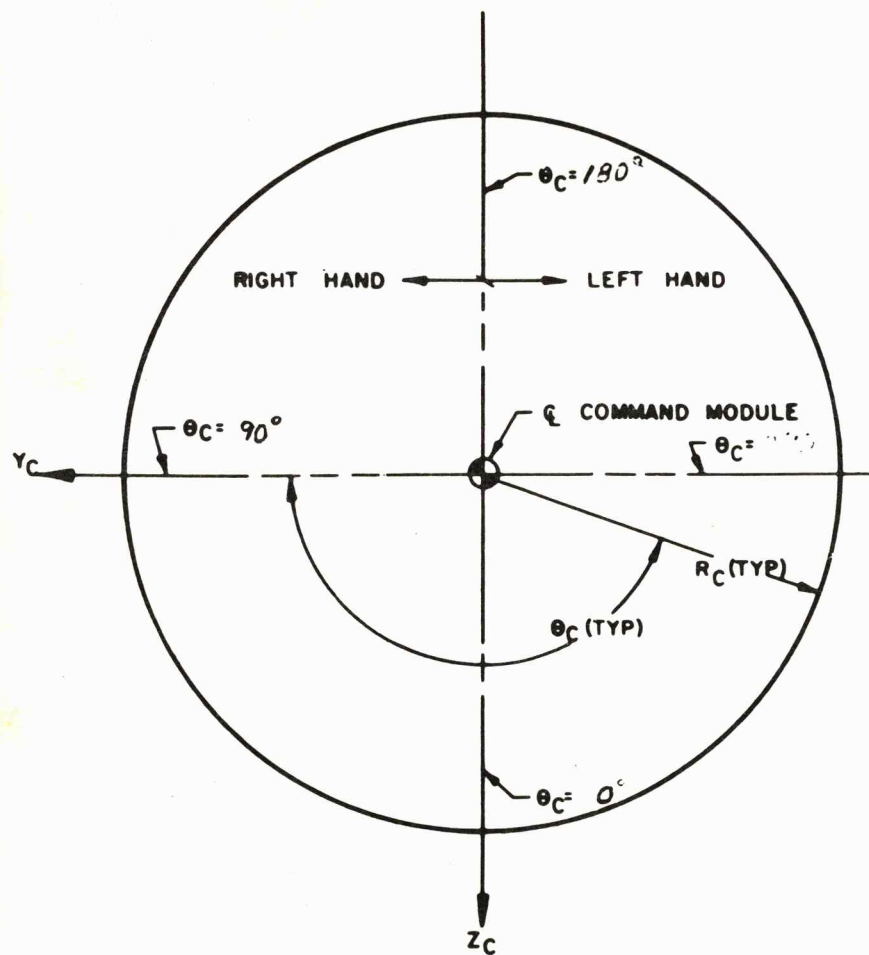
APOLLO VEHICLE COORDINATE REFERENCE SYSTEMS DIAGRAM



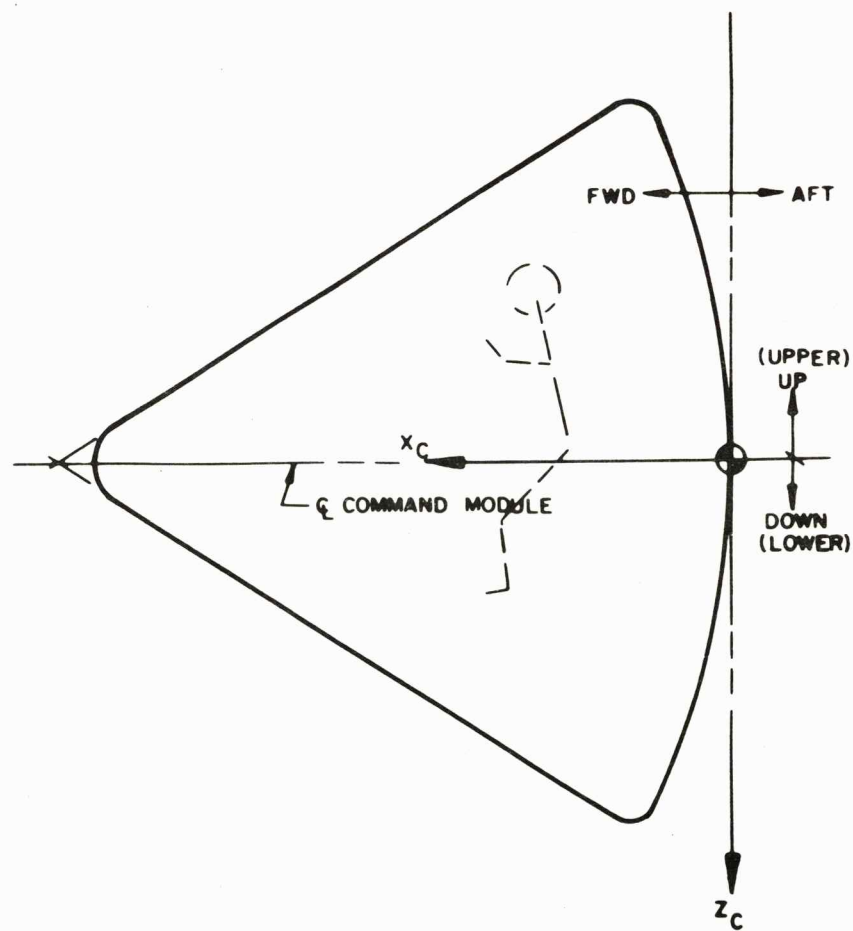
COORDINATE REFERENCE SYSTEM SUBSCRIPT DESIGNATION	
A	APOLLO VEHICLE REFERENCE SYSTEM
L	LAUNCH ESCAPE SYSTEM REFERENCE SYSTEM
C	COMMAND MODULE REFERENCE SYSTEM
S	SERVICE MODULE REFERENCE SYSTEM
D	ADAPTER REFERENCE SYSTEM



COMMAND MODULE COORDINATE REFERENCE SYSTEM DIAGRAM



VIEW LOOKING AFT



SIDE VIEW

BUTTOCK AND WATER PLANES

Buttock planes lie in the vertical position and are used to measure horizontal distances to the left and right of the fuselage centerline.

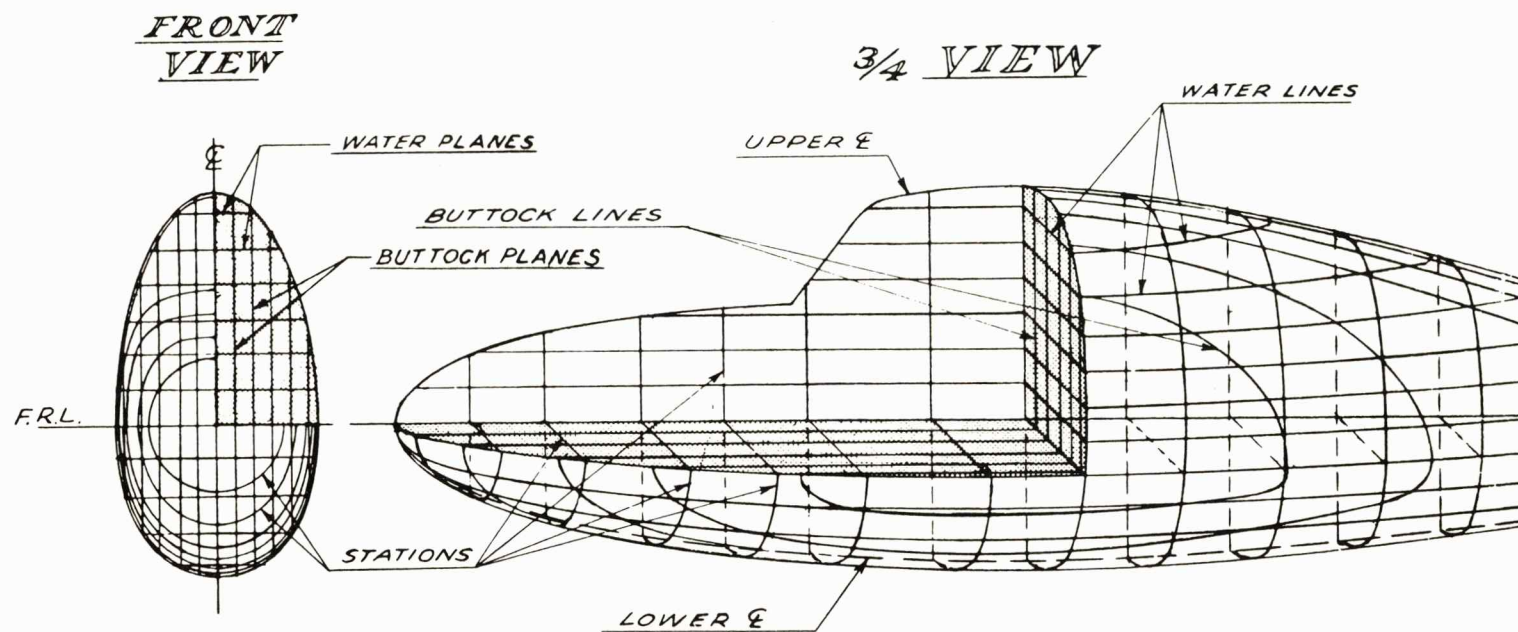
Water planes are horizontal in position and are used to measure distances above and below the "Fuselage Reference Line". A water plane below the FRL is called a minus WP (-WP).

Fuselage Station Lines measure distances aft of a forward reference point.

Any station forward of Fuselage Station 0 is called a minus station.

The sketch on the following page illustrates in detail this method of airframe dimensioning.

BUTTOCK & WATER LINES



CORPORATE SPECIFICATION

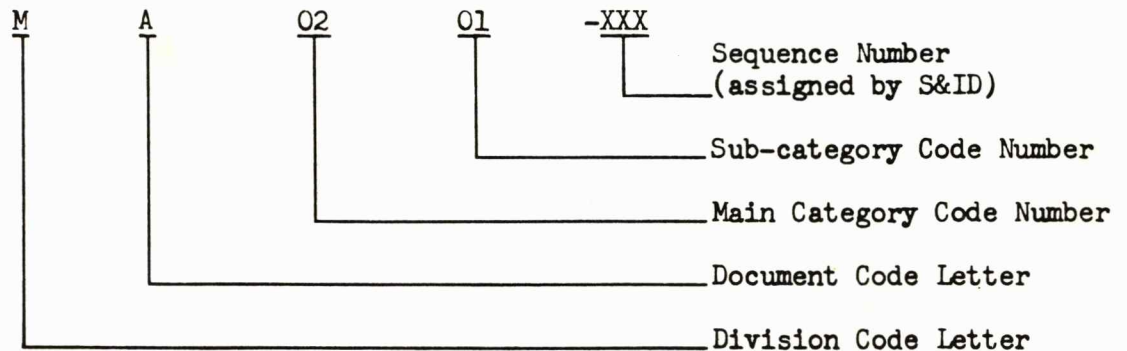
NUMBERING SYSTEM

I. General:

This guide describes a unified system for assigning numbers to Specifications. This system is now in use by S&ID.

II. Number Construction:

This is an example of a commonly used Corporate Specification Number. Notice that there are always two letters, four numerals, a hyphen, and three or more numerals.



III. Division Letter Code "M" for S&ID Specification

Other NAA division identity letters are as follows:

DIVISION
IDENTITY
LETTER

A
B
E
G
H
L
N
R
V
W
M

DIVISION

Autonetics
NAA Science Center
McAlester
General Offices
Columbus
Los Angeles
Atomics International
Rocketdyne
NAVAN Products
West Virginia
S&ID

- IV. The following documents have been assigned a document identity letter by the Corporate Engineering Standards Group. The document identity letter is an integral part of the document numbering system and is used to identify the type of document involved.

DOCUMENT
IDENTITY
LETTER

A
B
C
D
E
H
J
K
M
P
Q
S

TYPE OF DOCUMENT

Process Specifications
Material Specifications
Procurement Specifications
Standard Parts Drawing
Control Documents (Specification Control Drawings)
Interface Control Documents
Contract Specifications (Model Specifications)
Packaging Engineering Drawings
MRO Standards
Design Standards (Practices)
Quality Control Specifications
Standard Shapes Drawing

The above document identity letters have the prefix "M" which identifies the document as a Space and Information Systems Division document.

MA - Process Specifications

Process Specifications are written primarily to establish engineering requirements, supplemental to drawings. They establish methods and procedures that are essential to the fabrication, installation, or testing of a specific part or assembly. They present engineering requirements and are not used as design criteria.

MB - Material Specifications

Material Specifications are the formulated, definite, and complete requirements for basic raw materials, semifabricated materials, and semifinished materials.

MC - Procurement Specifications

Procurement Specifications are used to present clear and accurate descriptions of the technical requirements for purchased products (parts or assemblies intended as components of equipment), equipment (complete units or systems), and technical services. They shall include the requirements for acceptance and qualification testing in order to verify that such requirements have been met. They shall also include the necessary requirements for packing, packaging, preserving, marking, or other essential characteristics.

MD - Standard Parts Drawing

Standard Parts Drawings shall be used only for parts completely designed by the initiator of the standard or for vendor parts being altered by NAA. The drawing must show complete information for the manufacture of the NAA designed part or for alteration of the vendor part.

ME - Control Documents (Specification Control Drawings)

A Control Document is used to establish control over design and performance requirements of procurable items (commercial or vendor designed and manufactured for purposes of acceptance and procurement. This document may be self-sufficient, or when the item to be procured is a development item, a Procurement Specification defining the design and performance requirements and related acceptance and qualification tests, as well as preparation for delivery requirements, is prepared and referenced in the ME document.

MJ - Contract Specifications (Model Specifications)

A Contract Specification is a contractual document which presents a clear and accurate physical description and the functional requirements of an end item, designated by a model number. Additionally, Contract Specifications define the intent (scope of work) of the contracted effort and provide the basis for determining whether proposed changes to the scope of work are beyond the initial agreement.

MH - Interface Control Documents

An Interface Control Document shows the design agreement between S&ID and contractor(s), by means of a formal document.

MK - Packaging Engineering Drawings

Packaging Engineering Drawings are used to present technical requirements and instructions for protection and shipment of manufactured items.

MM - MRO Standards

Maintenance, Repair, and Operating (MRO) Supply Standards will cover items of equipment, machinery, structures or consumable materials, used on a recurring basis, for plant outfitting, maintaining, or operating purposes; and items used in processing or fabricating the end item when such processing or fabricating items are not specified or controlled by engineering MRO Standards do not include any items which become a permanent part of the end item.

MP - Design Standards (Practices)

Design Standards (Practices) are used for establishing basic engineering criteria and terminology. Commonly used design practices, such as rivet code and callout information, Weld Symbols, fabrication details, etc., are typical of this application.

MQ - Quality Control Specifications

Quality Control Specifications will establish detailed quality control requirements, methods, and standards. They will be written to specify quality requirements or quality information supplemental to Engineering requirements and will be issued only if it is not feasible to establish quality requirements in other media, such as Engineering specifications, purchase order codes, or divisional procedures.

MS - Standard Shapes Drawings

A Standard Shapes Drawing describes the cross-sectional parameters of a common design shape without regard to length. By noting the standard shape number and length on the engineering drawing, a configuration may be defined in detail without preparation of a separate detailed drawing.

V. PROCESS SPECIFICATIONS

Definitions

General Process Specifications are divided into two types: MA01 specifications for general use and MA06 specifications that provide a general process for a program (Apollo, Saturn S-II, etc.). These specifications provide engineering and quality requirements applicable to the process, as well as manufacturing methods essential to the fabrication of a part.

Specific Process Specifications (MA02, MA03, MA04) provide requirements relative to installation, assembly, calibration, etc., of specific parts and assemblies identified by part or assembly numbers.

Records and Forms Specifications (MA05) provide indices of all S&ID released process specifications, both active and inactive.

Mandatory Corporate Specification - A specification identified by the letter "G" in place of the division identity letter and established by Corporate Engineering Standards as mandatory for all divisions.

Permissive Corporate Specification - A specification identified by a division identity letter and established as a corporate document at the request of two or more divisions.

Main Category Code:

- 01 - General Processes
- 02 - Functional Test, Checkout and Acceptance Test, Operating Instructions
- 03 - Component Assembly or Installation
- 04 - Environmental Test
- 05 - Records and Forms
- 06 - Special Requirements by One Functional or Program Division

Subcategory Code:

01 - General Processes

- 01 - Application of Mechanical Fasteners
- 02 - Forming (Metallic)
- 03 - Metal Removal
- 04 - Marking (Identification Methods)
- 05 - Fabrication of Rubber, Plastics, Fabrics
- 06 - Adhesive Bonding, Sealing, Potting (Encapsulation)
- 07 - Joining
- 08 - Organic Finishing
- 09 - Inorganic Finishing
- 10 - Cleaning
- 11 - Heat Treatment
- 12 - Lubrication
- 13 - Electrical Bonding, Wiring, Insulating
- 14 - Casting and Compacting Procedures
- 15 - Quality Standards, Testing, and Special Processes
- 16 - Handling, Packaging, Preservation, Shipping and Storage
- 17 - Safety Procedures and Regulations
- 18 - Surface Conditioning of Metals
- 19 - Pyrotechnic, Hypergolic and Propellant Processes
- 20 - Assembly and Installation, General

02 - Functional Test, Checkout and Acceptance Test, Operating Instructions

- 01 - Systems and Combined Systems
- 02 - Armament
- 03 - Electrical
- 04 - Electromechanical
- 05 - Electronic
- 06 - Fluid Mechanics
- 07 - Magnetism

- 02 - 08 - Mechanical
- 09 - Optics
- 10 - Propulsion
- 11 - Ventilation, Heating and Cooling
- 12 - Heat Transfer
- 14 - Electromechanical (Extension of Subcategory 04)
- 15 - Electronic (Extension of Subcategory 05)
- 20 - Propulsion (Extension of Subcategory 10)

03 - Component Assembly or Installation

- 01 - (Reserved)
- 02 - Armament
- 03 - Electrical
- 04 - Electromechanical
- 05 - Electronic
- 06 - Fluid Mechanics
- 07 - Magnetism
- 08 - Mechanical
- 09 - Optics
- 10 - Propulsion
- 11 - Ventilation, Heating and Cooling
- 12 - Heat Transfer
- 14 - Electromechanical (Extension of Subcategory 04)
- 15 - Electronic (Extension of Subcategory 05)
- 20 - Propulsion (Extension of Subcategory 10)

04 - Environmental Test

- 01 - Systems and Combined Systems
- 02 - Armament
- 03 - Electrical
- 04 - Electromechanical
- 05 - Electronic
- 06 - Fluid Mechanics
- 07 - Magnetism
- 08 - Mechanical
- 09 - Optics
- 10 - Propulsion
- 11 - Ventilation, Heating and Cooling
- 12 - Heat Transfer
- 14 - Electromechanical (Extension of Subcategory 04)
- 15 - Electronic (Extension of Subcategory 05)
- 20 - Propulsion (Extension of Subcategory 10)

05 - Records and Forms

- 01 - General Specification Records
- 02 - Applicable Specifications to Airplane Models
- 03 - Applicable Specifications to Missile Models
- 04 - Applicable Specifications to Rocket Engine Models
- 05 - Applicable Specifications to Electronic Models
- 06 - Indexes of Equipment Specifications

06 - General Processes, e.g., Apollo, Saturn, etc.

- 01 - Application of Mechanical Fasteners
- 02 - Forming (Metallic)
- 03 - Metal Removal
- 04 - Marking (Identification Methods)
- 05 - Fabrication of Rubber, Plastics, Fabrics
- 06 - Adhesive Bonding, Sealing, Potting (Encapsulation)
- 07 - Joining
- 08 - Organic Finishing
- 09 - Inorganic Finishing
- 10 - Cleaning
- 11 - Heat Treatment
- 12 - Lubrication
- 13 - Electrical Bonding, Wiring, Insulating
- 14 - Casting and Compacting Procedures
- 15 - Quality Standards, Testing, and Special Processes
- 16 - Handling, Packaging, Preservation, Shipping and Storage
- 17 - Safety Procedures and Regulations
- 18 - Surface Conditioning of Metals
- 19 - Pyrotechnic, Hypergolic and Propellant Processes
- 20 - Assembly and Installation, General

VI. MATERIAL SPECIFICATIONS

Types of Material Specifications

There are two types of Material Specifications, both of which are applicable to manufacturing functions and are of primary concern to production engineering departments:

- A. Productive Material Specifications (MB01) govern raw materials from which finished parts are manufactured or which become a part of a deliverable item.
- B. Processing Material Specifications (MB02) govern processing materials which do not become a part of a contract end item, but are required for use during fabrication of the item and are called out for use in conjunction with process specifications.

Numbering Systems

The numbering system for Material Specifications is the same as for Process Specifications, except the letter "B" is used to identify the Material Specification document. This numbering system shall be used on all new material specifications and existing material specifications as they are revised and reissued.

Material Specifications released at the Tulsa facility are identified by use of number "8" as the first digit of the dash number, e.g., -8101, -8102, etc.

MAIN CATEGORY CODE: The main category codes for material specifications fall into two classifications:

- 01 Productive Material (formerly NA2)
- 02 Processing Material (formerly NA3)

SUBCATEGORY CODE:

A. The Subcategory Codes for 01 (Productive Material) are:

- 10 Chemicals
Acids, Alcohols, Coolants, Gases, Liquid Oxygen, Solutions, Solvents, etc.
- 15 Non-Metals
Ceramics, Glass, Mica, Refractories, Graphite, etc.
- 20 Adhesives, Cements, Sealants, etc.
- 25 Enamels, Paints, Lacquers, Varnishes, Waxes, Coatings, etc.
- 30 Rubber (natural and synthetic), Resins, Plastics and Plastic Laminates
- 35 Textiles, Felt, Fabrics, Fibers, (Including Thermal Insulation)
- 40 Lubricants (Oils, Greases, Solid Dry Films, etc.)
- 45 Hydraulic Fluids (Petroleum-Base, Silicate-Esters, etc.)
- 47 Propellants (Fuels, Oxidizers, etc.)
- 50 Electrical Wire, Cable, and Insulation (Includes Sleeving, Paper Insulation, etc.)
- 60 Ferrous Metals
Carbon and Alloy Steels
Corrosion and Heat Resisting Iron-Base Alloys
Special Alloys (Tool, Spring, Valve)

- 60 Ferrous Metals - Cont.
Electrical Materials (Pure Iron, Silicon-Iron, Nickel-Iron,
etc.)
Permanent Magnets

Note: Includes all forms, such as:
Plate, Sheet, Strip
Bar, Rod, Wire
Tubing
Forging, Extrusions
Castings
Powder Metals
Electrodes

- 69 Test Methods - General

- 70 Nonferrous Metals
Aluminum Alloys
Magnesium Alloys
Titanium Alloys
Nickel and Nickel-Base Alloys
Cobalt-Base Alloys
Copper Alloys
Zirconium Alloys
Beryllium, Tantalum, Molybdenum
Indium, Bismuth, Solium, Lead
Tungsten and High Density Materials
Anodes, Solders, Brazing Alloys
Electrodes, etc.

Note: Includes all forms, such as:
Plate, Sheet Strip
Bar, Rod, Wire
Tubing
Forgings, Extrusions
Castings
Powder Metals

- 77 Fissionable Materials

- 78 Thermoelectric Conversion Materials

- 80 (Reserved)

- 90 Identification Materials
(Includes Tapes, Decals, Nameplates, etc.)

- 95 Packaging Materials
(Includes Paper, Fiberboard, Wood, Cushioning, etc.)

B. The Subcategory Codes for 92 (Processing Material) are:

- 10 Chemicals
Plating Salts, Fluxes, Etchants,
Alkali Solutions, Acids, Solvents,
Paint Removers, Thinners, Parting
Agents, etc.
- 15 Non-Metals
Ceramics, Glass, Mica, Refractories, Graphite, etc.
- 20 Sealants, Maskants
Wood Sealer, Plastic Sealant for Ceramics and
Castings, etc.
- 25. Protective Coatings
Vinyl Coating, Paints, Lacquers, etc.
- 30 (Reserved)
- 40 (Reserved)
- 50 (Reserved)
- 60 (Reserved)
- 70 (Reserved)
- 80 (Reserved)
- 90 Identification Materials
Inks, Dyes, Tapes, Inspection Penetrants,
Rubber Stamps
- 95 Packaging Materials
Paper, Wood, Fiberboard, Cushioning, etc.

STANDARDS BOOK: The Standards Book contains information on standard parts such as bolts, nuts, rivets, clips, bushings, etc. Each part has a detailed drawing which shows the complete information concerning the part as to size, materials, specifications, and dimensions.

The book is divided into the following sections:

AN - Airforce - Navy
NAS - National Aircraft Standards
MD ~~NAA~~ - North American Aviation
AND - Airforce - Navy Design
MS - Military Standards

DESIGN HANDBOOK: This handbook prepared by the Design Producibility group provides Engineering with a central source of fundamental production information.

The book is issued in two volumes divided into 24 sections and may also be used by Manufacturing and supporting departments for reference information.

Sample sections are as follows:

Material Specifications	Welding
Rivets	Machining
Tubing	Heat Treatment, etc.

DRAWING REQUIREMENTS MANUAL: Prepared by the procedures group of the Engineering department, and used as a guide by the engineer to insure standardization of drafting practices.

The DRM is essentially a source of design information but may be used by the shop departments for reference purposes.

Sample sections are as follows:

Dimensioning and Tolerancing

Abbreviations and Symbols

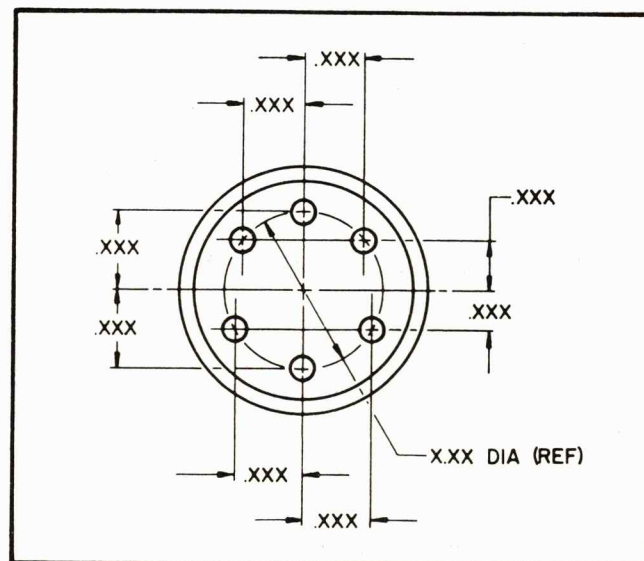
Supplemental Engineering Documents

DIMENSIONING

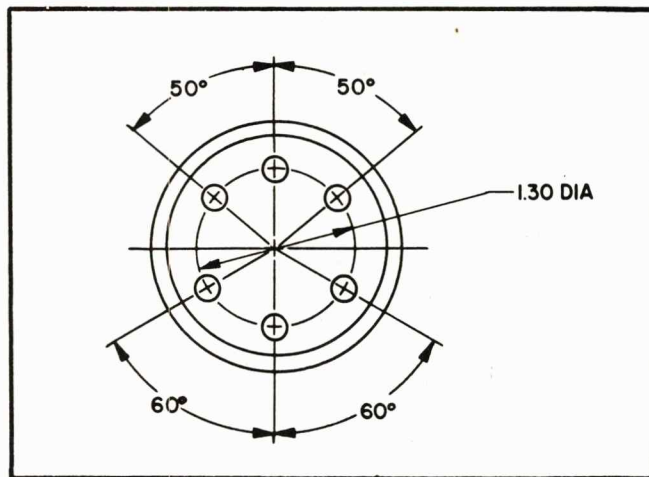
Dimensions are indicated by the use of lines, symbols, numbers and notes on drawings to define geometrical characteristics such as size, form, and location. Each line surface or point shall be located by one, and only one, set of dimensions which will not be duplicated in other views except as reference dimensions.

Size, form, and location are specified by means of two fundamental dimension systems, rectangular (or offset, or coordinate) and angular dimensioning. Both systems may be used on the same drawing, but any given surface or point must be located by only one system.

Rectangular dimensioning is the preferred method of indicating distances, locations, and size by means of linear dimensions measured parallel to reference lines or planes which are perpendicular to each other.

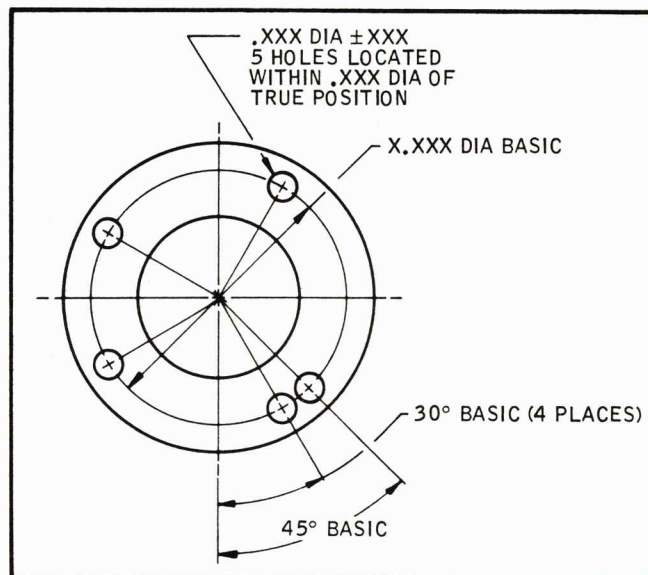
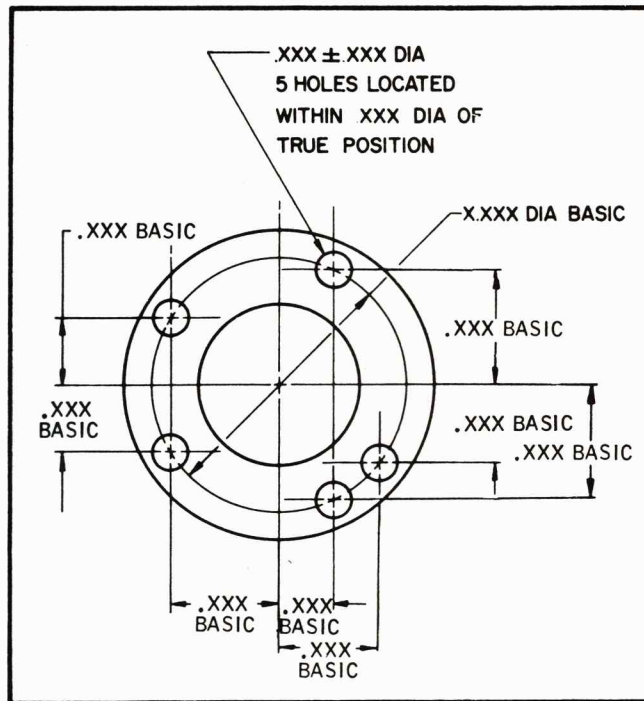


Angular dimensioning is the method of indicating the position of a point, line, or surface by means of linear dimension and angle, other than 90 degree angle implied by the horizontal and vertical center lines. The angular method is useful for specifying the location of several holes on a common arc where greater than nominal decimal tolerances (per drawing Title block, or other) can be permitted, and for the indication of simple bend angles on sheet metal parts.

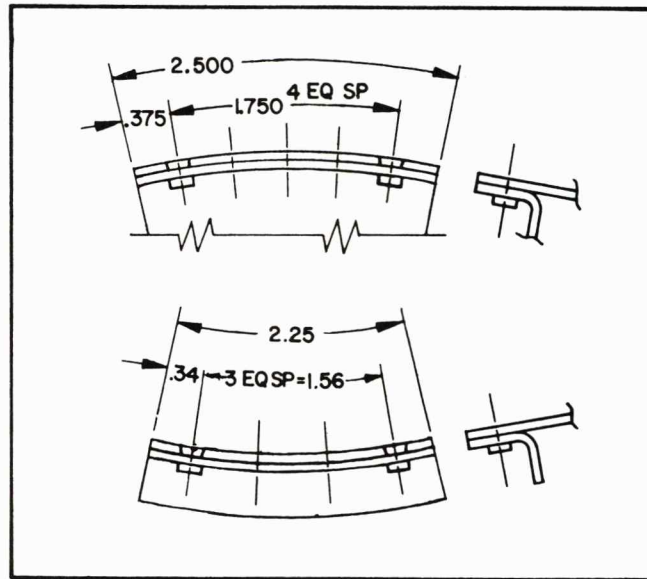


True-position dimensioning is the method of indicating distances, locations, spaces, and positions of points first in their basic or true position, then by specifying in note form the permissible variation or tolerance from this true position.

This method allows maximum manufacturing tolerances, but eliminates accumulation of tolerances since the hole-to-hole relationships are controlled by variation from true position. It is adapted particularly to many repeated patterns, such as holes, slots, bosses, tabs, etc., but is not confined to repeated patterns.



Curved Surfaces: In dimensioning the spacing of holes and other features of curved surfaces or contours, care should be taken to indicate clearly the surfaces on which the dimensioned points are to be measured, and whether the dimensions are rectangular, chordal or circumferential. Circular or cylindrical parts, in general, are dimensioned from or about center line.



Dimension lines are used to show the extent of lengths, widths, thicknesses, etc., to which the dimensions apply. Suitable spacing is about 1/2 inch between a dimension line and the outline of the part, and about 3/8 inch between parallel dimension lines.

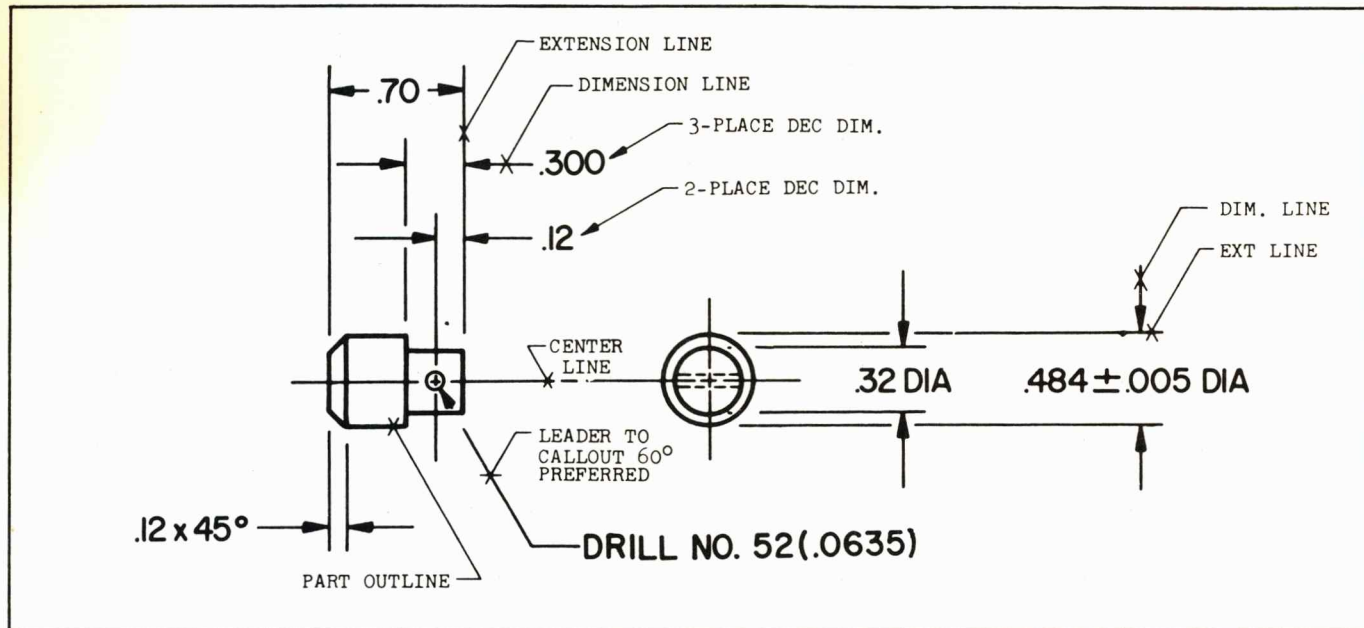
Extension lines are used to denote locations, such as points or surfaces, between which the dimension applies. They are drawn perpendicular to dimension lines and generally start about 1/16 inch from the outline of the part and extend to about 1/8 inch beyond the outermost dimension line.

Center lines are used to indicate points and axes of symmetry. They may be extended to show relationships of symmetrical features and also to serve as extension lines for dimensional purposes. A center line never shall be used as a dimension line.

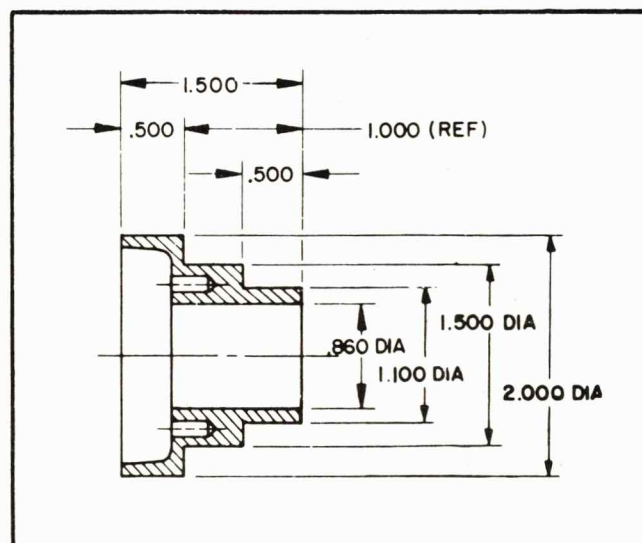
Two center lines shall be drawn at right angles to each other in views showing a circular contour, and the short dashes should intersect at the center of circles or circular features.

Dimensions are always shown in inches unless otherwise noted. All dimensions are intended to be read from one direction.

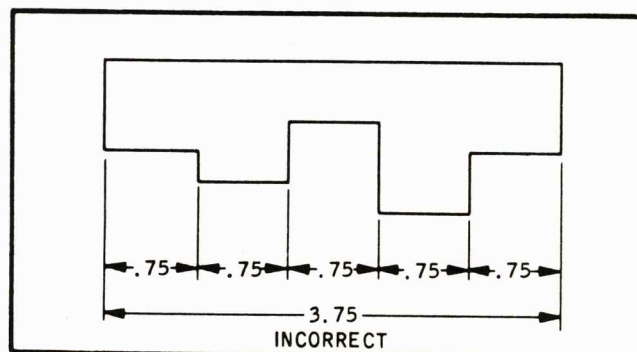
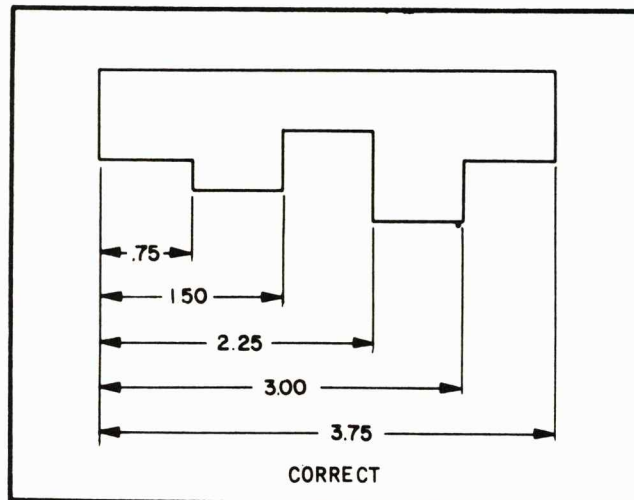
When reading a blueprint, use the dimensions shown, do not scale the drawing.



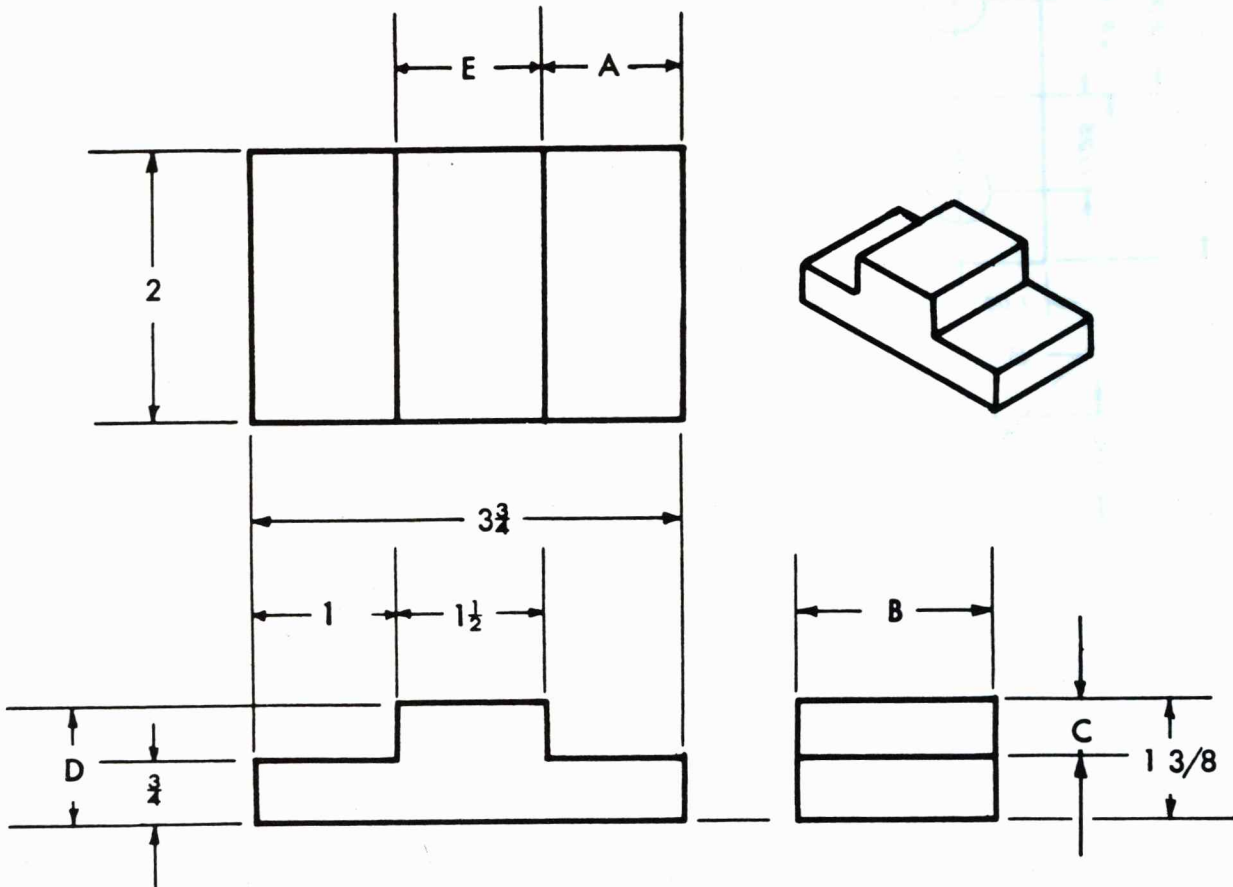
Preferable, dimensions shall be taken from visible outlines rather than from hidden lines. Dimensions shall be placed between extension lines wherever practical.



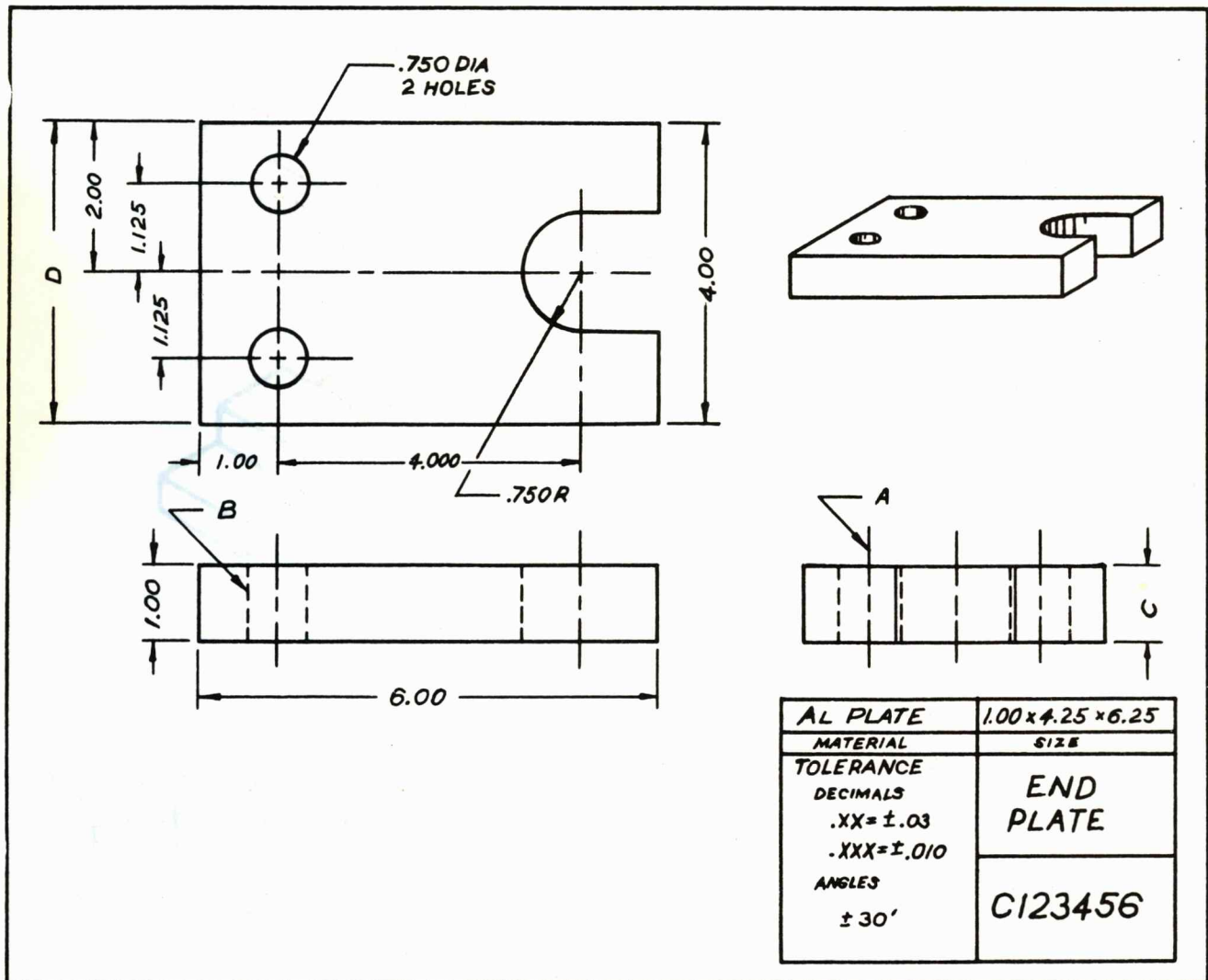
Base Line Dimensioning: Accumulation of tolerances may be avoided by using base line dimensioning, but in no case should non-critical surfaces or hole positions be held to closer tolerances than necessary in order to apply base line dimensioning on the drawing. Base line dimensioning implies that features (points, holes, edges, cutouts, etc.) are located relative to a pair of common base lines which are normally perpendicular to each other.



NOTES

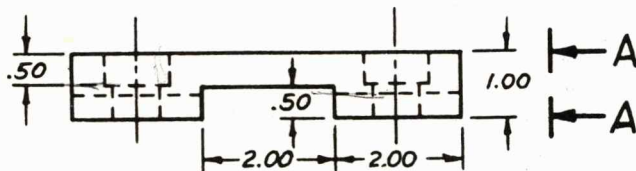
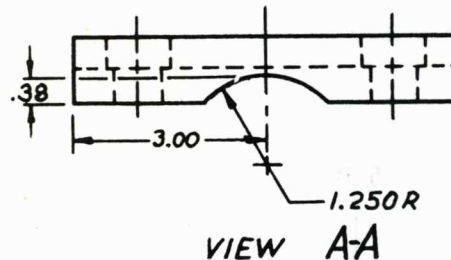
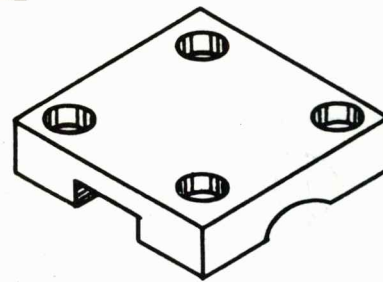
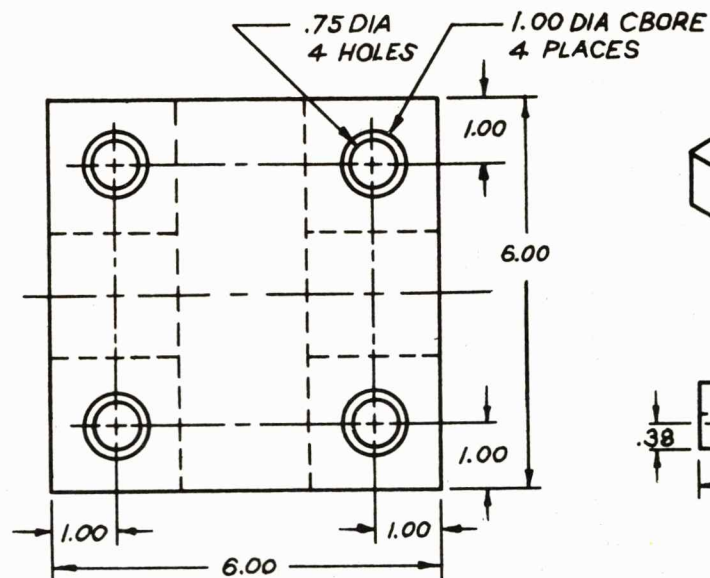


1. Give the dimension for A $1\frac{1}{4}$
2. Give the dimension for B 2
3. Give the dimension for C $\frac{5}{8}$
4. Give the dimension for D $1\frac{3}{8}$
5. What is the overall length? $3\frac{3}{4}$
6. What is the overall width? 2
7. What is the overall thickness? $1\frac{3}{8}$
8. What is the dimension for E? $1\frac{1}{2}$



1. What is the thickness of the end plate?
2. What is the length of the end plate?
3. What size are the holes?
4. Are the holes drilled through the plate?
5. What size raw material is required?
6. What kind of line is A?
7. What kind of line is B?
8. Give the dimensions for
9. What is the maximum acceptable length of the part?
10. What is the minimum acceptable width of the slot?

1.00
 6 + .750 + 1.125
 .750
 yes
 1 x 4 1/2 x
 Center
 Hidden
 C 1" D 4
 6.03
 1.480



IRON FORGING	1.25x6.25x6.25
MATERIAL	SIZE
TOLERANCE	CLAMP
DECIMALS	
.XX=±.03	D123456
.XXX=±.010	
ANGLES	
± 30'	

1. What is the maximum acceptable distance between two adjacent holes?
2. What kind of view is view A-A (Top, R.H., L.H., etc.)?
3. What kind of material is specified?
4. What size of raw material is required?
5. How deep are the holes counterbored?
6. How deep is the round slot?
7. What is the minimum acceptable radius for the slot?
8. How thick is the clamp?
9. How is the round slot shown in the front view?
10. What is the smallest acceptable hole size?
11. What is the name of the part?
12. What is the number of the part?

4.03

R.H.

Iron Forging

1.25x6.25x6.25

1/2"

~~3/8~~ .38

1.250

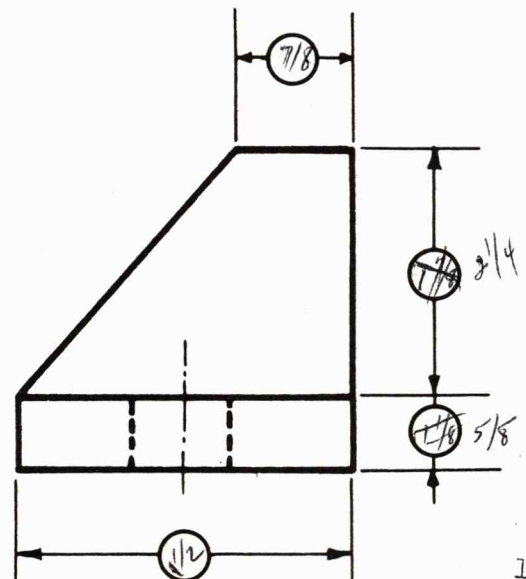
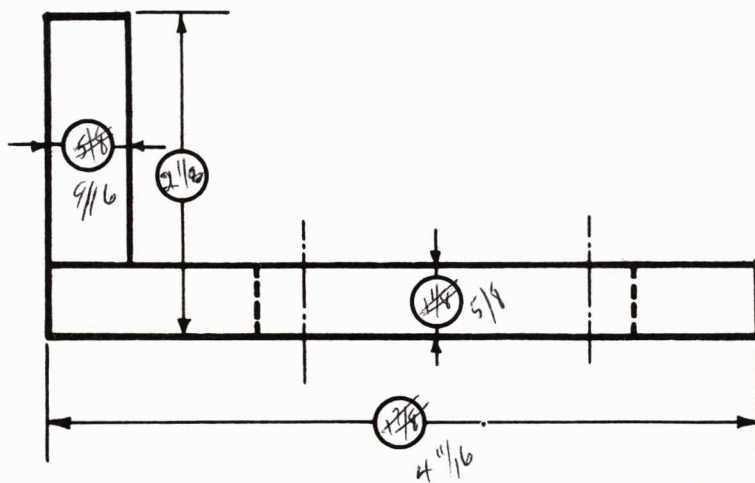
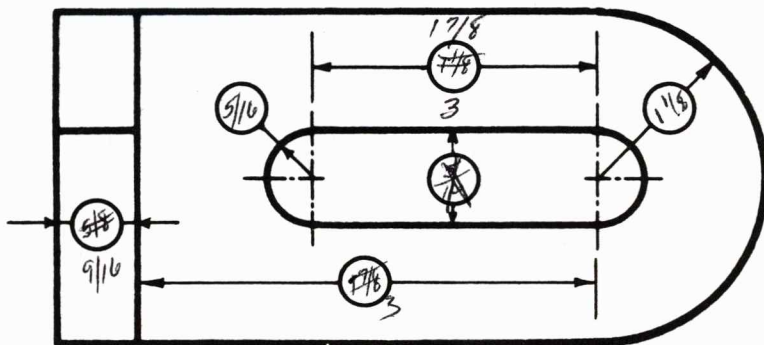
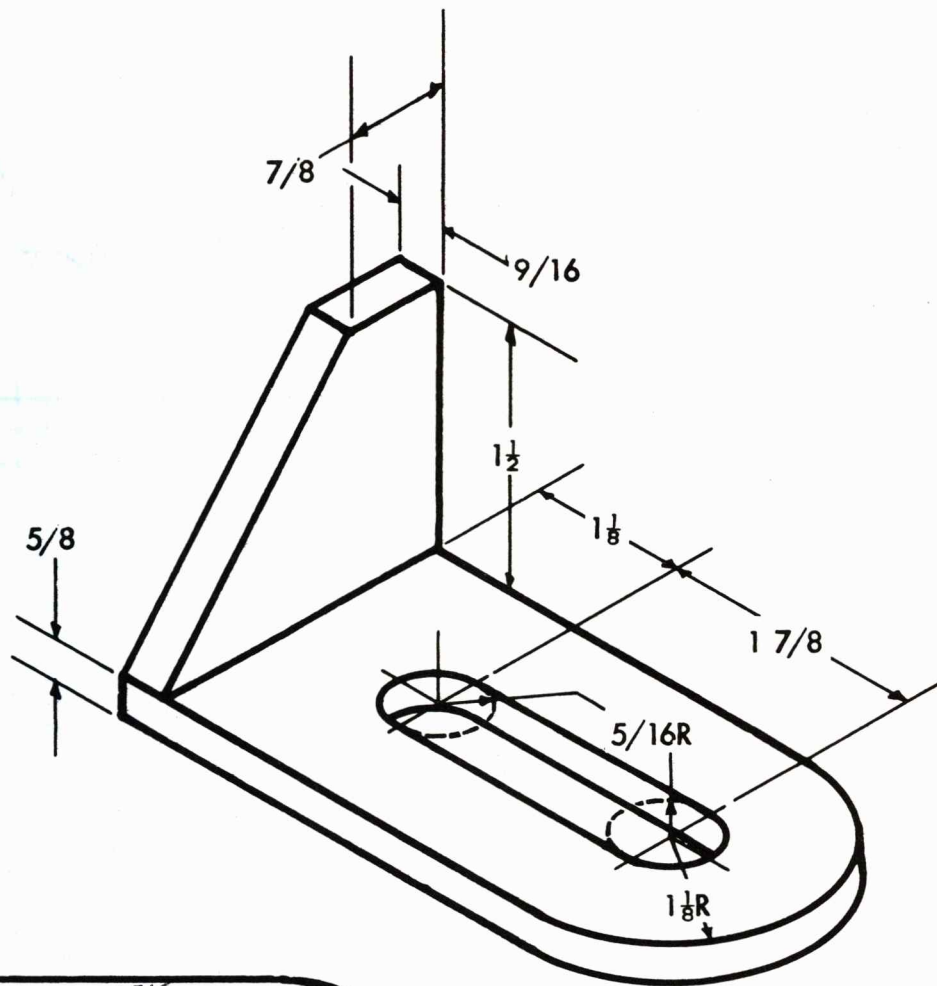
1"

1.250R hidden line view

.75

Clamp

D123456



DRAWING CHANGE

CHANGE AUTHORIZATION: Changes originate from either an outstanding Engineering Order, a properly approved Request for Drawing Change (RDC) which may be reflected by the issuance of an EO or incorporated into the drawing direct at the time of drawing revision. An RDC will be initiated for an improved design that is sanctioned by a group leader.

An Engineering Order (EO) is the means by which engineering releases drawings, process specifications, etc. It may also be used to obsolete parts, stop work, authorize rework, incorporate a change or to make a new part.

A Request for Drawing Change (RDC) is the means whereby a proposed change or sketch of a change may be submitted to the engineering group for approval and then incorporation into the drawing.

ENGINEERING ORDER (EO)

The purpose of Engineering Orders is to release requirements and to distribute drawings. They release process specifications and engineering information. EO's also provide a fast means of making and authorizing minor changes to a drawing that has been previously released.

<small>NORTH AMERICAN AVIATION, INC. SPACE AND INFORMATION SYSTEMS DIVISION</small> ENGINEERING ORDER										SHEET M	
MODEL 1		EFFECT ON 2			AUTHORITY: EG GO, MCR 3		PARTS MADE: <input type="checkbox"/> 4 OK TO USE <input type="checkbox"/> MAY BE RWKD <input type="checkbox"/> NOTED			EO BY & DATE ZIP	
SYM 5	DOCUMENT 6	NUMBER 7	REV 8	TYPE CODE		SUBJECT 9 10					
<div style="position: absolute; bottom: 10px; right: 10px; text-align: right;"> 11 12 </div>										DEPT. GROUP 13 EXT	
										S.P. DATE	
										DEPT./GROUP CHK	
										STRESS 14	
										PROJ. ENGR	
										EO COPIES TO ZIP	
										15	
										16	
										DIST. DATE	
										REF. E.O. REASON: 12	

SYMBOLS = DISTRIBUTE PRINTS A = ATTACHED COPIES TO DRAWINGS

Changes which affect more than one drawing, up to a maximum of 8 drawings, may be released on a single EO if the changes are related to the same design revision or if an identical change is being made to more than one drawing.

A copy of a Change-type EO will be attached to all prints of the affected drawing except Part By Number release. This type of EO is known as an "Outstanding Change" to the drawing number it is written against, and not superseded or cancelled, must eventually be incorporated into the drawing. The superseded EO is not an outstanding EO; but remains attached until the superseding EO is incorporated. "Outstanding Change" EO's are EO's which indicate that the drawing is to be changed.

On single sheet drawings, all outstanding EO's shall be incorporated when a maximum of ten EO's is reached. On multisheet drawings, all outstanding EO's shall be incorporated when one of the following conditions exist:

- (1) Ten EO's against the first sheet.
- (2) Five EO's against any subsequent sheet.
- (3) A total of twenty EO's against all sheets.

EO FORM SPACES

COPIES TO: The columns headed "COPIES TO" shall be used to distribute copies of the EO to others not normally named on the regular EO distribution list. The zip column shall include the mailing code number. These spaces are also used by the Release Group to route copies to major sub-contractors and other facilities.

PROJ ENGR	
EO COPIES TO	ZIP

EFFECT ON: The "EFFECT - ON" block is provided primarily to indicate the appropriate "CHANGE POINTS", or the production point on which changes or new drawings become effective. It is also used to indicate the production point at which Stop Orders become effective.

MODEL		EFFECT ON	
SYM	DOCUMENT NUMBER	REV	

PARTS MADE: The PARTS MADE block will be filled in on Change-type EO's by placing an (X) or a symbol in the applicable square to indicate the desired position of parts already completed to the currently released drawings. Unless otherwise noted, the choice of a disposition shall be based on the assumption that all of the total quantity of required parts have already been completed.

MAY BE REWORKED will be indicated when Engineering approves the use of parts or assemblies reworked as shown. This disposition will also be indicated when the nature of the change is such that it is impossible to rework the parts to be exact to the configuration shown, but by means of special instructions (shown on the EO, or on a separate EO, or on a Rework Drawing) the parts may be made usable. This disposition gives Manufacturing Scheduling the option to scrap existing parts and make new parts in lieu of accomplishing the rework.

OK TO USE will be indicated when all parts made to the currently effective design configuration can be used.

NOTED will be indicated when the disposition requires an explanation in the body of the Engineering Order.

ENGINEERING ORDER

AUTHORITY: EG GO, MCR		PARTS MADE:		SHEET _____	
		<input type="checkbox"/> OK TO USE	<input type="checkbox"/>	M	
		<input type="checkbox"/> MAY BE RWKD	<input type="checkbox"/>		
		<input type="checkbox"/> NOTED	<input type="checkbox"/>		
TYPE CODE		SUBJECT		EO BY & DATE ZIP	
				DEPT / GROUP EXT	
				SUPV DATE	
				DEPT / GROUP	

EO BY: The "EO BY" block provides space for the EO writer's name, phone extension, and group. The date on which the EO is written shall be included in the space.

SUPV.: The "SUPV." block provides space for signature by supervision of the person writing the EO as well as the signatures of the supervision of the Engineering Group responsible for the affected drawing.

CHECKED BY: The "CHECKED BY" block provides space for the signature of the checker in Document Verification responsible for EO clarification. The date will be entered upon completion of the checking function.

STRESS: "STRESS" check and signature by the Structures Group prior to release may be required at the discretion of the Group or by the Project Engineer by encircling the word "Stress."

DER	
SHEET _____	
M	
ISE <input type="checkbox"/>	
ED <input type="checkbox"/>	
EO BY & DATE	
ZIP	
DEPT / GROUP	
EXT	
SUPV	DATE
DEPT / GROUP	
CHK	
STRESS	
PROJ ENGR	
EO COPIES TO	ZIP

MODEL		EFFECT ON	
SYM	DOCUMENT	NUMBER	REV

MODEL BLOCK: On Change EO's (including Stop Orders, Part-By-Number, Information, etc.), only those models affected by the change or those models for which the change is being released shall be listed in the Model block; the work "ONLY" shall be used in these cases to indicate (1) that there are other models and (2) that the other models are unaffected.

FORM M 153-K-6

REF EOs
REASONS

SYMBOLS: \emptyset = DISTRIBUTE PRINTS ☐ A = ATTACH EO COPIES TO DRAWINGS

REFERENCED EO: The "REFERENCED EO" block is provided for listing the serial numbers of other EO's which are related. Coordinated EO numbers are listed in the body of the EO directly above this block.

TYPE: Code & Subject space shall indicate the kind of action which the EO is designed to accomplish. When two or more types of EO's are combined, the clock shall contain each type. A "STOP ORDER" and a "STOP ORDER RELEASE" are the only types that may carry the word "STOP."

ENGINEERING ORDER

AUTHORITY: EG GO,MCR		PARTS MADE:		E
		<input type="checkbox"/> OK TO USE <input type="checkbox"/> MAY BE RWKD <input type="checkbox"/> NOTED	<input type="checkbox"/> <input type="checkbox"/>	
TYPE CODE		SUBJECT		DI
				SL

SYMBOL, DOCUMENT NUMBER AND REVISION LETTER COLUMNS: When releasing drawings or other documents, or ordering parts, the numbers shall be listed in either numerical or parts-list order directly under "DOCUMENT NUMBER". When drawings or other documents are being released, the number shall be prefixed by the symbol ϕ , entered in the "Symbol" column. The symbol indicates the prints will be made and distributed.

When new drawings are being released, the word "NEW" shall be shown under the "Revision column" heading. When a drawing is being initially released under a letter change, the words "INITIAL RELEASE" shall be shown parenthetically adjacent to the drawing number.

When changed drawings are being released, the last change letter shall be shown under the "Revision column".

"Number Required" and "Next Using Drawing" columns are used only when ordering parts by Part Number-type or EO Drawing type EO's. The "Number Required" shall be used to indicate the quantity to be ordered. When the part is needed for a production-model-type article, the indicated quantity shall be sufficient to make one end-item.

NORTH AMERICAN AVIATION, INC. SPACE and INFORMATION SYSTEMS DIVISION			
MODEL		EFFECT ON	
SYM	DOCUMENT NUMBER	REV	

REASONS

The "Reasons" space is reserved for any useful information outlining the reason for the change, or for other general remarks which would help clarify or coordinate the information on the EO. On change EO's incorporating Requests for Drawing Change (RDC's), the RDC number with the word INCORPORATED shown in parentheses shall be noted. When a supersedure EO is written, the Reason & Remarks space shall repeat the original reason for the change as called out on the superseded EO, along with the reason for the change of the superseding EO.

FORM M 153-K-6 NEW 4-

REF EOs

REASONS

SYMBOLS: Ø=DISTRIBUTE PRINTS ☐=ATTACH EO COPIES TO DRAWINGS

AUTHORITY: The document authorizing the change, i.e. MCR or DCA, etc., will be entered in this space. The MCR or DCA Numbers, as applicable, will be entered on EO's in one of the following ways:

- (1) For Class 1 changes. Multiple MCR or DCA numbers will require symbol coding to indicate specific applicability to the EO information.
- (2) For Class 2 changes. Since these changes do not require MCR or DCA authorization, the words "NOT REQD" shall be entered or a diagonal line extending from lower left to upper right hand corner of the block shall be entered.
- (3) The Authority space shall also be used for applicable NAA account numbers when Engineering action is charge-

able to test accounts. When this occurs, the proper account number(s) shall be listed.

- (4) The Authority space shall also be used for the listing of the General Order Number(s) applicable to the drawings when the drawings are being released for production.

ENGINEERING OR	
	AUTHORITY: EG GO, MCR
	PARTS MADE: <input type="checkbox"/> OK TO U MAY BE RWKI NOT
	TYPE CODE
	SUBJECT

ATTACH EO COPIES TO DRAWING NO.: Engineering Orders shall be attached to all directly affected except as noted below.

The following Types of EO's shall not be attached to drawings:

Stop Order

Stop Order Release (Without Change)

New or Changed Drawing (Not Rework - Type Drawings)

EO Drawing

Obsolescence

Part by number

When it is necessary for an EO to be attached to affected drawings, the symbol ☐ shall be used, and shall be placed in the "Symbol" column of the EO.

SYMBOLS: \emptyset = DISTRIBUTE PRINTS A = ATTACH EO COPIES TO DRAWINGS

RELEASED: A space shall be reserved on all EO's (all programs) for release data stamping by Technical Records. The stamping information, the space to be reserved, and the location are illustrated. It is emphasized that any information written in the space reserved for stamping will be removed.

DIST CODE	
M	
SHEET _____	

TYPES OF EO's

The most predominantly used EO's are:

NEW DRAWING: This type of EO is used to release new drawings.

The "Effect On" block shall contain a choice of the following effects on.

End Item X & Subs (or X Thru Y)

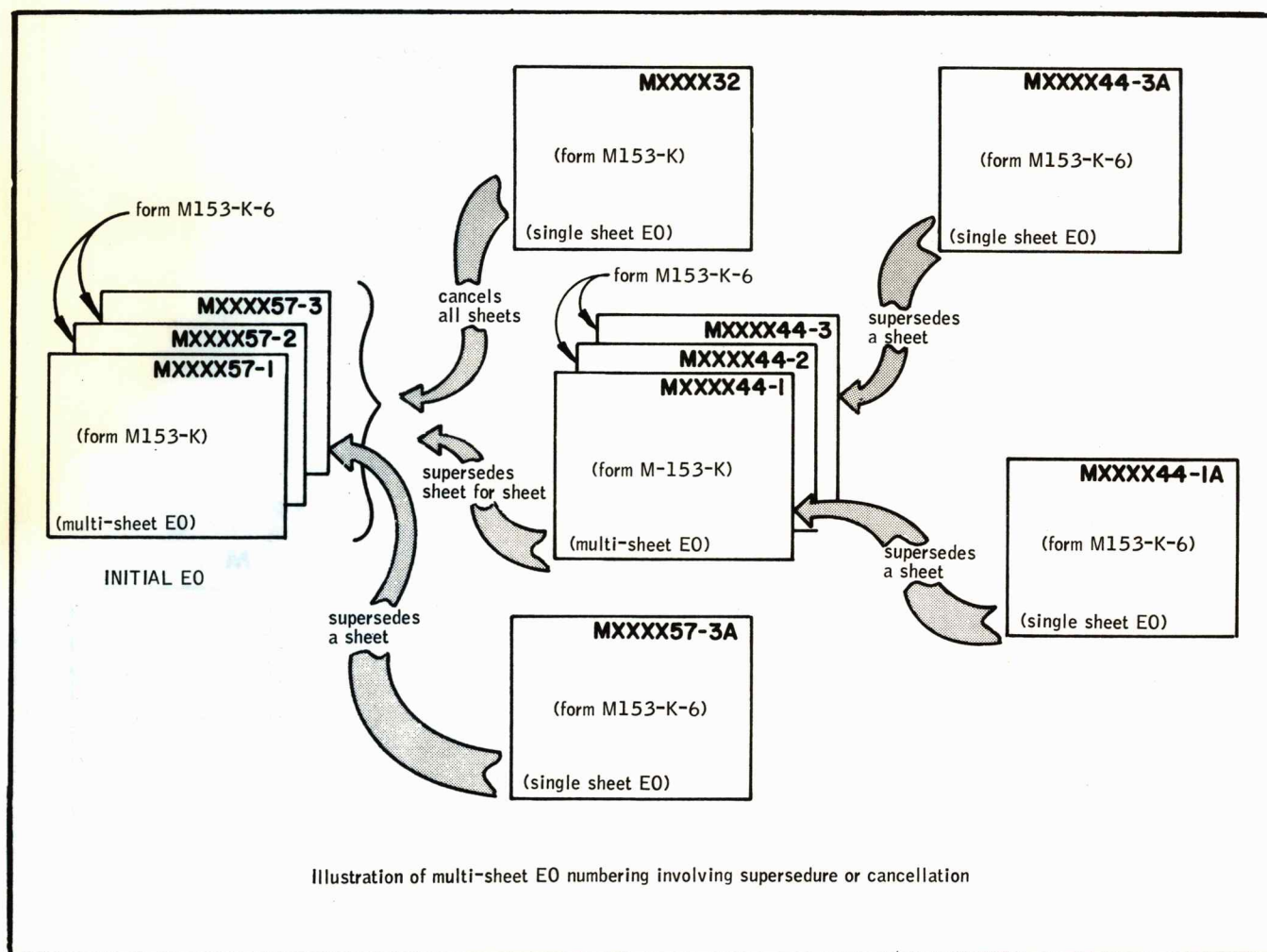
End Item ✓ X & Subs

TYPES OF ENGINEERING ORDERS

Should it become necessary to cancel all of the information on a given EO sheet, the sheet will be superseded as described above except that the supersedure note entered in the body of the superseding sheet will read "This sheet supersedes sheet (sheet number and supersedure letter, if any) of EO XXXXXX in that all information is canceled, and the drawing is returned to its original state." (Add disposition of parts made.) When superseding (sheet-for-sheet) all sheets, a new EO number shall be used. Cancellation of a multi-sheet EO cancels all sheets and is accomplished by the preparation of a single sheet cancellation EO using an unrelated EO number and indicating in the body of the cancelling EO that "This EO cancels EO XXXXXX (sheets X through Y) in its entirety and restores the drawing to its original state." When cancelling a multi-sheet "change" EO, the "subject" of the cancelling EO is "CHANGE." A copy of all sheets of a multi-sheet EO (which have not been superseded) shall accompany the cancelling EO through the release system. Figure 4.2b illustrates multi-sheet EO numbering system.

NORTH AMERICAN AVIATION, INC. ENGINEERING ORDER SYSTEMS DIVISION 2214 EAST 10TH AVENUE, DENVER, COLORADO 80202				ENGINEERING ORDER		SHEET <u>2</u>	
MODEL VXX-2	EFFECT ON END ITEM 4 & SUBS			AUTHORITY: EG GO, MCR GOXXXX MCRXXX	PARTS MADE: <input type="checkbox"/> OK TO USE <input type="checkbox"/> MAY BE RWD <input type="checkbox"/> NOTED	M 475190-2A	
SYM	DOCUMENT NUMBER	REV	TYPE CODE	SUBJECT			
THIS SHEET SUPERSEDES SHEET 2 OF EO M475190 AND DIFFERS AS FOLLOWS: CUTOUT DIM .75 WAS .50. PARTS MADE PER EO M475190 SHEET 2 TO BE REWORKED.					EO BY & DATE DEPT / GROUP EXT SUPV DATE DEPT / GROUP CHK STRESS PROJ ENGR EO COPIES TO ZIP		
<div style="display: flex; justify-content: space-between;"> <input type="checkbox"/> V17-470150 A DC CHANGE </div> <div style="text-align: center; margin-top: 20px;"> <p style="margin-top: 10px;">EO VIEW A-A (SEE SHEET 1 OF EO)</p> </div>					DIST CODE <div style="font-weight: bold; font-size: large;">M 475190-2A</div> SHEET <u>2</u>		
REF EOs REASONS SUPERSEDURE - ADDITIONAL CLEARANCE NEEDED.							
SYMBOLS: <input checked="" type="checkbox"/> = DISTRIBUTE PRINTS <input type="checkbox"/> = ATTACH EO COPIES TO DRAWINGS							

ENGINEERING ORDERS



5. **SPECIAL DISTRIBUTION. RESTRICTED DISTRIBUTION** is a subnormal distribution of prints of drawings that are of value to only a limited number of individuals or departments and may be effected by using the word "RESTRICTED" in parentheses in front of the EO subject entered in the "Subject" Column (see Figure 5) of the releasing EO. The "MODEL & EFFECTIVITY" block and the "PARTS MADE" block are crossed out. All EO's indicating restricted distribution are "SC" type. The EO body will contain a list of intended recipients under the note "PRINTS TO BE DELIVERED TO THE FOLLOWING ONLY." Change EO's may be written against a drawing which has been given RESTRICTED distribution; however, these EO's will carry the distribution note and the list of recipients as shown on the previous EO. RESTRICTED drawings may be obsoleted when necessary. The list of recipients will be the same as on previous EO's but will appear in the "COPIES TO" block of the EO. It is necessary that drawings be removed from the "RESTRICTED" category when parts are to be made. This shall be accomplished by a non-restricted (normal) drawing release under the next sequential change-letter. The following note shall be the first entry in the drawing Revision block: "NC DRAWING (or "A" CHANGE DRAWING) WAS RESTRICTED." The restricted distribution list shown on the last previous releasing EO shall be duplicated on the new releasing EO but will be shown in the "Copies To" block only.

ENGINEERING ORDERS

NORTH AMERICAN AVIATION, INC. ENGINEERING AND INSTRUMENTATION SYSTEMS DIVISION 12214 LAKEMOORE BLVD., GAITHERSBURG, MD 20878				ENGINEERING ORDER		SHEET _____	
MODEL		EFFECT ON		AUTHORITY: EG GO, MCR GO XXX-X		PARTS MADE: <input type="checkbox"/> OK TO USE <input type="checkbox"/> MAY BE REV'D <input type="checkbox"/> NOTED	
SYM	DOCUMENT NUMBER	REV	TYPE CODE		SUBJECT		
Ø	XXX-XXX287	NEW	(RESTRICTED)		SC DOCUMENT		
<p>PRINTS TO BE DELIVERED TO THE FOLLOWING ONLY:</p> <div style="border: 1px solid black; padding: 5px; display: inline-block;"> <p>LIST THE INTENDED RECIPIENTS, QUANTITY & MAILING CODE.</p> </div>							
REF EOs						DIST CODE	
REASONS REF SUBJECT 8130						M SHEET _____	

SYMBOLS: Ø = DISTRIBUTE PRINTS A = ATTACH EO COPIES TO DRAWINGS

6. **SECURITY CLASSIFICATION NOTES.** If a Security Classification is required on a drawing, it is specified by the responsible originating Engineering group on the releasing EO. The Release Group will place the security classification along with the Espionage Notation in the appropriate drawing areas as discussed in Subject 7171. The security classification for each classified drawing being released on an EO will be noted in parentheses adjacent to the drawing number and to the right of the "REV" letter column. EO's releasing classified drawings into the normal production release system shall list the intended recipients under the following note: PRINTS TO BE DELIVERED TO THE FOLLOWING ONLY (list recipients and quantity and mailing code.)

ENGINEERING ORDERS

7. **EO TYPES.** Engineering Orders are classified by the following types:

- A. Basic Drawing Release (Type Code BR)
- B. Design Change Release (Type Code DC)
- C. Subordinate Document Release (Type Code SD)
- D. Supplementary Control Release (Type Code SC)

The four types of EO's are to be used as follows (see coordination chart, Figure 7):

A. **Basic Drawing Release (Type Code BR)** - Release of drawings representing the basic contract end item Detail Specification configuration. Basic Release will only apply to release of new model requirements represented by the indentured drawing list identified in the Basic Release Package as determined by the Program Engineering head. Any subsequent drawing changes or new drawings not identified in the Basic Release Package will be identified as Design Change Type. Basic drawing releases will consist of:

New drawings
Changes to existing drawings to add the new model requirements. (Changes may be by direct drawing revision or Change EO.)

Basic Release will normally show effectivity 1 & SUBS. However, the basic contract specification may specify certain CEI serial numbers to contain installations different from other CEI serial numbers. In this case, the release EO for Basic Release will show effectivity other than 1 & SUBS as specified in the basic contract specification.

B. **Design Change Release (Type Code DC)** - Release of changes to the configuration established by Basic Release. Design change releases will consist of:

New drawing
Changes to existing drawings. (Changes may be by direct drawing revision or Change EO.)

C. **Subordinate Document Release (Type Code SD)** -

Release of documents which are subordinate to the model configuration drawings and are activated by callout on the model configuration drawings. The entry in the Effect On block of releasing EO's normally will be "Release to Files." If there is a necessity for limiting effectivity of Subordinate Documents to specific serial numbers of a model, the EO "Effect On" block must specify such effectivity in accordance with the normal rules regarding interchangeability. Subordinate Document releases will consist of:

Process specifications	Wiring diagrams
Procurement specifications	Schematics
Standard drawings	Specification control drawings
Material specifications	

Note: In some instances a specification control drawing may be a contract end item itself; therefore, would have no using drawing. In these cases, the type would be BR for initial release or DC in event of design changes.

D. **Supplementary Control Releases (Type Code SC)** -

Releases which do not establish a model design configuration. Supplementary control releases will consist of:

Stop Order and Stop Order Release	Test/Development Requirements
Rework Information	Drawings updated only to incorporate outstanding EO's, (changes with "Effect On" of "no affect on drawing effectivity")
Misc. Documents (ICD's, QC Spec., etc.)	
Quotation Request and Purchase Request	Inboard Profile Drawings
	Design Layouts

ENGINEERING ORDERS

EO SUBJECT/TYPE CORRELATION CHART

TYPE OF DOCUMENT LISTED ON EO	OLD EO "SUBJECT"	NEW EO "SUBJECT"	EO TYPES				REMARKS
			BR (BASIC RELEASE)	DC (DESIGN CHANGE)	SD (SUB DOCUMENT)	SC (SUPP CONTR)	
Drawings (Release of new or changed)	New Drawing or Changed Drawing	Document	X	X	X ①	X ②	EO not attached
Misc Documents (Release of new or changed) Design Layouts Inboard Profile Dwgs Proposal Dwgs QC Specs, Etc. (not normally called out on using Dwgs)	New Drawing or Changed Drawing	Document				X	EO not attached
Process Spec (Release of new or changed)	Process Spec	Document ⑧			X ②		EO not attached ③
Material Spec (Release of new or changed)	Material Spec	Document ⑧			X		EO not attached
Procurement Spec (Release of new or changed)	Control Document	Document			X		EO not attached
Standard Drawing (New or changed)	Standard Drawing	Document ⑧			X		EO not attached
Specification Control Drawing as contract end item (New or changed)	Control Document	Document	X	X			EO not attached
Specification Control Drawing as component (New or changed)	Control Document	Document			X		EO not attached
Test Drawings (Release of new or changed)	New Drawing or Changed Drawing	Document				X	EO not attached
	EORQ or EORQ Change	Quotation Request ⑧				X	
	EOPR or EOPR Change	Purchase Request				X	
	EO Drawing (File as)	Document ⑧	X	X		X Test Dwg Only	EO not attached
	Limited Release	Document ④	X	X		X Test Dwg Only	EO not attached
	Change EO	Change		X	X	X ⑤	Attaches to Document
	Supersede (of EO) or Supplementary Information	Same Subject as EO being superseded or supplemented	X	X	X	X ⑤	Attaches to Document if EO being superseded or supplemented was attached
	Part by Number	Change	X ⑥				EO not attached
		Test/Dev ⑥				X Test Dwg Only	EO not attached
	Cancellation of EO	Cancellation ⑦ ⑧		X	X	X ⑤	Attaches to document if EO being canceled was attached
	Obsolescence (Of document)	Cancellation		X	X	X ⑤	EO not attached
	Stop Order	Stop Order ⑧				X	EO not attached
	Stop Order Release	Stop Order Release				X	EO not attached
	Rework Information	Rework				X	EO not attached
	EO Part by Sketch	Rework				X	EO not attached
	Engineering Information	Rework				X	EO not attached

① Includes reference documents which are normally called out on using documents, i.e., schematics, wiring diagrams, etc.

② Use this type code when releasing documents which have been changed for the purpose of incorporating outstanding EO's while at the same time minor direct drawing changes may have been made which do not affect configuration.

③ Specific Process specifications may be revised by "CHANGE" EO which are attached to the specification.

④ "Effectivity" block of EO carries "limited" in parentheses.

⑤ All EO's involving Test and Development requirements (EO effectivity is "TEST") are "SC" Type EO's and will utilize the same EO "SUBJECTS" as would be applicable to production parts.

⑥ Applicable only for additional quantities needed for a new model or new test requirements.

⑦ When an outstanding change EO is to be canceled the "subject" of the cancelling EO shall be "CHANGE" and the EO type code will be the same as the change EO being canceled.

⑧ Shall not be combined with any other EO subject on the same EO.

ENGINEERING ORDERS

8. **EO SUBJECTS.** In addition to the type code, the EO shall have a subject listed in the "Subject" column. The following subjects shall be the only ones used:

- | | |
|------------------|------------------------|
| (a) Document | (f) Stop Order Release |
| (b) Change | (g) Quotation Request |
| (c) Rework | (h) Purchase Request |
| (d) Cancellation | (j) Test/Development |
| (e) Stop Order | |

For preparation of Quotation Request and Purchase Request, (see EOM).

8.1 **DOCUMENT.** To be used when releasing all new and changed documents and drawings (see Figure 8.1).

8.1.1 When a "Document" subject EO is used to release a changed drawing which adds initial requirements for an additional model, the body of the EO shall note:

"INITIAL REQUIREMENTS FOR MODEL XXX-X"

8.1.2 When a "Document" subject EO is used to release new production requirements for a document previously used only for test, the body of the EO shall note:

"INITIAL RELEASE - PREVIOUSLY RELEASED FOR TEST ONLY"

If previously fabricated test parts are acceptable for production, their use must be authorized on the EO by a note.

NORTH AMERICAN AVIATION, INC. SPACE AND INFORMATION SYSTEMS DIVISION 12214 LAKEWOOD BLVD. JORDNEY, IL 60438				ENGINEERING ORDER		SHEET _____																																																
MODEL 123-2 123-2	EFFECT ON END ITEM 1 & SUBS ① SEE REVISIONS BLOCK ②		AUTHORITY: EG GO, MCR GO XXXX MCR XXX		PARTS MADE: <input type="checkbox"/> OK TO USE <input type="checkbox"/> MAY BE RWD <input type="checkbox"/> NOTED	M																																																
SYM	DOCUMENT NUMBER	REV	TYPE CODE	SUBJECT																																																		
Ø	XXX-XXXX89	NEW ①	DC	DOCUMENT																																																		
Ø	XXX-XXXX80	B ②																																																				
Ø	RRXX-XXXX80																																																					
				<table border="1" style="width: 100%; border-collapse: collapse; font-size: x-small;"> <tr> <td colspan="2">EO BY & DATE</td> <td>ZIP</td> </tr> <tr> <td colspan="2">DEPT / GROUP</td> <td>EXT</td> </tr> <tr> <td>SUPV</td> <td colspan="2">DATE</td> </tr> <tr> <td>DEPT / GROUP</td> <td colspan="2"></td> </tr> <tr> <td>CHK</td> <td colspan="2"></td> </tr> <tr> <td>STRESS</td> <td colspan="2"></td> </tr> <tr> <td>PROJ ENGR</td> <td colspan="2"></td> </tr> <tr> <td>EO COPIES TO</td> <td colspan="2">ZIP</td> </tr> <tr><td> </td><td colspan="2"> </td></tr> <tr><td> </td><td colspan="2"> </td></tr> <tr><td> </td><td colspan="2"> </td></tr> <tr><td> </td><td colspan="2"> </td></tr> <tr><td> </td><td colspan="2"> </td></tr> <tr><td> </td><td colspan="2"> </td></tr> <tr><td> </td><td colspan="2"> </td></tr> <tr><td> </td><td colspan="2"> </td></tr> </table>			EO BY & DATE		ZIP	DEPT / GROUP		EXT	SUPV	DATE		DEPT / GROUP			CHK			STRESS			PROJ ENGR			EO COPIES TO	ZIP																									
EO BY & DATE		ZIP																																																				
DEPT / GROUP		EXT																																																				
SUPV	DATE																																																					
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EO COPIES TO	ZIP																																																					
REF EOs P.R. EO MXXXXXX				DIST CODE																																																		
REASONS REF SUBJECT 8130				<div style="text-align: center; font-weight: bold; font-size: large;">M</div> SHEET _____																																																		
SYMBOLS: Ø = DISTRIBUTE PRINTS A = ATTACH EO COPIES TO DRAWINGS																																																						

ENGINEERING ORDERS

8.1.3 This subject is also used when parts are drawn on the EO format in advance of being prepared on the conventional drawing format. The released EO is then established as the working drawing until the conventional drawing is released. This "EO drawing" shall only be used when schedules preclude the use of the conventional drawing methods. It should not be used to release parts which can be detailed in the conventional manner with equal effort. This method of release may only be used if all the required information is contained on a single sheet EO. It shall not be combined with any other document or subject. The conventional drawing shall be prepared and released within 30 days from the date of release of the EO drawing. The body of the EO drawing shall specify as the first entry the note:

"FILE AS XXX-XXXXXX"

The drawing title shall be specified in the lower right hand corner of the EO. The number required per end item, next using drawing, and all the necessary information to completely fabricate the part shall be specified (see Figure 8.1.3). An EO drawing shall not be changed or superseded. However, it may be canceled without making the conventional drawing. When a change is required, the conventional drawing shall be made and released incorporating the changes. When a conventional drawing is established from an EO drawing, without changes, the "A" change revision block of the drawing will carry the following note:

REDRAWN WITHOUT CHANGES - WAS EO MXXXXXX

When a conventional drawing is established with changes, a Revision Record shall be prepared in accordance with standard practice.

MODEL				EFFECT ON				AUTHORITY: EG GO, MCR				PARTS MADE:				SHEET	
123-2				END ITEM 1 & SUBS				GOXXXX MCRXXX				<input type="checkbox"/> OK TO USE <input type="checkbox"/> MAY BE REV'D <input type="checkbox"/> NOTED				M	
SYM	DOCUMENT	NUMBER	REV	QTY PER END ITEM	NEXT USING DRAWING	TYPE CODE	SUBJECT							EO BY & DATE	ZIP		
Ø	FILE AS:	XXX-XXXX91	NEW	1	XXX-XXXX02	DC	DOCUMENT							DEPT / GROUP	EXT		
																SUPV	DATE
<div style="display: flex; justify-content: space-between;"> <div> <p>1. FINISH PER (LIST APPLICABLE SPEC). 2. RESISTANCE WELD PER MXXXX-XXX.</p> <p>NOTES: UNLESS OTHERWISE SPECIFIED</p> <p>TITLE: INCLUDE COMPLETE TITLE OF DRAWING IN THIS PORTION OF THE EO.</p> </div> <div> <p>REF EOs</p> <p>REASONS</p> <p>REF. SUBJECT 8130</p> </div> </div>																DEPT / GROUP	EXT
<p>SYMBOLS: Ø = DISTRIBUTE PRINTS A = ATTACH EO COPIES TO DRAWINGS</p>																EO COPIES TO	ZIP
<p>DIST CODE</p> <p>M</p> <p>SHEET</p>																	

ENGINEERING ORDERS

8.2 **CHANGE.** To be used when effecting a change against an Engineering document. A design change EO is always written against a document and it is considered as an outstanding change to the document on release. It shall be indicated as "attached to" (A) the document and will be incorporated into the vellum at the next revision (see Figure 8.2a and 8.2b). The one exception to this procedure is a change EO used to establish initial requirements for an existing part used on an additional model (part by number) when no other drawing revisions are being made; this EO will not be attached but will be incorporated into the vellum at the next revision.

MODEL				EFFECT ON		AUTHORITY: EG GO, MCR		PARTS MADE:		SHEET	
123-2				END ITEM: X & SUBS		GOXXXX MCRXXX		<input type="checkbox"/> OK TO USE <input type="checkbox"/> MAY BE RWKD <input type="checkbox"/> NOTED		M	
SYM	DOCUMENT	NUMBER	REV	TYPE CODE		SUBJECT		EO BY & DATE		ZIP	
A	XXX-XXXX	33	C	DC		CHANGE		DEPT / GROUP		EXT	
ON F/D & L/M ESTABLISH -3 CHASSIS SAME AS BASIC EXCEPT AS SHOWN.											
DRILL NO. 31 (.120) 2 HOLES											
DRILL NO. 27 (.144) 1 HOLE						VIEW OF BASIC (EO REF)					
REVISE U/B AS FOLLOWS:											
-3 123-2 XXX-XXXX10 Y & SUBS											
BASIC 123-2 XXX-XXXX09 I - X											
WAS											
BASIC 123-2 XXX-XXXX09 I & SUBS											
REF EOs: EO MXXXXXX											
REASONS: REF. SUBJECT 8130											
DIST CODE											
M											
SHEET											

SYMBOLS: Ø = DISTRIBUTE PRINTS A = ATTACH EO COPIES TO DRAWINGS

Figure 8.2a

MODEL				EFFECT ON		AUTHORITY: EG GO, MCR		PARTS MADE:		SHEET	
123-2				END ITEM 1 & SUBS		GO XXXX MCR XXX		<input checked="" type="checkbox"/> OK TO USE <input type="checkbox"/> MAY BE RWKD <input type="checkbox"/> NOTED		M	
SYM	DOCUMENT	NUMBER	REV	TYPE CODE		SUBJECT		EO BY & DATE		ZIP	
Ø	XXX-XXXX	79	NEW	DC		DOCUMENT		DEPT / GROUP		EXT	
A	XXX-XXXX	70	A ①	DC		CHANGE		SUPV		DATE	
ON DRAWING XXX-XXXX70 IN L/M & F/D ADD: XXX-XXXX79-1 & -2 BRACKET, 1 EACH REQUIRED.											
REF EOs: P.R. EO MXXXXXX											
REASONS: REF SUBJECT 8130											
DIST CODE											
M											
SHEET											

SYMBOLS: Ø = DISTRIBUTE PRINTS A = ATTACH EO COPIES TO DRAWINGS

ENGINEERING ORDERS

8.2.1 A change EO that is used to establish the initial requirements for an existing part for a new model (part by number) shall list the NAA parts individually with the applicable identifying dash numbers of right-hand, left-hand, or tabulated-type parts as might be necessary. The quantity required per end item and the next using drawing for each entry shall be indicated. The model block shall show only the model for which the part is being released. The current revision letter should be omitted (see Figure 8.2.1).

8.2.2 When it is necessary to cancel a previously released (but not yet incorporated) "change" EO, a new "change" subject EO shall be written cancelling the entire contents of the previously released EO (see Figure 8.2.2). The effectivity of the new change EO must be identical to the effectivity of the previously released change EO to be canceled. A note on the new change EO should state that the old EO is to be canceled and shall indicate the disposition of parts made, e.g.,

"This EO cancels EO MXXXXXX (give sheet dash numbers if multi-sheet EO, e.g., sheet 1 thru 4) and returns drawing to its original state. Parts made to EO MXXXXXX may be reworked."

(Rework information is furnished on separate EO when required.)

When the canceled EO added newly created captive dash-numbered components to a drawing, then the cancelling EO shall give specific instructions to add the newly created dash numbers to the drawing L/M and "line-thru" to indicate it is not to be used (see Subject 7430). If the to-be-canceled EO removed dash-numbered components, then the cancelling EO shall give specific instructions as to reinstatement of drawing to its original configuration.

NORTH AMERICAN AVIATION, INC. SPACE AND INFORMATION SYSTEMS DIVISION 2224 LAKEMOOD ROAD, GAITHERSBURG, M.D. 20878										ENGINEERING ORDER				SHEET _____	
MODEL 123-2		EFFECT ON END ITEM 1 & SUBS				AUTHORITY: EG GO, MCR GO XXXX MCR XXX		PARTS MADE: <input type="checkbox"/> OK TO USE <input type="checkbox"/> MAY BE RWKD <input checked="" type="checkbox"/> NOTED		M		EO BY & DATE		ZIP	
SYM	DOCUMENT	NUMBER	REV	QTY PER END ITEM	NEXT USING DRAWING	TYPE CODE	SUBJECT		DEPT / GROUP		EXT				
	XXX-XXXX	20		2	XXX-XXXX07		BR CHANGE		SUPV		DATE				
	XXX-XXXX	21		2	XXX-XXXX07				DEPT / GROUP		CHK				
	XXX-XXXX	22		4	XXX-XXXX21				STRESS						
	XXX-XXXX	23-11		8	XXX-XXXX22				PROJ ENGR						
REVISE DRAWINGS TO ADD NEW MODEL REQUIREMENTS.										EO COPIES TO		ZIP			
REF EOs: EO MXXXXXX															
REASONS: REF SUBJECT 8130															
SYMBOLS: <input checked="" type="checkbox"/> = DISTRIBUTE PRINTS <input type="checkbox"/> = ATTACH EO COPIES TO DRAWINGS															

Figure 8.2.1

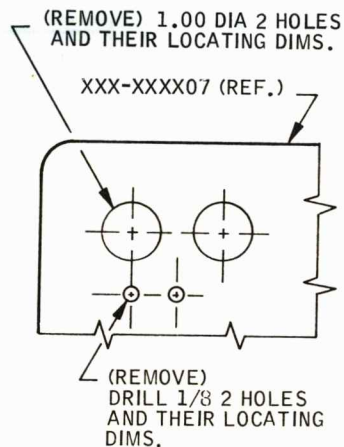
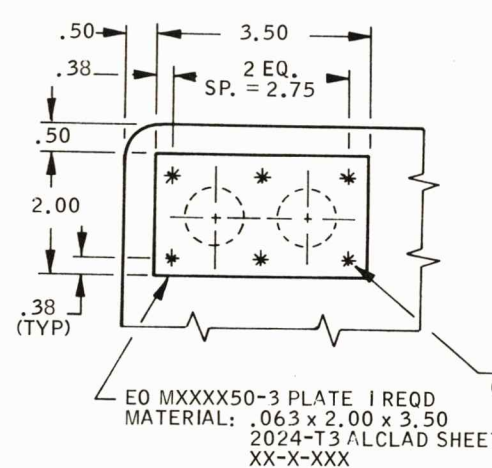
NORTH AMERICAN AVIATION, INC. SPACE AND INFORMATION SYSTEMS DIVISION 2224 LAKEMOOD ROAD, GAITHERSBURG, M.D. 20878										ENGINEERING ORDER				SHEET _____	
MODEL 123-2		EFFECT ON SAME EFFECTIVITY AS THE EO BEING CANCELED				AUTHORITY: EG GO, MCR GO XXXX MCR XXX		PARTS MADE: <input type="checkbox"/> OK TO USE <input type="checkbox"/> MAY BE RWKD <input checked="" type="checkbox"/> NOTED		M		EO BY & DATE		ZIP	
SYM	DOCUMENT	NUMBER	REV			TYPE CODE	SUBJECT		DEPT / GROUP		EXT				
<input checked="" type="checkbox"/>	XXX-XXXX	14	A				DC CHANGE		SUPV		DATE				
THIS EO CANCELS THE INFORMATION CONTAINED IN EO MXXXXXX AND RETURNS DRAWING TO ITS ORIGINAL STATE. PARTS MADE PER EO MXXXXXX TO BE REWORKED.										DEPT / GROUP		CHK			
NOTE: -13 ADDED BY EO MXXXXXX TO BE ADDED TO THE VELLUM THEN "LINED THRU" WHEN INCORPORATING THIS CHANGE.										STRESS					
										PROJ ENGR					
REF EOs:															
REASONS: REF SUBJECT 8130															
SYMBOLS: <input checked="" type="checkbox"/> = DISTRIBUTE PRINTS <input type="checkbox"/> = ATTACH EO COPIES TO DRAWINGS															

ENGINEERING ORDERS

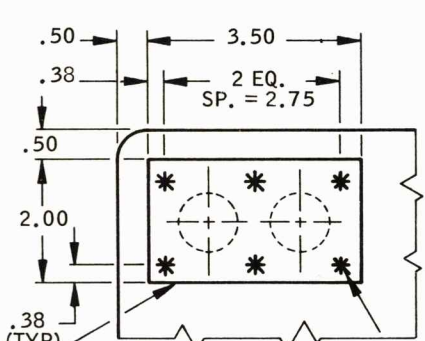
8.3 **REWORK.** To be used when it is necessary to furnish special instructions as follows:

(A) When information is required to use parts which have been made prior to, or concurrent with, a drawing change (or a previously released change EO) but cannot be reworked to be identical to the revised drawing (see Figure 8.3a) and, (B) When information is required to fabricate, assemble, install, test, etc., components **NOT** like the Engineering drawing (see Figures 8.3b and 8.3c).

Note: This subject cannot be used to salvage parts not made per a drawing due to a manufacturing error. This subject shall always be used with the SC type of EO. Any special parts or assemblies required to support this rework EO or any parts that are fabricated differently than the Engineering Drawing will be depicted on the EO and assigned EO dash number for identification. A specific effectivity should be given, if known. Rework subject EO's shall not indicate the "Attach To" symbol (**A**).

NORTH AMERICAN AVIATION, INC. SPACE AND INFORMATION SYSTEMS DIVISION 12214 LAKEWOOD BLVD. DOWNEY, CALIF. 90241				ENGINEERING ORDER		SHEET <u> </u> MXXXX50																																											
MODEL 123-2	EFFECT ON (1) END ITEM 1 & SUBS (2) NOTED		AUTHORITY: EG GO, MCR GOXXXX MCRXXX		PARTS MADE: <input type="checkbox"/> OK TO USE <input type="checkbox"/> MAY BE RWKD NOTED (2)																																												
SYM	DOCUMENT	NUMBER	REV	TYPE CODE	SUBJECT																																												
A	XXX-XXXX07	A		(1) DC (2) SC	CHANGE REWORK																																												
(1) CHANGE F/D AS SHOWN 				(2) REWORK INFORMATION FOR PARTS MADE. COVER THE TWO 1.00 HOLES AS SHOWN: 																																													
REF EOs				<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="2">EO BY & DATE</td> <td>ZIP</td> </tr> <tr> <td colspan="2">DEPT / GROUP</td> <td>EXT</td> </tr> <tr> <td>SUPV</td> <td colspan="2">DATE</td> </tr> <tr> <td>DEPT / GROUP</td> <td colspan="2"></td> </tr> <tr> <td>CHK</td> <td colspan="2"></td> </tr> <tr> <td>STRESS</td> <td colspan="2"></td> </tr> <tr> <td>PROJ ENGR</td> <td colspan="2"></td> </tr> <tr> <td>EO COPIES TO</td> <td colspan="2">ZIP</td> </tr> <tr> <td></td> <td colspan="2"></td> </tr> <tr> <td></td> <td colspan="2"></td> </tr> <tr> <td></td> <td colspan="2"></td> </tr> <tr> <td></td> <td colspan="2"></td> </tr> <tr> <td></td> <td colspan="2"></td> </tr> <tr> <td></td> <td colspan="2"></td> </tr> </table>				EO BY & DATE		ZIP	DEPT / GROUP		EXT	SUPV	DATE		DEPT / GROUP			CHK			STRESS			PROJ ENGR			EO COPIES TO	ZIP																			
EO BY & DATE		ZIP																																															
DEPT / GROUP		EXT																																															
SUPV	DATE																																																
DEPT / GROUP																																																	
CHK																																																	
STRESS																																																	
PROJ ENGR																																																	
EO COPIES TO	ZIP																																																
REASONS REF SECTION 8130				<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td colspan="2" style="text-align: center; font-weight: bold;">MXXXX50</td> </tr> <tr> <td colspan="2">SHEET <u> </u></td> </tr> </table>				MXXXX50		SHEET <u> </u>																																							
MXXXX50																																																	
SHEET <u> </u>																																																	
SYMBOLS: = DISTRIBUTE PRINTS A = ATTACH EO COPIES TO DRAWINGS																																																	

ENGINEERING ORDERS

NORTH AMERICAN AVIATION, INC. NAVAE and ENGINEERING, WESTERN DIVISION 12214 LAKEWOOD BLVD., DOWNEY, CALIFORNIA				ENGINEERING ORDER		SHEET _____	
MODEL 123-2		EFFECT ON NOTED		AUTHORITY: EG GO, MCR GOXXXX MCRXXX		PARTS MADE: <input type="checkbox"/> OK TO USE <input type="checkbox"/> MAY BE RWKD <input checked="" type="checkbox"/> NOTED	
						M XXXX60	
SYM	DOCUMENT NUMBER	REV	TYPE CODE		SUBJECT		
	XXX-XXXX82	A	SC		REWORK		
<p>REWORK INFORMATION FOR PARTS MADE PRIOR TO EO MXXXX70. OR DRAWING CHANGE "A" ITEM X. COVER 1.00 DIA 2 HOLES AS SHOWN:</p>							
							
<p>EO MXXXX60-3 PLATE 1 REQD MATERIAL: .063 x 2.00 x 3.50 2024-T3 ALCLAD SHEET XX-X-XXX</p>							
<p>① 2. RESISTANCE WELD PER MAXXXX-XXX. 1. IDENTIFY -3 PER MAXXXX-XXX.</p>							
REF EOs						M XXXX60	
REASONS						SHEET _____	
REF SECTION 8130							
SYMBOLS: Ø = DISTRIBUTE PRINTS [A] = ATTACH EO COPIES TO DRAWINGS							

ENGINEERING ORDERS

NORTH AMERICAN AVIATION, INC. SPACE AND INFORMATION SYSTEMS DIVISION 12214 LAKEWOOD BLVD., CLARK COUNTY, CALIF. 92305				ENGINEERING ORDER		SHEET _____	
MODEL 123-2	EFFECT ON <div style="border: 1px solid black; padding: 2px; display: inline-block;"> 1 END ITEM 1 & SUBS 2 NOTED </div>		AUTHORITY: EG GO, MCR GO XXXX MCR XXX		PARTS MADE: <div style="border: 1px solid black; padding: 2px; display: inline-block;"> 1 OK TO USE 2 MAY BE RWKD NOTED </div>		MXXXXX70
SYM	DOCUMENT	NUMBER	REV	TYPE CODE	SUBJECT		
A	XXX-XXXX07	A			DC CHANGE		
<div style="border: 1px solid black; padding: 5px;"> 1 CHANGE F/D AS SHOWN: </div>				<div style="text-align: center;"> </div>			
				NOTE: THESE 1/8 HOLES NEED NOT BE PLUGGED.			
<div style="border: 1px solid black; padding: 5px;"> 2 REWORK INFORMATION CONTACT J. SMITH EXT. 1234 FOR REWORK INFORMATION IF NECESSARY </div>				<div style="border: 1px solid black; padding: 5px;"> IF REWORK INFORMATION IS FOUND TO BE REQUIRED, A SEPARATE REWORK EO MAY BE ISSUED (FIGURE 8.4b) OR THIS EO MAY BE SUPERSEDED TO INCLUDE THE REWORK INFORMATION IF THIS EO HAS NOT BEEN INCORPORATED </div>			
						DIST CODE <div style="border: 1px solid black; padding: 2px; display: inline-block; font-weight: bold; font-size: large;">MXXXXX70</div>	
REF EOs						SHEET _____	
REASONS							
REF SECTION 8130							
SYMBOLS: Ø = DISTRIBUTE PRINTS A = ATTACH EO COPIES TO DRAWINGS							

ENGINEERING ORDERS

8.4 **CANCELLATION.** To be used when obsoleting or canceling previously released Engineering information or documentation.

8.4.1 "CANCELLATION" is to be used when "obsoleting" a drawing. A drawing shall not be obsoleted if it is applicable to any items delivered to the customer. The drawing original shall accompany the EO through the Release system to the Release Desk. Release Desk will mark the drawing "obsolete," record the data on the release card, and send it to the vellum vault. Engineering shall see that action is taken to remove all reference to the obsoleted drawing. The removal from the next assembly drawing shall be accomplished simultaneously with the obsoletion. The statement: "REMOVE ALL PRINTS FROM ALL FILES AND DESTROY" shall be contained in the body of the EO. A drawing, once obsoleted, may be reinstated when circumstances require its use. Outstanding EO's will never be incorporated against an obsoleted drawing until such time as the drawing is reinstated. (See Figure 8.4.1).

NORTH AMERICAN AVIATION, INC. SPACE AND INFORMATION SYSTEMS DIVISION 12214 LAKEMORE BLVD., QUANTICO, VA 22135				ENGINEERING ORDER		SHEET _____
MODEL 123-2	EFFECT ON END ITEM 1 & SUBS		AUTHORITY: EG GO, MCR GO XXXX MCR XXX		PARTS MADE: <div style="border: 1px solid black; padding: 2px; display: inline-block;">5</div> OK TO USE MAY BE RWKD NOTED	M
SYM	DOCUMENT NUMBER	REV	QTY PER END ITEM	NEXT USING DRAWING	TYPE CODE	SUBJECT
Ø	XXX-XXXX10	NEW	1	XXX-XXXX10	BR	DOCUMENT
	XXX-XXXX09	B	2		DC	CANCELLATION
	XXX-XXXX08		3		BR	CHANGE
A	XXX-XXXX07	NC	3		BR	CHANGE
A	XXX-XXXX01	C	5		DC	CHANGE
<p>② CANCELS DWG XXX-XXXX09. REMOVE ALL PRINTS FROM ALL FILES AND DESTROY.</p> <p>③ INITIAL REQUIREMENTS FOR MODEL 123-2.</p> <p>④ ON DWG XXX-XXXX07 ESTABLISH -3 CONFIGURATION & REQM'TS IDENTICAL TO BASIC EXCEPT: MATERIAL FOR -3 = 7075 AL AL PLATE .250 x 2.00 x 2.00 PER QQ-X-XXXX. IN U/B -3 WAS BASIC N/A XXX-XXXX10 WAS XXX-XXXX09</p> <p>⑤ ON DWG XXX-XXXX01 REVISE L/M & F/D AS FOLLOWS: DELETE: XXX-XXXX09 SUPPORT ASSY 1 REQD. ADD: XXX-XXXX10 SUPPORT ASSY 1 REQD.</p>						
REF EOs ① P.R. EO MXXXXXX						DIST CODE
REASONS REF SUBJECT 8130						M
						SHEET _____
SYMBOLS: Ø = DISTRIBUTE PRINTS A = ATTACH EO COPIES TO DRAWINGS						

ENGINEERING ORDERS

8.4.2 "CANCELLATION" shall also be used when the entire contents of a previously released EO (other than a change EO) are to be canceled (see Figure 8.4.2). The effectivity shall be identical to the EO which is being canceled. Adequate notes shall be used to direct disposition of those parts made. An EO that released new or changed drawings may not be canceled nor may an EO that has been incorporated into a drawing be canceled. A copy of the canceled EO will accompany the canceling EO through the release system. When the entire contents of a "change" EO are to be canceled, the EO requirements shall be as described in paragraph 8.2.2.

8.4.3 When it is necessary to cancel a portion of the requirements ordered on an EO that establishes initial requirements for an existing part used on a new model (part by number), the cancellation EO will be prepared as illustrated in Figure 8.4.3. It should be noted that this kind of EO cancels all quantity requirements for a given part ordered on the previous EO (when it is necessary to change "quantities" a superseding EO shall be used). Except for this kind of EO, a CANCELLATION EO cancels another EO in its entirety.

NORTH AMERICAN AVIATION INC. SPACE AND INFORMATION SYSTEMS DIVISION 12214 LAKEMONT ROAD, GAITHERSBURG, M.D. 20878										ENGINEERING ORDER		SHEET _____			
MODEL 123-2		EFFECT ON SAME AS EO BEING CANCELED			AUTHORITY: EG GO, MCR GO XXXX MCR XXX		PARTS MADE: <input type="checkbox"/> OK TO USE <input type="checkbox"/> MAY BE RWKD <input checked="" type="checkbox"/> NOTED		M		EO BY & DATE _____ ZIP _____				
SYM	DOCUMENT	NUMBER	REV	TYPE CODE		SUBJECT		DEPT / GROUP		EXT					
	XXX-XXXX91		NC			SC CANCELLATION		SUPV		DATE					
<p>THIS EO CANCELS EO MXXXXXX. PARTS MADE PER EO MXXXXXX ARE OK TO USE.</p> <p>OR, PARTS MADE PER EO MXXXXXX TO BE REWORKED.</p> <p>THIS SAMPLE TO BE USED ONLY WHEN THE EO TO BE CANCELED IS OTHER THAN A "CHANGE" SUBJECT EO.</p>												DEPT / GROUP CHR			
												STRESS			
												PROJ ENGR			
												EO COPIES TO		ZIP	
REF EOs												M		SHEET _____	
REASONS															
REF SUBJECT 8130															
SYMBOLS: <input type="checkbox"/> = DISTRIBUTE PRINTS <input type="checkbox"/> = ATTACH EO COPIES TO DRAWINGS															

Figure 8.4.2

NORTH AMERICAN AVIATION INC. SPACE AND INFORMATION SYSTEMS DIVISION 12214 LAKEMONT ROAD, GAITHERSBURG, M.D. 20878										ENGINEERING ORDER		SHEET _____			
MODEL XX-XXX		EFFECT ON 1 & SUBS			AUTHORITY: EG GO, MCR XX-XXX		PARTS MADE: <input type="checkbox"/> OK TO USE <input type="checkbox"/> MAY BE RWKD <input checked="" type="checkbox"/> NOTED		M		EO BY & DATE _____ ZIP _____				
SYM	DOCUMENT	NUMBER	REV	QTY PER END ITEM	NEXT USING DRAWING	TYPE CODE		SUBJECT		DEPT / GROUP		EXT			
	XXX-XXXX51	①		4	XXX-XXXX78	DC		CANCELLATION		SUPV		DATE			
	XXX-XXXX28	①		2	XXX-XXXX34					DEPT / GROUP CHR					
<p>THIS EO CANCELS A PORTION OF THE REQUIREMENTS ORDERED ON EO MXXXX47.</p> <p>① PARTS CANCELED.</p> <p>NOTE: THIS KIND OF EO SHALL CANCEL ALL QUANTITY REQUIREMENTS SHOWN ON THE PREVIOUS EO FOR THE PARTS BEING CANCELED.</p>												STRESS			
												PROJ ENGR			
												EO COPIES TO		ZIP	
REF EOs												M		SHEET _____	
REASONS															
SYMBOLS: <input type="checkbox"/> = DISTRIBUTE PRINTS <input type="checkbox"/> = ATTACH EO COPIES TO DRAWINGS															

ENGINEERING ORDERS

8.5 **STOP ORDER.** To be used when it is necessary to stop fabrication and/or installation of previously released parts. This subject shall always be used with the SC type EO. The part numbers of all parts which are to be stopped shall be listed. A Stop Order which lists an assembly number only will not stop work on any of the NAA part-numbered components of that assembly whether or not the components are detailed on separate drawings or are dash-numbered details of the assembly drawing. The effectivity of the stoppage for the NAA parts is to be indicated by production end item numbers. A note shall always appear specifying the purchasing action required as a result of the stop order, such as: "Procurement not affected" or "Stop Procurement." Special care should be taken on castings and forgings to indicate if the rough casting or forging is to be stopped. In the event a status report is required, the EO should so indicate either as a planning note (for NAA fabricated parts) or as a purchasing note (for outside parts). Stop Order EO's shall always specify the date of the estimated release from Engineering (see Figure 8.5). Stop Order EO's shall not be superseded, canceled, nor combined with any other subject. When a Stop Order is considered as not required after it is issued, then it shall be removed by a "Stop Order release" EO. If any (or all) of the information contained on a Stop Order EO is to be modified, the Stop Order shall be removed by a Stop Order Release EO and a new Stop Order EO issued incorporating the changes that made the action necessary.

NORTH AMERICAN AVIATION, INC. SPACE AND INFORMATION SYSTEMS DIVISION 12400 AIRPORT BLVD., DALLAS, TEXAS 75244				ENGINEERING ORDER		SHEET M	
MODEL 123-2		EFFECT ON END ITEM 1 THRU 15		AUTHORITY: EG GO, MCR GO XXXX MCR XXX		PARTS MADE: <input type="checkbox"/> OK TO USE <input type="checkbox"/> MAY BE RWD <input type="checkbox"/> NOTED	
SYM	DOCUMENT NUMBER	REV	TYPE CODE		SUBJECT		
	XXX-XXXX22		ASSY ONLY		SC STOP ORDER		
	XXX-XXXX23		ASSY & ALL DASH NOS.				
	XXX-XXXX24-1 & -2		ASSY & ALL DASH NOS.				
	XXX-XXXX25-11		ONLY				
	XXX-XXXX26						
	XXX-XXXX27-1 & -2						
	XXX-XXXX28-3 & -9		ONLY				
	XXX-XXXX29-17 & -27		ONLY				
	XXX-XXXX30 & -3	3					
	XXX-XXXX31-3	2					
<p>STOP ALL WORK ON THE ABOVE PARTS. ESTIMATED RELEASE DATE 2-30-66.</p> <p>② PLANNING NOTE: ADVISE J. SMITH, DEPT XXX EXT XXXX OF STATUS OF XXX-XXXX30, ROUGH FORGING XXX-XXXX30-3, & XXX-XXXX31-3.</p> <p>PURCHASING NOTES:</p> <p>① PROCUREMENT NOT AFFECTED.</p> <p>③ STOP PROCUREMENT - NOTIFY J. SMITH, DEPT XXX EXT XXXX AS TO STATUS OF XXX-XXXX30 ROUGH FORGING.</p>							
<p>REF EOs</p> <p>REASONS</p> <p>REF SUBJECT 8130</p>							
<p>SYMBOLS <input type="checkbox"/> = DISTRIBUTE PRINTS <input type="checkbox"/> = ATTACH EO COPIES TO DRAWINGS</p>							
						DST CODE	
						SHEET M	

ENGINEERING ORDERS

8.6 **STOP ORDER RELEASE.** To be used when releasing parts previously stopped by a Stop Order. This subject shall be used with the "SC" type EO. Stop Order Release may be used to remove all or part of an item (or items) from a Stop Order. A note on the EO should indicate if the Stop Order is being released in full or in part (see Figure 8.6). It is desirable at times to combine a Stop Order Release with another "subject," such as: Cancellation, Change, Document, etc. The EO shall provide complete information for the disposition of those parts for which the Stop Order is to be lifted without design change to the stopped part. The drawing number and its current change letter shall be indicated. A copy of the Stop Order EO shall always accompany a Stop Order Release EO through the release system.

NORTH AMERICAN AVIATION, INC. SPACE AND INFORMATION SYSTEMS DIVISION 2214 CANADIAN BLVD. CANADA, ONTARIO				ENGINEERING ORDER		SHEET <u> </u>	
MODEL 123-2	EFFECT ON		1 SEE REVISIONS BLOCK 2 END ITEM 1 & SUBS 3 NO AFFECT ON DWG EFFECTIVITY	AUTHORITY: EG GO, MCR GO XXXX MCR XXX	PARTS MADE: <input type="checkbox"/> OK TO USE <input type="checkbox"/> MAY BE REV'D <input type="checkbox"/> NOTES	M	
SYM	DOCUMENT	NUMBER	REV	TYPE CODE	SUBJECT	EO BY & DATE	ZIP
Ø	XXX-XXXX24	NEW		2	DC DOCUMENT	DEPT / GROUP	EXT
Ø	XXX-XXXX21	A		1 4	SC STOP ORDER REL	SUPV	DATE
Ø	RRXXX-XXXX21					DEPT / GROUP	
	XXX-XXXX23	A		5 3	DC CANCELLATION	CHK	
	XXX-XXXX22	NC		3 4 6	SC STOP ORDER REL	STRESS	
4 THIS EO RELEASES STOP ORDER EO MXXXXXX IN PART.						PROJ ENGR	
5 REMOVE ALL PRINTS FROM ALL FILES & DESTROY.						EO COPIES TO	ZIP
6 THIS ASSEMBLY BEING RELEASED FROM STOP ORDER WITHOUT CHANGE.							
REF EOs							
REASONS				REF SUBJECT 8130		M	
SYMBOLS				DISTRIBUTE PRINTS		SHEET <u> </u>	
				A ATTACH EO COPIES TO DRAWINGS			

8.7 **QUOTATION REQUEST.** To be used when requesting a quotation from Purchasing. This subject shall always be used with the "SC" type EO (see EOM).

8.8 **PURCHASE REQUEST.** To be used to authorize procurement in advance of the drawing release. This subject shall always be used with the "SC" type EO (see EOM).

ENGINEERING ORDERS

8.9 EO SUPERSEDURE

8.9.1 When it becomes necessary to supersede information contained in a previously released EO that has not been incorporated into the drawing, the following method shall be used: Form M153-K will be used for superseding a single sheet EO. In effect, the new EO cancels all of the previously released information contained on the superseded EO and replaces it with the revised information, thus becoming the outstanding EO against the drawing. Additional new information shown on the superseding EO shall be restricted to that which made the supersedure of the EO necessary. Therefore, any other additional information which can be released separately shall not be added to the revised EO unless its separate release would violate the rule that an EO shall not conflict with information shown on another EO and cannot depend on information shown on a previously released EO. This type of EO shall not be combined with any subjects other than those that were already combined with the original EO. A copy of the superseded EO shall accompany the superseding EO through the Release system.

8.9.2 The EO "type" and "subject" shall be the same as the EO that is being superseded. The upper portion of the field of the superseding EO shall contain an introductory paragraph which will begin as follows:

"SUPERSEDES EO MXXXXXX AND DIFFERS AS FOLLOWS":

The difference between the superseding EO and the superseded EO shall then be described. The introductory paragraph shall also contain a disposition for parts made to the superseded EO similar to the following:

"PARTS MADE PER EO MXXXXXX TO BE REWORKED"

(or)

"THE SUPERSEDING PORTION OF THIS EO DOES NOT AFFECT PARTS MADE"

(or)

"PARTS MADE PER EO MXXXXXX OK TO USE"

Following this introductory paragraph, a line shall be drawn across the body of the EO to separate this information from the correct information which shall be carried from the previous EO, except as modified and described in the introductory paragraph. The "REASONS" block of the superseding EO shall repeat the "reasons" shown on the superseded EO along with the reason for the superseding EO. The superseding EO will be completed giving the revised, added, removed, and all correct information except:

- (a) The Ø symbol will not be used
- (b) If the superseded EO superseded another EO, the latter's introductory paragraph will not be shown on the new EO.

8.9.3 If the superseded EO contained any EO dash-numbered parts, information will have to be given on the superseding EO defining the reidentification of those parts made as well as any rework that may be required. For example:

"EO MXXXXX7-3 MAY BE MADE FROM EO MXXXXX8-3"

(or)

"EO MXXXXX8-1 MAY BE MADE FROM EO MXXXXX4-1 BY REIDENTIFICATION ONLY"

EO information which has been incorporated into a drawing cannot be revised or canceled by this kind of EO.

8.9.4 In the event the superseded EO contained entries for several drawings, part of which have been incorporated into the drawings, and part that have not, the following method shall be used, (see Figure 8.9):

- A. Make the superseding EO as noted above omitting those drawings which have already incorporated the change and indicate this above the line with the revised information.
- B. Below the line list the balance of the drawings and proceed with the change as noted above.

8.10 The following EO subjects shall not be combined with each other or any other subject on the same EO:

1. "DOCUMENT" when the document involved is one of the following:
 - (a) Process specification
 - (b) Material specification
 - (c) Standard drawing
 - (d) EO drawing (file as)
2. "CANCELLATION" (of EO)
3. "STOP ORDER"
4. "QUOTATION REQUEST"
5. Supersedure of EO wherein the "subject" shall be the same as the EO being superseded (which may be a combination).

ENGINEERING ORDERS

NORTH AMERICAN AVIATION INC. SPACE AND INFORMATION SYSTEMS DIVISION 1234 LAMAR STREET, BOSTON, MASSACHUSETTS 02111				ENGINEERING ORDER		SHEET _____
MODEL 123-2	EFFECT ON END ITEM 1 & SUBS		AUTHORITY: EG GO, MCR GO XXXX MCR XXX		PARTS MADE: <input checked="" type="checkbox"/> 1 OK TO USE MAY BE RWKD <input checked="" type="checkbox"/> 2 NOTED	M
SYM	DOCUMENT	NUMBER	REV	TYPE CODE	SUBJECT	EO BY & DATE _____ ZIP _____ DEPT / GROUP _____ EXT _____ SUPV _____ DATE _____ DEPT / GROUP _____ CHK _____ STRESS _____ PROJ. ENGR _____ EO COPIES TO _____ ZIP _____
SUPERSEDES EO MXXXXXX AND DIFFERS AS FOLLOWS: (A) INFORMATION TO CHANGE XXX-XXXX49 IS REMOVED DUE TO INCORPORATION. (B) INFORMATION TO CHANGE XXX-XXXX52 EFFECTIVE END ITEM 1 & SUBS IS REMOVED AND DRAWING IS RETURNED TO ITS ORIGINAL STATE. ② PARTS MADE TO EO MXXXXXX TO BE REWORKED.						
<input type="checkbox"/> A XXX-XXXX52 <input checked="" type="checkbox"/> B ② <input type="checkbox"/> A XXX-XXXX76 <input checked="" type="checkbox"/> C ①		DC CHANGE				
ON DWG XXX-XXXX76 REVISE F/D & L/M AS FOLLOWS: XXX-XXXX94-11 FREQ CONV 1 REQD WAS XXX-XXXX94 FREQ CONV 1 REQD						
REF EOs _____ REASONS REF SUBJECT 8130						M
SYMBOLS: <input checked="" type="checkbox"/> = DISTRIBUTE PRINTS <input type="checkbox"/> A = ATTACH EO COPIES TO DRAWINGS						SHEET _____

9. **LIMITED RELEASE.** An EO releasing a new drawing may release its parts for a limited quantity of end items by designating the end items in the EO "Effect On" block and using the word LIMITED parenthetically in the EO "Effect On" block. However, the drawing's Application (Usage) Data block will not agree with the EO "Effect On" block, i.e., it will reflect the end item effectivity required by its next assembly usage. The drawing shall not be serial number coded to agree with the EO "Effect On" block (see Figure 9).

NORTH AMERICAN AVIATION INC. SPACE AND INFORMATION SYSTEMS DIVISION 1234 LAMAR STREET, BOSTON, MASSACHUSETTS 02111				ENGINEERING ORDER		SHEET _____
MODEL 123-2	EFFECT ON END ITEM 2 & 3 ONLY (LIMITED)		AUTHORITY: EG GO, MCR GO XXXX MCR XXX		PARTS MADE: <input type="checkbox"/> OK TO USE MAY BE RWKD <input type="checkbox"/> NOTED	M
SYM	DOCUMENT	NUMBER	REV	TYPE CODE	SUBJECT	EO BY & DATE _____ ZIP _____ DEPT / GROUP _____ EXT _____ SUPV _____ DATE _____
Ø	XXX-XXX288	NEW			BR DOCUMENT	
REF EOs _____ REASONS REF SUBJECT 8130						M
SYMBOLS: <input checked="" type="checkbox"/> = DISTRIBUTE PRINTS <input type="checkbox"/> A = ATTACH EO COPIES TO DRAWINGS						SHEET _____

ENGINEERING ORDERS

9.1 Change EO's written against drawings which are on a limited status shall carry the word LIMITED parenthetically in the EO "Effect On" block, and will, if rework is required, be effective on the limited end items only.

9.2 The limited status may be maintained when releasing a changed drawing by using the word LIMITED parenthetically in the EO "Effect On" block of the releasing EO. The effect on the rework called for in the drawing Revisions Record shall be limited end items.

9.3 The limited status shall be subsequently removed. This shall be accomplished by releasing a changed drawing. The following note shall be the first entry in the Drawing Revisions Record:

NC DRAWING (or "A" CHANGE DWG) WAS LIMITED RELEASED FOR END ITEMS X THRU Y ONLY

Following the note, revision items will be listed and if rework is indicated, the effectivity will no longer be the limited end items. The "Effect On" block of the EO releasing such a drawing shall show SEE REVISIONS BLOCK. A note similar to the following shall be entered in the body of the EO:

THIS EO REMOVES LIMITED RELEASE STATUS EFFECT ON 1 & SUBS WAS 1 THRU 2 ONLY

9.4 When a limited released drawing is to be obsoleted, the word "LIMITED" shall not be used in the EO "Effect On" block. The effectivity shown on the obsoleting EO shall be the current limited end items. LIMITED releases shall not be combined with RESTRICTED distribution or NORMAL releases.

10. TEST AND DEVELOPMENT

10.1 A test and development type part as referenced herein is a part or assembly which is fabricated for the sole purpose of performing a functional or structural test. The instructions herein do not apply to testing of production parts or to the testing of suppliers off-the-shelf proprietary items. The provisions of the foregoing paragraphs shall apply towards EO preparation in addition to the following.

10.2 Only the word "TEST" will appear in the "Effect On" block of the EO. No model number will appear in the model block of the EO. All EO's involving test/development requirements are "SC" type EO's and the EO "SUBJECTS" are the same as would be applicable to production parts (except for additional quantities needed for new test requirements wherein the subject is "TEST/DEV"). (See Figure 10.2.)

NORTH AMERICAN AVIATION, INC. SPACE AND INFORMATION SYSTEMS DIVISION 2224 LARKWOOD BLVD. SUITE 100, FORT WORTH, TEXAS 76104				ENGINEERING ORDER		SHEET _____	
MODEL		EFFECT ON		AUTHORITY: EG GO, MCR GO XXXX MCR XXX		PARTS MADE: <input type="checkbox"/> OK TO USE <input type="checkbox"/> MAY BE RWD <input type="checkbox"/> NOTED	
TEST						M XXX333	
SYM	DOCUMENT NUMBER	REV	TOTAL QTY REQD	NEXT USING DRAWING	TYPE CODE	SUBJECT	
	XXX-XXXXXX		2	① TEST		SC TEST/DEV	
	EO MXXX333-1		1	① TEST			
	EO MXXX333-11			EO MXXX333-1			
	EO MXXX333-3			EO MXXX333-11			
① DESIRED COMPLETION DATE XX-XX-XX DELIVER COMPLETED PARTS TO DEPT XXX							
NOTES: 1. EO MXXX333-1 IS THE SAME AS XXX-XXXX50 EXCEPT THAT 2C-11 CLIP IS OMITTED, AND EO XXX333-11 REPLACES XXX-XXXX51. 2. EO MXXX333-11 IS THE SAME AS XXX-XXXX51 ASSY EXCEPT THAT EO MXXX333-3 REPLACES XXX-XXXX52 BRACKET. 3. EO MXXX333-3 BRACKET IS THE SAME AS XXX-XXXX52 EXCEPT THAT .50 DIA HOLE WAS .25 DIA.							
REF EOs						DIST CODE	
REASONS						M XXX333	
REF SUBJECT 8130						SHEET _____	
SYMBOLS: \emptyset = DISTRIBUTE PRINTS [A] = ATTACH EO COPIES TO DRAWINGS							

ENGINEERING ORDERS

10.3 EO's involving test and development requirements shall indicate the total quantity required for each entry listed and the next using drawing for those entries that are further assembled or installed for the test. For those parts not further assembled or installed, the "NEXT USING DRAWING" column of the EO will indicate "TEST" (see Figure 10.3).

NORTH AMERICAN AVIATION, INC. SPACE AND INFORMATION SYSTEMS DIVISION 2224 LAKEWOOD BLVD. GAITHERSBURG, MD 20878							ENGINEERING ORDER		SHEET <u> </u> M		
MODEL		EFFECT ON			AUTHORITY: EG GO, MCR GO XXXX MCR XXX		PARTS MADE: <input type="checkbox"/> OK TO USE <input type="checkbox"/> MAY BE RWD NOTED		EO BY & DATE		
		TEST							ZIP		
SYM	DOCUMENT	NUMBER	REV	TOTAL QTY REQD	NEXT USING DRAWING	TYPE CODE	SUBJECT				
Ø	XXX-XXX779	NEW		2	TEST ① ②	SC	DOCUMENT				
Ø	XXX-XXX780	NEW		2	TEST ②	SC					
Ø	XXX-XXX781	NEW (WIRING DIAGRAM SCHEMATIC)				SD					
Ø	XXX-XXX782	NEW		4	XXX-XXX801 ③ ②	SC					
Ø	XXX-XXX783	NEW		4	XXX-XXX782 ③ ②	SC					
<p>① THIS EO RELEASES DWG XXX-XXX779 AND ALL SUBORDINATE PARTS.</p> <p>② DESIRED COMPLETION DATE: XX-XX-XX. DELIVER COMPLETED PARTS TO DEPT XXX. FOR INFORMATION CONTACT J. SMITH, EXT XXXX</p> <p>③ THESE PARTS ARE COMPONENTS OF ASSEMBLY RELEASED ON EO MXXXXXX.</p>											
REF EOs							DIST CODE				
REASONS							SHEET <u> </u> M				
REF SUBJECT 8130											

SYMBOLS: Ø = DISTRIBUTE PRINTS A = ATTACH EO COPIES TO DRAWINGS

ENGINEERING ORDERS

10.3.1 When all, or part, of the components of an assembly are required, a note may appear on the EO such as: "THIS EO RELEASES DRAWING XXXX-XXXXXX AND ALL SUBORDINATE PARTS," (or) "..... ALL SUBORDINATE PARTS EXCEPT" (list the exceptions). This method eliminates the necessity of listing all subs; however, partial assemblies will be assigned EO dash numbers for identification purposes.

10.3.2 Any special instructions or deviations required shall be specified in a note on the face of the EO, e.g., "NO INSPECTION REQUIRED" or "NO PLATING REQUIRED."

10.3.3 Those parts or assemblies that are fabricated differently from those described on the drawing will require assignment of an EO dash number for identification and shall be labeled "For Testing Purposes Only." Completion date and delivery information including information on parts to be furnished by Engineering (Engineer's name and extension) will appear in the body of the EO (see Figures 10.3 and 10.3.3).

10.4 Parts required for test/development usage as depicted on production drawings may be ordered as noted above. Test/development requirements shall not be reflected in the U/B of production drawings.

10.4.1 When test drawings are to be released for the fabrication of production parts, all desirable design changes and EO's shall be incorporated into the drawing and the U/B revised to remove the test requirements and add the production requirements. The drawing shall be released for production as a changed document under the next applicable change letter.

10.4.2 If completed test parts are acceptable as production parts, the production release EO should so state in addition to indicating where the test parts may be obtained. The parts will receive normal processing, inspection, etc.

NORTH AMERICAN AVIATION, INC. SPACE AND INFORMATION SYSTEMS DIVISION 2224 LANTANA DRIVE, SANTA ANA, CALIF. 92705				ENGINEERING ORDER		SHEET _____	
MODEL		EFFECT ON TEST		AUTHORITY: EG GO, MCR GOXXXX MCRXXX		PARTS MADE: <input checked="" type="checkbox"/> OK TO USE <input type="checkbox"/> MAY BE RWKD <input type="checkbox"/> NOTED	
SYM	DOCUMENT NUMBER	REV	TYPE CODE		SUBJECT		
A	XXX-XXXXXX	NC	SC		CHANGE		
<p>REVISE XXX-XXXXXX BULKHEAD ASSY TO REMOVE 1/2 DIA HOLE 1 PLACE AS INDICATED. PARTS MADE WITH 1/2 DIA HOLE MAY BE REWORKED BY ADDING EO MXXXXXX-3 PLATE AND WELDING AS SHOWN.</p>							
<p>REF EOs</p> <p>REASONS TO REMOVE HOLE IN SEALED AREA.</p>							
<p>SYMBOLS: ϕ - DISTRIBUTE PRINTS A - ATTACH EO COPIES TO DRAWINGS</p>							
						DIST CODE	
						M	
						SHEET _____	

ENGINEERING ORDERS

11. EFFECTIVITY & DISPOSITION NOTATIONS

11.1 Figure 11.1 tabulates the principal uses of EO's coupled with the proper notations in the Effect On and Parts Made blocks for the noted EO subjects.

EO EFFECT ON ENTRIES	PARTS MADE DISPOSITION	EO TYPE CODE & SUBJECT	PRINCIPAL USE	LIMITATIONS	PLANNING ACTION	INSPECTION ACTION
END ITEM 1 & SUBS	NONE (New Parts) Parts Made block of EO crossed out.	Type: BR or DC* Subj: Document or Type: BR** Subj: Change	For initial release of model requirements, i.e., release of new parts or release of additional requirements for existing parts for incorporation on all end items. EO should indicate whether old part can be reworked into new configuration. * Use DC only for release of new parts not identified in "Basic Release Package." ** For releasing those requirements for a new model as identified in the "Basic Release Package."	Do not use "NONE" disposition when releasing a design change. Not to be used after manufacturing completion of end items except as a deferred change or a reference effectivity when complying with "Multiple Release."	Issue new orders.	None
	<input checked="" type="checkbox"/> MAY BE REWORKED	Type: DC Subj: Change	For design changes to existing parts to be incorporated on all end items.	Not to be used when establishing new model requirements. Not to be used after manufacturing completion of end items except as a deferred change or a reference effectivity when complying with "Multiple Release."	Issue new or rework orders to support 1 & SUBS effectivity.	Verify according to normal CVR procedures.
END ITEM X & SUBS OR END ITEM X THRU Z OR X ONLY	NONE (New Parts) Parts Made block of EO crossed out.	Type: DC Subj: Document or Type: DC or BR* Subj: Change	For initial release of model requirements not to be effective on the total quantity of end items, i.e., release of new parts or release of additional requirements for existing parts to be effective at some point other than 1 & SUBS. EO should indicate whether old part can be reworked into new configuration. * When releasing those requirements for a new model as identified in the "Basic Release Package."	The disposition "NONE" should not be used to release a design change on the part.	Issue new orders to support affected end items.	None
	<input checked="" type="checkbox"/> MAY BE REWORKED	Type: DC Subj: Change	For design changes to existing parts that must be effective on specified end items other than 1 & SUBS.	Not to be used when releasing new requirements.	Issue new or rework orders to support all affected end items and post in CVR.	Verify according to normal CVR procedures.
END ITEM ✓ & SUBS OR — & SUBS	NONE (New Parts) Parts Made block crossed out.	Type: DC Subj: Document	For initial release of parts to be used in support of a substitutable or replaceable type change, and where the specific effectivity point must be determined but is not predetermined by Eng. requirements. Specific effectivity will be determined by Mfg. Sched. prior to release of EO. Prior to release, Mfg. Sched. must insert a specific end item number. (✓) must be removed at that time. See DRM 7620 for Service Note requirements.	Do not use disposition "NONE" when releasing a design change, or when mandatory installation is required on specific end items, or where the effectivity must be pre-coordinated with effectivity of related changes.	Issue new orders to support affected end items.	None
	<input checked="" type="checkbox"/> MAY BE REWORKED	Type: DC Subj: Change	For design changes not affecting part substitutability or replaceability and where the effectivity must be determined but is not predetermined by Engineering requirements. The specific end item effectivity will be determined by Mfg. Sched. prior to release of EO. Prior to release, Mfg. Sched. must insert a specific end item number. (✓) must be removed at that time. See DRM 7620 for Service Note requirements.	Do not use if interchangeability is affected. (Two-way) Do not use when releasing new requirements.	Issue new or rework orders to support all end items affected.	Verify according to normal CVR procedures.
* REL X & SUBS	NONE (New Parts) Parts Made block crossed out.	Type: DC Subj: Document	For release of new interchangeable parts (two-way) with Service Note Per DRM 7620. * Use when Program requirements warrant this type of change point. Program Configuration Accountability or Configuration Control should be contacted prior to its use. Used when not necessary to make change on definite end item. Change desired to improve the design.	Not to be used whenever it is desired to make the change on definite end items. Not to be used if interchangeability (two-way) is affected.	Issue orders for REL No. noted and subsequent. Planning may issue orders for earlier release on authority of change control letter.	Change is not entered in CVR. No assembly line verification required. Detail and subassembly inspection is to require that the change is made on the Release noted, but verification on next assembly of the changed parts is not required.
	<input checked="" type="checkbox"/> OK TO USE	Type: DC Subj: Change	For non-mandatory design changes to be effective on the release noted. Used where it is not necessary to make the change on a definite end item and since parts made are O.K. to use, the affected releases shall include only those orders not yet released from Planning. For design changes not affecting interchangeability and when there is no need to establish limitation of installation.	Not to be used when it is desired to make change effective on specific end items. Not to be used if part interchangeability (two-way) is affected.		

Figure 11.1 (Continued on next page)

ENGINEERING ORDERS

Figure 11.1 (Continued)

EO EFFECT ON ENTRIES	PARTS MADE DISPOSITION	EO TYPE CODE & SUBJECT	PRINCIPAL USE	LIMITATIONS	PLANNING ACTION	INSPECTION ACTION
NEXT PARTS MADE	<input checked="" type="checkbox"/> OK TO USE	Type: DC Subj: Change	For interchangeable changes after all production orders have been issued by Production Planning for all current requirements.	Do not use if interchangeability (two-way) is affected.	Change master for use on subsequent issue.	None
NOW SHOP PRACTICE	Parts Made block crossed out.	Type: DC Subj: Change	For shop worked changes prior to EO coverage by Engineering. Changes necessary to correct assembly of installation and do not affect design or hardware. Engineering releases EO to cover the work accomplished by shop.	Not to be used with end item number effectivity. Not to be used unless work being done in dept. that normally does the work.	Issue necessary orders on basis of "parts not assembled or installed." Run status as re-quired.	None
NOW SHOP PRACTICE IN DEPT. XX	<input checked="" type="checkbox"/> MAY BE REWORKED	Type: DC Subj: Change	Minor corrective changes when Mfg. has worked out change prior to release of EO, but change is accomplished by department subsequent to normal dept. performing operation.	To be used only when work is not being accomplished in the dept. that normally does the work. Not to be used with definite end item number effectivity.	Issue rework orders as required to accomplish change in normal position.	None
NOTED*	<input checked="" type="checkbox"/> NOTED**	Type: DC Subj: Change	Use when necessary to list specific effect on or disposition information on the body of the EO. * When space in Effect On block is inadequate for required effectivity listings. ** When disposition on parts made requires explanatory information.			
SEE REVISIONS BLOCK **	Parts Made block crossed out.	Type: DC Subj: Document or Type: SC* Subj: Document	Use when releasing changed drawings only. The effectivity and disposition will be noted on each drawing change revision notice sheet. * When change consists of EO Incorporation only. ** When used in combination with a release of a change by EO, the effectivity and disposition must also be shown on the EO.			
NO AFFECT ON DRAWING EFFECTIVITY	Parts Made block crossed out.	Type: SC** Subj: Change Type: DC* Subj: Change Type: SC*** Subj: Stop Order Release Type: DC**** Subj: Cancellation Type: SD**** Subj: Cancellation Type: SC **** Subj: Cancellation Type: SD***** Subj: Change	* 1. Use when correcting clerical errors, addition of views, reference dimensions, correction of assembly picture to agree with detail changes on Assy Dwg. * 2. For correction of L/M to agree with F/D. * 3. For addition of information without which completion and inspection of part would be impossible. ** 4. For change EO's against reference documents not called out on drawings. 5. For stop order release without change.*** 6. For cancellation (obsolescence) of dwg.**** 7. For changes to Revision Record. 8. For changes to Application (Usage) Data block except for changes in end item serial numbers on installation drawings. 9. For change EO's against reference documents which are normally called out on dwgs.*****	Do not use if change affects design or hardware.		
RELEASE TO FILES	Parts Made block crossed out.	Type: SD Subj: Document*	Used when releasing subordinate documents such as standard dwgs., specifications, reference dwgs. (schematics, block diagram, etc.), and Spec. Control Dwgs. * The release of Specific Process Specs. may require a definite effectivity and change of part number when change involves non-interchangeability.			
TEST	Parts Made block crossed out. See notes* and ***. <input checked="" type="checkbox"/> MAY BE RWKD **	Type: SC Subj: Document* or Type: SC Subj: Change** or Type: SC Subj: Test/Dev ***	Use when releasing parts or changes for a test project. The quantity of parts required is noted on the body of the EO. * When releasing new parts ** When making EO changes to test parts. *** When releasing additional quantities for new test requirements.	Do not combine production and test requirements on EO's or drawings.		

ABBREVIATIONS

A

AbbreviateABBR
 AboutABT
 AboveABV
 AbrasiveABRSV
 Abrasive-resistantABRSV RES
 AbsoluteABS
 Absolute ampereABAMP
 Absolute ceilingABS CLG
 AccelerateACCEL
 Acceleration (4)G
 AccelerometerACCEL
 Access openingAO
 AccessoryACCESS.
 Access panelAP
 AccordinglyVIZ
 AccumulateACCUM
 Accumulator (3)ACCUMR
 AcetyleneACET
 AcidproofAP
 Acidproof floorAPF
 Acid resistingAR
 Acid wasteAW
 AcousticACST
 Acoustical plaster ceiling.....APC
 Acoustical tile ceilingATC
 AcquisitionACQ
 Actinium (1)Ac

 ActivatorACTVTR
 ActualACT.
 Actuate, ActuatingACT.
 ActuatorACTR
 AdamsiteDM
 AdaptationADAPT.
 AdapterADPT
 Adapter boosterAB
 AddendumADD.
 AdditionADD.
 AdhesiveADH
 AdjustADJ
 Adjusting (3)ADJG
 Adjustment (3)ADJT
 Adjutant GeneralAG
 Adjutant General's Corps ...AGC
 AdmiralADM
 AdvanceADV
 Advance material request ...AMR
 AerodynamicAERODYN
 Aerodynamic centerAC
 AerologicalAEROL
 AeronauticAERO
 Aeronautical material
 specificationAMS
 Aeronautical national
 taper pipe threadsANPT

Aeronautical recommended
 practicesARP
 Aeronautical Standards
 GroupASG
 AerospaceAERO-SP
 Aerospace Industries
 AssociationAIA
 AfterAFT.
 AfterburnerAB
 After engine roomAER
 After perpendicularAP
 AggregateAGGR
 AileronAIL.
 AirborneABN
 Airborne early warningAEW
 Air-break switchABS
 Air circuit breakerACB
 AircooledACLD
 AircraftACFT

 Air Defense CommandADC
 AirdromeADRM
 Air escapeAE
 Air ForceAF
 Air Force BaseAFB
 Air Force-NavyAN
 Air Force-Navy Aeronautical.ANA
 Air Force-Navy-CivilANC
 Air Force-Navy DesignAND
 AirframeAFR
 Air horsepowerAHP
 Air lockAI.
 Air Materiel CommandAMC
 Air over hydraulicA/H
 AirplaneAPL
 AirportAPRT
 Air position indicatorAPI
 AirscoopAS.
 Air speedAS
 AirtightAT.
 Air-to-airAA
 Air-to-air missileAAM
 Air-to-groundAG
 Air-to-surface missileASM
 Air-to-underwater missile ...AUM
 AlarmALM
 AlcoholALC
 AlignmentALIGN.
 AllowanceALLOW.
 AlloyALY
 Alloy-steel protective plating .ASPP
 AlterationALT
 AlternateALT
 Alternating currentAC
 Alternating current
 synchronousACS
 Alternating current, volts ...VAC
 AlternatorALT
 AltimeterALTM
 AltitudeALT
 AluminumAL or Al (1)

AmatolAM.
 AmberAMB
 AmbientAMB
 AmbulanceAMB
 AmericanAMER
 American Association
 of EngineersAAE
 American Association of
 State Highway Officials....AASHO
 American Bureau of
 ShippingABS
 American Boiler Manu-
 facturers Association (and
 Affiliated Industries).....ABMA
 American Chemical Society ..ACS
 American Concrete Institute .ACI
 American Electrochemical
 SocietyAES
 American Electroplaters
 SocietyAES
 American Engineering
 CouncilAEC
 American Foundrymen's
 AssociationAFA
 American gage design
 standardAGDS
 American Gas Association ...AGA
 American Gear Manu-
 facturers AssociationAGMA
 American Institute of
 ArchitectsAIA
 American Institute of
 Chemical EngineersAICE
 American Institute of
 Electrical EngineersAIEE
 American Institute of
 Mining and Metallurgical
 EngineersAIMME
 American Institute of
 Steel ConstructionAISC
 American Iron and
 Steel InstituteAISI
 American National
 Red CrossARC
 American Ordnance
 AssociationAOA
 American Petroleum
 InstituteAPI
 American Railway
 AssociationARA
 American Railway Bridge
 and Building Association..ARBBA
 American Railway
 Car InstituteARCI
 American Railway
 Engineering Association ..AREA
 American Society of
 Civil EngineersASCE
 American Society of
 Engineers and Architects..ASEA

Continued

ABBREVIATIONS

American Society of
Heating and Ventilating
EngineersASHVE
American Society of
Mechanical EngineersASME
American Society for
MetalsASM
American Society of
Refrigerating Engineers ..ASRE
American Society of
Sanitary EngineersASSE
American Society for
Steel TreatingASST
American Society for
Testing MaterialsASTM
American Society of
Tool EngineersASTE
American Standard
Elevator CodeASEC
American Standards
AssociationASA
American Steel
Wire GageASWG
American Steel
Foundrymen's Association .ASFA
American Transit
AssociationATA
American War Standards ...AWS
American Water Works
AssociationAWWA
American Welding Society ..AWS
American wire gageAWG
American Wood Preservers
AssociationAWPA
AmericiumAM or Am (1)
AmmeterAM.
Ammonium nitrateAM NIT
AmmunitionAMMO
Ammunition identification
codeAIC
AmountAMT
AmpereAMP
Ampere (combining form)...A
Ampere hourAMP HR
Ampere hour meterAHM
Ampere-turnAT.
AmphibiousAMPH
Amphibious truckAMPH TRK
AmplifierAMPL
Amplitude (an elliptical
function)AM.
Amplitude modulationAM.
Anchor boltAB
Anchored filamentANF
Anchor lightAN LT
And (2)&
Angle stop valveASV
Angstrom unitA
AnhydrideANHYD
AnhydrousANHYD

AnnealANL
AnnunciatorANN
AnodizeANOD
AntennaANT.
AntiaircraftAA
Antiaircraft artilleryAAA
Antiaircraft commonAAC
Antiaircraft fire controlAAFC
Antiaircraft self-destroying .AASD
Antifriction bearingAFB
Antifriction Bearing Manu-
facturing AssociationAFBMA
Antifriction metalAFM
Anti-icingAI
AntijammingAJ
AntilogarithmANTILOG
Antimony (stibium) (1).....Sb
AntimotorboatAMB
Anti-motor torpedo boatAMTB
AntipersonnelAPERS
AntisubmarineAS.
Anti-submarine warfareASW
Anti-tankAT.
Antitank nonmetallicATUM
Anti torpedoAT.
Anti-tracking controlATRC
Anti-transmit-receiveATR
Anti-transmit-receive tube ..ATRT
ApartmentAPT.
ApparatusAPPAR
AppendixAPPX
ApplicationAPPL
ApprovedAPPD
ApproximateAPPROX
AprilAPR
Architectural projected
windowAPW
ArchitectureARCH.
Arc weldARC W
Area (3)A
Area drainAD.
Argentum (Silver)SIL
Argentum (Silver) (1)Ag
Argon (1)A
Arithmetic averageAA
ArmamentARMT
ArmatureARM.
Armature acceleratorAA
Armature shuntASH.
Armed Services Medical
Procurement AgencyASMPA
Armed Services Procure-
ment RegulationsASPR
ArmingARM.
Arming wireAW
ArmoredARMD
Armored utility vehicleAUV
Armor gratingAG
Armor piercingAP
Armor-piercing-cappedAPC

Armor-piercing-capped
incendiaryAPCI
Armor-piercing-capped
incendiary with tracerAPCI T
Armor-piercing-capped
with tracerAPC T
Armor-piercing
incendiaryAPI
Armor-piercing
incendiary with tracerAPI T
Armor-piercing
with tracerAP T
Armor plateARM PL
ArmyA
Army Air ForceAAF
Army Ballistic
Missile AgencyABMA
Army Field ForcesAFF
Army-Navy-Air ForceANAF
Army Nurse CorpsANC
Army Post OfficeAPO
Army regulationAR
AromaticAROM
ArrangementARR
Arresting (gear or hook)ARG
ArrestorARR
Arsenic (1)As
ArticleART.
ArtificialART.
ArtilleryARTY
AsbestosASB
Asbestos cementAC
Asbestos-cement boardACB
Asbestos-covered metalACM
Asbestos mill boardAMB
Asbestos roof shinglesARS
AsphaltASPH
Asphalt roof shinglesASPHRS
Asphalt-tile baseATB
Asphalt-tile floorATF
AssembleASSEM
AssemblyASSY
AssignASG
AssistantASST
Assistant Secretary of
the Air ForceAS OF AF
Assistant Vice Chief of
StaffAVCS
AssociateASSOC
AssociationASSN
Association of American
RailroadsAAR
Association of American
Steel ManufacturersAASM
AssortASST
AstatineAT or At (1)
AstragalA
Astronomical time switch ...ATS
AtmosphereATM

ABBREVIATIONS

B

AtomicAT.
Atomic Energy Commission...AEC
Atomic explosionAT XPL
Atomic hydrogen weldAT/W
Atomic weightAT WT
Attach (3)ATT
Attached (3)ATTG
Attaching (3)ATTG
AttendantATT
AttentionATTN
Attenuation, AttenuatorATTEN
AudibleAUD
Audio frequencyAF
AugustAUG
Aurum (Gold) (1)Au
AuthorizeAUTH
AutomaticAUTO
Automatic brightness
controlABC
Automatic direction finder ...ADF
Automatic door sealADS
Automatic frequency
controlAFC
Automatic gain controlAGC
Automatic leanAUTO LEAN
Automatic mixture
controlAMC
Automatic noise limiterANL
Automatic phase controlAPC
Automatic pistolAUTOP
Automatic reclosingAUTO RECL
Automatic richAUTO RICH
Automatic sensitivity
controlASC
Automatic sprinklerAS.
Automatic sprinkler
riserASR
Automatic stop and check
valveAUTO S&CV
Automatic volume control ...AVC
Automatic volume expansion...AVE
Automatic zero setAZS
AutomobileAUTO
Automobile Manufac-
turers AssociationAMA
AutomotiveAUTOM
AuxiliaryAUX
Auxiliary power unitAPU
Auxiliary switch (breaker)
normally closedASC
Auxiliary switch (breaker)
normally openASO
AvenueAVE
AverageAVG
AviationAVN
Aviation Supply OfficeASO
AvoirpoulsAVDP
AwningAWN
Axial flowAX FL
AzimuthAZ

BabbitBAB
Back-connectedBC
Back-feedBF
Back focal lengthBFL
Back gearBG
Back pressureBP
Back-pressure controlBPC
Back to backB TO B
Back-water valveBWV
BacteriologicalBACT
BaffleBAF
BaggageBAG.
BakeryBAK
BalanceBAL
Balanced voltageBV
BallastBALL.
Ball bearingBB
BallisticB
BandBND
Band displayBNDDIS
Band eliminationBE.
BandpassBP
BandwidthB
BarbetteBARB.
Barge, cargoBC
Barge, knockdownBK
Barge, trainingBT
Barium (1)Ba
Barium crownBC
BarometerBARO
BarracksBKS
BarrelBBL
Barrel rollerBBL ROLL.
Barrels per dayBPD
Barrels per hourBPH
Barrel-tile roofBTR
BarrierBARR
Barrier ready light system...BRL SYS
Barrier up indicator system...BUI SYS
Baryta light flingBLF
BaseB
Base and incrementB&I
Base bandBB
Base detonatingBD
Base detonating fuzeBDF
Base detonating,
self-destroyingBDS
Base ejectionBE.
Base fuzeBF
Base ignitionBI
Base lineBL
BasementBSMT
Base percussionBP
Base plateBP
BasicBSC
BastardBSTD

BathernographB T
BattalionBN
BattenBATT
Battery (artillery)BTRY
Battery (electrical)BAT.
Battery CommanderBC

BattleBAT.
Battle dressingBD
BauméBE.
Bayonet candelabra
double contactBAY CAND DC
BeaconBGN
BeamBM
Beams and stringersB&S
BearingBRG
Bearing deviation
indicatorBDI
Beat-frequency (adj)B F
Beat-frequency oscillator ...BFO
BedroomBR
Bell-alarm switchBA SW
Bell and bellB&B
Bell and flangeB&F
Bell and spigotB&S
Bell cordBC
Bell crankBELCRK
Bell endBE.
Belt work lineBWL
BenchboardBNCHBD
Bench markBM
Bend downBDN
Bending momentM
Bend upBUP
BentBT
BerkeliumBK or Bk (1)
BerthBTH
BerthingBERTH.
BerylliumBE.
Beryllium (glucinum) (1) ...Be
BessemerBESS
BetweenBET.
Between centersBC
Between perpendicularsBP
BevelBEV
Beveled wood sidingBWS
BicycleBCL
BilletBL
Bill of exchangeB/E
Bill of ladingB/L
Bill of materialB/M
Bill of saleB/S
BindingBIND.
Biochemical oxygen demand..BOD
Biological defenseBIODEF
Biological warfareBW
Biparting doorsBIPD
Birmingham Wire GageBWG
Bismuth (1)Bi
BituminousBITUM

Continued

ABBREVIATIONS

BlackBLK
 BlackboardBKD
 BlackoutBO
 Blackout doorBOD
 Blackout windowBOW.
 Black powderBP
 BlacksmithBSMITH
 BlankBLK
 Blasting powderBLSTG PWD
 BlockBLK
 Blocking oscillatorBO
 BlowerBLO
 BlowoffBO
 Blowout coilBOC
 BlueBLU
 BlueprintBP
 Blue stern lightBST LT
 BoardBD
 Board footFBM
 BoatswainBOSN
 Body-on-chassisBOC
 BoilerBLR
 Boiler feedBF
 Boiler feed compound tank...BFCT
 Boiler feed pumpBFP
 Boiler feed waterBFW
 Boiler horsepowerBHP
 Boiler houseBH
 BoilerplateBLR-PL
 Boiling pointBP
 BolsterBOLS
 Bolt circleBC
 Bolted plateBP
 BombBB
 Bombardment (projectile)...BBT
 Bomber (when used in
 aircraft design)B
 Bomb nose fuzeBNF
 Bomb serviceBS
 BombsightBOMST
 Bomb tail fuseBTF
 Bomb testing deviceBTD

BondingBOND.
 BookcaseBC
 Book rackBR
 BoosterBSTR
 Boron (1)B
 Boro-silicate crownBSC
 Borrowed lightBLT
 Both facesBF
 Both sidesBS
 Both waysBW

BottleBTL
 BottomBOT
 Bottom chordBC
 Bottom faceBF
 BottomingBOTMG
 Bottom layerBL
 BoundaryBDY
 Bow designation lightBD LT
 Bow lightBW LT
 BracketBRKT

BrakeBK
 Brake horsepowerBHP
 Brake mean effective
 pressureBMEP
 BranchBR
 BrassBRS
 Brass divider stripBDS
 BrazierBRAZ
 BrazingBRZG
 Breadth or Beam (of ship)...B
 BreakerBKR
 Breathing apparatusBA
 Breech loadingBL
 Breech mechanismBM
 BrickBRK
 BridgeBRDG
 Brigadier GeneralBRIG GEN
 Bright, BrightnessBRT
 BrillianceBRIL
 Brinell hardnessBH
 Brinell hardness number...BHN
 British standardBR STD
 British thermal unitBTU
 BroachBRO
 BroadcastBC
 Bromine (1)Br
 BronzeBRZ
 Broom closetBCL
 BrownBRN
 Brown and Sharpe (gage)...B&S

Browning Aircraft
 Machine GunBAMG
 Browning automatic rifle...BAR.
 Browning machine gunBMG
 BuckramBUCK.
 BuildingBLDG
 Building lineBL
 BulkheadBHD
 BulldozerBDZR
 BulletinBUL
 Bulletin boardBB
 BulletproofBPRF
 Bull noseBN
 BundleBDL
 BuoyancyB
 BureauBU
 Bureau of AeronauticsBUAER
 Bureau of OrdnanceBUORD
 BurlapBRLP

BurnerBNR
 BurningBRNG
 BurnishBHN
 BursterBRSTR
 BushelBU
 BushingBUSH.
 Bus tieBT
 Bus transferBTR
 Buttock lineBL
 ButtonBUT.
 Butt lineBL
 BuzzerBUZ
 By (used between
 dimensions) (2) (3)x
 BypassBYP

C

CabinCAB.
 CabinetCAB.
 CableCA
 Cab over engineCOE
 CadmiumCAD. or Cd
 Caesium (Cesium) (1).....Cs
 Calcium (1)Ca
 CalculateCALC
 CaliberCAL
 CalibrateCAL
 Calibrated air speedCAS
 Californium (1)Cf
 CaliperCLPR
 Calked jointCAJ
 CalkingCLKG
 CalorieCAL
 CamberCAM.
 CameraCAMR
 CamouflageCAMOF
 CampCP
 Camp chairCC
 Canadian Engineering
 Standards Association...CESA
 Canadian Lumbermen's
 AssociationCLA
 Cancel (3)CANC
 CandelabraCAND
 Candelabra screwCAND SC
 CandleC
 CandlepowerCP
 CanisterCSTR
 CanopyCAN.
 CantileverCANTIL
 CanvasCANV
 Canvas-covered-wire-rope
 handrailCC WR HDR
 CapacitanceC

ABBREVIATIONS

CapacitorCAP.
CapacityCAP.
CaptainCAPT
CarbineCBN
Carbon (1)C
Carbon steelCS
CarburetorCARB
Carburetor air temperature ..CAT.
CarburizeCARB
CargoCAR.
CarpetCARP.
CarriageCRG
CarrierCARR
CartonCTN
CartridgeCTG
Cartridge actuated device ..CAD.
Cartridge storage caseCSG
Case hardenCH
Casement projected transom..CPT
Cast (abbreviate only in
conjunction with other
materials)C
CastellateCTL
CastingCSTG
Cast ironCI
Cast-iron pipeCIP
CastleCAS
Castle nutCAS NUT
Cast steelCS
Cast stoneCS
CatalogueCAT.
CatapultCAT.
Catch basinCB
CathodeC
Cathode rayCR
Cathode-ray oscilloscope
(or oscillograph).....CRO
Cathode-ray tubeCRT
CavalryCAV
CavityCAV
CeilingCLG

CementCEM
Cement baseCB
Cement floorCF
Cement mortarCEM MORT
Cement plasterCPL
Cement-plaster ceilingCPC
CenterCTR
Center lineCL
Center Line (2)CL
Centerline vertical keelCVK
Center matchedCM
Center of buoyancyCB
Center of flotationCF
Center of gravityCG
Center of pillarCPLR
Center of pressureCP
Center sectionCS

Center tapCT
Center to centerC TO C
Centi (10⁻²)C
CentigradeC
CentigramCG
CentiliterCL
CentimeterCM
Centimeter gram secondCGS
Centimeters per secondCMPS
Central fire controlCFC
CentrifugalCENT.
Centrifugal forceCF
CeramicCER
Ceramic glazed structural
facing unitsCGSFU
Ceramic glazed structural
unit baseCGSUB
Ceramic glazed unitsCGU
Ceramic tileCT
Ceramic-tile baseCTB
Ceramic-tile floorCTF
Cerium (1)Ce
Cesium (Caesium) (1).....Cs
CesspoolCP
ChainCH
ChallengeCHAL
ChamberCHAMB
ChamferCHAM
ChangeCHG
Change noticeCN
Change orderCO
ChannelCHAN
ChaplainCH
Chaplain CorpsCHC
ChargeCHG
ChargerCHGR
ChassisCHAS
CheckCHK
Check valveCV
ChemicalCHEM
Chemical, biological,
radiological (warfare)CBR
Chemical defenseCMLDEF
Chemical warfareCW
Chemically pureCP
Chest of drawersC DWR
ChiefCH
Chief of ChaplainsC OF CH
Chief of EngineersC OF ENGRS
Chief of FinanceC OF F
Chief of Naval Operations ..CNO
Chief of Naval Personnel ...CHBUPERS
Chief of OrdnanceC OF ORD
Chief of StaffC OF S
Chief of Staff,
United States ArmyC OF SA
Chief of the Bureau of
AeronauticsCHBUAER
Chief of the Bureau of
Medicine and SurgeryCHBUMED

Chief of the Bureau of
OrdnanceCHBUORD
Chief of the Bureau of
ShipsCHBUSHIPS
Chief of the Bureau of
Supplies and Accounts ...CHBUSANDA
Chief of the Bureau of
Yards and DocksCHBUDOCKS
Chief of TransportationC OF T
Chief Petty OfficerCPO
Chief Signal OfficerCSIGO
ChiffonierCH
Chiffonier-lockerCH LKR
Chiffonier mirrorCH MIR
Chilled drinking waterCDW
Chilled drinking water
returnCDWR
Chilled waterCHW
ChloracetophenoneCN
Chloracetophenone solution..CNS
Chlorine (1)Cl
ChloropicrinPS
Chloropicrin stannic
chlorideNC
Choke coilCHC
Chrome molybdenumCR MOLY
Chrome-tanned leatherCR TAN LTHR
Chrome vanadiumCR VAN
Chromium (3)CHROM
Chromium (1)Cr
CircuitCKT
Circuit breakerCKT BKR
Circuit closingCKT CL
CircularCIR
Circular milCM
Circular pitchCP
CirculateCIRC
Circulating water pumpCWP
CircumferenceCIRC
Civil Aeronautics
AdministrationCAA
Civil Engineer CorpsCEC
ClassCL
ClassificationCLASS.
Claw plateCP
Clay pipeCP
Cleaning gear lockerCG LKR
CleanoutCO
Cleanout(flush with
finished floor).....FCO
ClearCLR
ClearanceCL
Clear glazed structural
facing unitsCLGSFU
Clear glazed structural
unit baseCLGSUB
Clear wire glassCLWG
ClevisCLV
ClockwiseCW

Continued

ABBREVIATIONS

CloseCL
ClosetCLO
Closing coilCC
ClosureCLOS
CoamingCOAM
Coat and hat (hooks)C & H
CoatedCTD
Coated metalCMET
Coat hookCH
Coating (3)CTG
CoaxialCOAX
Cobalt (1)Co
CobblerCOBB
CockpitCKPT
CodingCOD.
CoefficientCOEF
Coffee tableCT
CofferdamCOFF
CognizantCOG.
Coin dimpleCD
Cold-drawnCD
Cold-drawn steelCDS
Cold-Finish (3)C-FIN
Cold-punchedCP
Cold-rolledCR
Cold-rolled steelCRS
Cold waterCW
CollarCOL
CollectorCOLL
CologarithmCOLOG
ColonelCOL
Color codeCC
Columbium (niobium) (1)Cb
ColumnCOL
CombatCBT
Combat information centerCIC
Combat vehicleCV
CombinationCOMB.
CombustionCOMB.
CommanderCDR
Command information
centerCIC
Commanding OfficerCO
Command postCP
Command reconnaissanceCOM RCN
Command weapon carrierCOM WC
CommercialCOML
Commercial projected
windowCPW
Commissioned Warrant
OfficerCWO
CommodoreCOMO
CommonCOM
Common batteryCB
Common steel (projectile)CS
CommunicationCOMM
CommutatorCOMM

CompanionCOMP
CompanyCO
CompareCOMP
CompartmentCOMPT
Compartment and accessC & A
CompensateCOMPEN
ComplementCOMP
CompleteCOMPL
Completely knocked downCKD
Complete roundCR
Complete-round chartCRC
Complex operatorJ
CompositeCOMP
CompositionCOMP
Composition floorCOMPF
Composition roofCOMPR
CompoundCOMP
CompressCOMP
Compressed airCOMPA
CompressionCOMPR
CompressorCOMPR
ComputerCMPTR
ConcentrateCONC
ConcentricCONC
ConcreteCONC
Concrete blockCONC B
Concrete ceilingCONC C
Concrete floorCONC F
Concrete piercingCP
Concrete splash blockCSB
CondensateCNDS
CondenserCOND
ConditionCOND
ConductivityCOND
ConductorCOND
ConduitCND
ConfidentialCONF
Connect (3)CONN
ConnectorCONN
ConsoleCSL
ConstantCONST
ConstructionCONSTR
Construction jointCJ
ContactCONT
Contact making clockCMC
Contact making voltmeterCMVM
Contacting, runningCOR
Contacting, startingCOS
ContainerCNTR
ContaminatedCONTAM
Contaminated oil
settling tankCOST.
ContentsCONT
Continental horsepowerCONT HP
ContinueCONT
Continuous blowdownCB
Continuous commercial
serviceCCS
Continuous waveCW
Continuous windowCONT W

ContourCTR
ContractCONTR
Contract change noticeCCN
ContractorCONTR
Contractor-furnished
equipmentCFE
Contractor-furnished
propertyCFP
ControlCONT
Control jointCIJ
ControllerCONT
ConverterCONV
ConvertibleCONV
ConveyorCNVR
CoolantCOOL.
CooledCLD
CoolerCLR
CoordinateCOORD
CopperCOP or Cu (1)
CopperedCOPD
CopperamithCSMITH
CordCD
CordweltCDWT
CorkCK
Cork baseCKB
Cork boardCKBD
Cork floorCKF
CornerCOR
Corner headCOR BD
CorporalCPL
CorporationCORP
Corps of EngineersCE
CorrectCORR
Correspondence (3)CORRES
CorrosionCORR
Corrosion-resistantCRE
Corrosion-resistant steelCRES
CorrugateCORR
Corrugated metal pipeCMP
Corrugated wire glassCWG
CosecantCSC
CosineCOS
CotangentCOT.
CotterCOT.
CottonCOT.
CounterCTR
CounterbalanceCBAL
CounterboreCBORE
CounterclockwiseCCW
Counter countermeasureCCM
CounterdrillCDRILL
Counter electromotive forceCEMF
Counter flashingCFLG
Counterintelligence CorpsCIC
CountermeasureCM
CounterpoiseCPSE
CounterpunchCPUNCH
Counter-radar measuresCRM
CountersinkCSK
Countersink other sideCSKO

ABBREVIATIONS

D

CounterweightCTWT
CouplingCPLG
CoverCOV
CowlingCOWL
CraneCRN
Crane loadCL
CrankcaseCRKC
CrankpinCPIN
CrankshaftCSHAFT
Crew (as spaces)CR
Cross armXARM
Cross connectionXCONN
Cross countryXCX
Cross sectionXSECT
CruisingCRUIS
Crushed stoneCRSHD STN
CrystalXTAL
Crystal oscillatorXTLO
Crystal unit (piezoelectric)CU
CubicCU
Cubic centimeterCC
Cubic feetCU FT
Cubic feet per minuteCFM
Cubic feet per secondCFS
Cubic inchCU IN.
Cubic meterCU M
Cubic millimeterCU MM
Cubic yardCU YD
CulvertCULV
CupboardCUP
CuriumCM or Cm(1)
CurrentCUR
Current transformerCT
CurtainCURT
CutoffCO
CutoutCO
Cutout valveCOV
Cut stoneCUT S
CutterCTR
CuttingCTG
CyanideCYN
CycleCY
Cycle (combining form)C
Cycles per minuteCPM
Cycles per secondCPS
CycloniteRDX
CylinderCYL
CylindricalCYL
Cylinder lockCYL L

Damage controlDC
DamperDMPR
DampproofingDP
Dash pot (relay)DP
DatedDTD
DatumD
Dead lightDL
Dead loadDL
Dead reckoningDR
Dead reckoning analyzerDRA
Dead reckoning tracerDRT
Dead reckoning trainerDRTR
DeadweightDWT
Deaerating feed tankDFT
DecalcomaniaDECAL
DecaliterDAL
Decanning scuttleDS
Deceleration (3)DECEL
DecemberDEC
Deci (10⁻¹)D
DecibelDB
Decibel (referred to 1) voltDBV
Decibel (referred to 1) wattDBW
Decibels (referred to 1) milli-
watt (in 600 ohms)DBM
Decibels above reference
noiseDBRN
DeciliterDL
DecimalDEC
DecimeterDM
DeckDK
Deck drain valveDDV
Deck edge lightDE LT
Deck houseDK HSE
Deck piercingDP
Deck surface lightDS LT
DecontaminationDECONTN
DecreaseDECR
DedendumDED
Deep-drawnDD
DefenseDEF
DeflectDEFL
Deflection plateDP
DefoggingDF
Defrost, DefrostingDFR
DegreeDEG
De-icingDI
DelayDLY
Delayed automatic volume
controlDAVC
Delay lineDL
Delta amplitudeDN
Demand meterDM
DemodulatorDEM
DemolitionDML

Dense flintDF
DensityD
Dental CorpsDC
DepartmentDEPT
Department of DefenseDD
Department of the
Air ForceDAF
Department of the ArmyDA
Department of the Army
modification work orderDAMWO
Department of the NavyDN
Depot installedDEP INST
DepressionDEPR
Depressurization (3)DEPRESS.
DepthD
Depth chargeDC
Depth deviation indicatorDDI
Depth of shipD
Deputy Chief of Staff,
MaterialDCS/M
Deputy Chief of Staff,
OperationsDCS/O
DermatineDER
DescribeDESCR
DesignDSGN
DesignatorDES
Designed water lineDWL
Desk, combination flat top
and typewriterFT&TW
Desk double-pedestal
flat-topDPFT
Desk double-pedestal
typewriterDPTW
Desk single-pedestal
flat-topSPFT
Desk single-pedestal
typewriterSPTW
Destructive firingDESTR FIR.
DesuperheaterDSUPHTR
DetachedDET
DetailDET
DetectorDET
Detector back biasDBB
DetentionDET
DetonatorDET
Deuterium (Hydrogen
isotope H²) (1)D
DevelopDEV
Developed horsepowerDHP
Developed LengthDEV-LG
Developed WidthDEV-W
DeviationDEV
Dew pointDP
DiagonalDIAG
DiagramDIAG
DiagrammaticDIAGR

Continued

ABBREVIATIONS

Dial-lockD LOCK
DiameterDIA

Diametral pitchDP
DiamondDMD
DiaphragmDIAPh.
DichlorodifluoromethaneF-12
Dichlorotetrafluoroethane ...F-114
DieselDSL
Diesel-electricDE
Diesel-mechanicalDM
Diesel oilDO.
DifferentialDIFF
DiffusingDIFFUS
DilutionDIL
DimensionDIM.
DimmerDIM.
DiodeDIO
DirectDIR
Direct-connectDIR CONN
Direct currentDC
Direct-current test,voltsVDCT
Direct-current,voltsVDC
Direct-current working,volts .VDCW
DirectionDIR
Directional couplerDIR COUP.
Direction finderDF
DirectorDIR
DisassemblyDISASSY
Discarding sabotDS
Disc grindDG
DischargeDISCH
DisconnectDISC.
DiscriminatorDISCR
DishwasherDW
DispensaryDISP
DispenserDISP
DisplacementDISPL
DisplayDIS
Dissolved oxygenDO.
DistanceDIST
Distance measuring
equipmentDME
DistantDIST
Distant early warningDEW.
DistillDSTL
Distilled waterDW
Distribute, DistributionDISTR
Distribution boxDB
Distribution panelD PNL
DistributorDISTR
DistrictDIST
District EngineerDE
DittoDO.
DivideDIV
DivisionDIV
Division EngineerDIV E

DollyDLY
DomesticDOM
Domestic serviceDS
DoorDR
Door closerDC
Door stopD ST
Door switchDSW
DoubleDBL

Double actingDBL ACT.
Double-acting doorDAD.
Double biased (relay)DB

Double contactDC

Double endDE
Double feederDF

Double groove (insulators) ..DG
Double groove, double
petticoat (insulators)DGDP
Double-hung windowsDHW

Double poleDP
Double pole both connected ..DPBC
Double-pole double throw ...DPDT
Double pole front connected ..DPFC
Double-pole single throw ...DPST
DoublerDBLR
Double sidebandDSB

Double throwDT
Double weightDW
Douglas firDOUG FIR.
DovetailDVTL
DowelDWL
DownDN
DownspoutDS
DozenDOZ
DraftDFT
Draftsman (3)DFTSMN
Draft stopDS
DrainDR
Drain tileDT
DramDR
Drawbar horsepowerDBHP
Drawbar pullDBP
DrawerDWR
DrawingDWG
Drawing listDL
DrawnDR

Dressed and matchedD & M
DresserDRSR
DrillDR
Drill rodDR
Drinking fountainDF
DripproofDP
DriveDR
Drive fitDF
Drop forgeDF
Drop manholeDMH
Drop wood sidingDWS
Dry bulbDB
DrydockDD
Dry pipe valveDPV
Dual tiresDT
Dumb-waiterDW
Dumb-waiter doorDWD
DuplicateDUP
Dutch doorDD
DynamicDYN
Dynamic brakingDYB
DynamiteDYNMT
DynamometerDYN0
DynamotorDYNM
Dysprosium (1)Dy

E

EachEA
Each faceEF
Each layerEL
EastE
EccentricECC
EchelonFCH
Echo rangingER
Echo soundingES
Economize, EconomizerECON
Edge Distance (3)E/D
Edge thicknessET
Edison Electric Institute ...EEI
EffectiveEFF
Effective diameter of
objectiveEDO
Effective focal lengthEFL
Effective horsepowerEHP
EfficiencyEFF
Einsteinium (1)E
Ejection Seat (3)EJCTN ST
EjectorEJECT.
Elastic (3)ELAS
Elastic limitEL
Elastic Modulus (3)E

ABBREVIATIONS

ElbowELL
ElectricELEC
Electrically polarized (relay) ..EP
Electrical metallic tubing ...EMT
Electrical timeET
Electrical time, superquick ...ETSQ
Electric horsepowerEHP
Electric-motor drivenEMD
Electric water coolerEWC
Electrochemical SocietyES
ElectrolyticELECT.
Electromagnetic unitsEMU.
Electromotive forceEMF
Electron coupled oscillator ...ECO
Electronic countermeasure ..ECM
Electronic Industries
 AssociationEIA
Electron voltEV
Electro-pneumaticEP
Electrostatic unitsESU
ElementELEM
ElevateELEV
ElevationEL
ElevatorELEV
EliminateELIM
ElongationELONG
Elongation in 2 inchesEL2
EmergencyEMER
Emergency identification
 lightEID LT
EmissionEMIS
EmpennageEMP
EncloseENCL
End to endE TO E
EngineENG
EngineerENGR
EngineeringENGRG
Engineering change order ..ECO
Engineering change
 proposalECP
Engineering orderEO
Engineering work orderEWO
Engine oilEO
Engine roomENG RM
EnglishENG
Enlisted menEM
Enlisted Reserve CorpsERC
Enlisted WomenEW
EnsignENS
EntranceENT
Entrance pupilAP
EnvelopeENV
Environmental system (3) ... ENVR-SYS
Equal, EqualizerEQ
Equal sectionES
Equal spaces (3)EQ SP

EquationEQ
EquipmentEQUIP.
Equipment and spare parts...E&SP
EquivalentEQUIV
Equivalent air speedEAS
Equivalent direct radiation...EDR
Equivalent focal lengthEF
Equivalent-noise-sideband
 inputENSI
Equivalent shaft
 horsepowerESH
Erbium (1)Er
ErectionERECT.
EscapeESC
EscutcheonESC
EstimateEST
Et ceteraETC
Ethylene OxideETO
Europium (1)Eu
Evaporate, EvaporatorEVAP
ExampleEX
ExcavateEXC
ExchangeEXCH
ExciterEXC
ExclusiveEXCL
ExecutiveEXEC
ExerciseEXER
ExhaustEXH
Exhaust gas temperature...EGT
Exhaust ventEXH V
ExhibitEXH
ExistingEXIST.
Exit pupilEP
Expanded metalEM
ExpansionEXP
ExperimentEXP
Explosion-proofEP
ExplosiveXPL
Explosive DXPL D
ExpressEXP
ExpulsionEXP
ExtensionEXT
ExteriorEXT
ExternalEXT
External pipe threadEPT
Extinguish, Extinguisher ...EXT
ExtraEXT
Extra fine (threads)EF
Extra heavyX HVY
Extra-long wheel baseXLWB
Extra strongX STR
Extreme high waterEHW
Extreme low waterELW
Extremely-high frequency ...EHF
ExtrudeEXTR

F

FabricateFAB
Face to faceF TO F
FacingFCG
FacsimileFAX
FahrenheitF
FairingFAIR.
FaradF
Far sideFS
FastenerFASTNR
Fast operating (relay)FO
Fast release (relay)FR
Fast time constantFTC
FebruaryFEB
FederalFED.
Federal Communications
 CommissionFCC
Federal Power Commission ..FPC
Federal SpecificationFS
Federal stock numberFSN
FeederFDR
Feed waterFDW
Feet board measureFBM
Feet per minuteFPM
Feet per secondFPS
Fermium (1)Fm
Ferrule-contactFER CON
Ferrum (Iron) (1)Fe
FiberFBR
FieldFLD
Field acceleratorFAC
Field ArtilleryFA
Field deceleratorFDE
Field dischargeFDI
Field dynamic brakingFDB
Field failureFFL
Field forcing, decreasing ...FFD
Field forcing, increasing ...FFI
Field manualFM
Field protectiveFFP
Field reversingFFR
Field ServiceFS
Field service modification
 work orderFSMWO
Field weakeningFFW
Fighter (when used in
 aircraft design)F
FigureFIG.
FilamentFIL
Filament center tapFCT
File cabinetFC
FilletFIL
FillingFILL.

ABBREVIATIONS

FillisterFIL
 Fillister headFIL H
 FilterFIL
 Final limit, downFLDO
 Final limit, forwardFLF
 Final limit, hoistFLH
 Final limit, lowerFLL
 Final limit, reverseFLR
 Final limit, upFLU.
 Finance DepartmentFD
 FinishFIN.
 Finish all overFAO
 Finish one sideF1S
 Finish two sidesF2S
 Fin stabilizedFS
 FireF
 Fire alarm bellFABL
 Fire alarm boxFABX
 Fire and bilgeF&B
 Fire and flushingF&F
 Fire clayFC
 Fire controlFC
 Fire control systemFCS
 Fire-department connectionFDC
 Fire doorF DR
 Fire extinguisherFE
 Fire hoseFH
 Fire-hose cabinetFHC
 Fire-hose rackFHR
 Fire-hydrantFHY
 Fire mainFM
 FireplaceFP
 Fire plugFPL
 FireproofFPRF
 Fire resistantFRES
 Fire roomF RM
 Fire stationFS
 Fire wallFW
 First-aid boxFAB
 First Lieutenant1ST LT
 FittingFTG
 FixedFXD
 Fixed transomFTR
 FixtureFIX.
 FlagstoneFLGSTN
 FlameproofFP
 Flame-tightMT
 FlangeFLG
 FlashingFL
 FlashlessFLHLS
 Flashless nonhygroscopicFNH

 Flat barFB
 Flat headFH
 Flat nose (projectile)FN
 Flat ovalFO
 Flat patternF/P

Flat pointFP
 Flat-tile roofFTR
 Fleet AdmiralFADM
 FlexibleFLEX.
 FlightFLT
 Flight ControlFLT-CONT
 Flight control ready
 light systemFCRL SYS
 FlintF
 FloatFLT
 FloatingFLTG
 Floating machine shopFMS
 FloorFL
 Floor drainFD
 FlooringFLG
 FlotationFLOT
 Flow lineFL
 FluidFL
 FluorescentFLUOR
 Fluorine (1)F
 Flush armor balanced
 watertight hatchFL ABWTH
 Flush metal thresholdFMT
 Flush oiltight ventilation
 holeFL OTVH
 Flush or flood (verb)FL
 Flush thresholdFT
 Flush valveFV
 FoldingFOLD.
 FootFT
 Foot-candleFC
 FootingFTG
 Foot-lambertFL
 Foot-poundFT LB
 Foot-pound-second
 (system)FPS
 ForceF
 Forced draftFD
 Forced-draft blowerFDB
 Fore and aftF&A
 ForecastleFCSLE
 Foreign serviceFS
 ForesightFS

 Forged steelFST
 ForgingFORG
 ForkFK
 Form (3)FRM
 FormationFORM.
 FormerFRMR
 ForwardFWD
 Forward engine roomFER
 Forward perpendicularFP
 FoundationFDN
 FoundryFDRY
 Four-conductor4/C
 Four-pole4P
 Four-way4 WAY
 FragmentationFRAG

FrameFR
 FrameworkFRWK
 Francium (1)Fr
 Free apertureFA
 FreeboardFREEBD
 Free cutting brassFCB
 Free heightFRHGT
 Free-machining steelFMS
 Free on boardFOB.
 Freezing pointFP
 FreightFRT
 Freight supply (vessel)FS
 FrequencyFREQ
 Frequency meterFRM
 Frequency modulationFM
 Frequency-shift keyingFSK
 Fresh waterFW
 Fresh water drain
 collecting tankFWDCT
 FrictionFRICT
 Friction horsepowerFHP
 FrogFG
 From belowFR BEL
 FrontFR
 Front-connectedFC
 Front focal lengthFF
 Front of dashFD
 Front View (3)FV
 FuelF
 Fuel-air ratioF/A RATIO
 Fuel oilFO
 Fuel-oil transferFOT
 Full fieldFF
 Full indicator readingFIR.
 Fume-tightFT
 FurlongFUR.
 FurnishFURN
 FurnitureFURN
 FuselageFUS
 Fusion pointFNP
 FuzeFZ

G

Gadolinium (1)Gd
 GageGA
 Gain time controlGTC
 Gallium (1)Ga
 GallonGAL
 Gallons per acre per dayGPAD
 Gallons per capitaGPC
 Gallons per capita per dayGPCD
 Gallons per dayGPD

ABBREVIATIONS

Gallons per hourGPH
 Gallons per minuteGPM
 Gallons per secondGPS
 GalvanizeGALV
 Galvanized ironGI
 GalvannealedGALVND
 GalvanometerGALV
 GarageGAR
 GarboardGARBD
 Garnish moldingGMLDG
 Gas amplificationGA
 Gas ejectionGE
 Gaseous HeliumGAS-HE
 Gaseous HydrogenGAS-H
 Gaseous NitrogenGAS-N
 Gaseous OxygenGAS-O
 Gas GeneratorGAS-GEN
 GasketGSKT
 GasolineGAS.
 Gasoline engine drivenGED
 Gas, nonpersistentG NP
 Gas, persistentG P
 GasproofGPF
 GastightGT
 Gate valveGTV
 GearGR
 GeneralGEN
 General Accounting OfficeGAO
 General HeadquartersGHQ
 General purpose (bomb)GP
 General Staff CorpsGSC
 GeneratorGEN
 Generator fieldGF
 Germanium (1)Ge
 German-silverG SIL
 GimbalGMBL
 GirderG
 GlassGL
 Glass blockGLB
 GlazeGL
 Glazed facing unitsGFU
 Glazed structural facing
 unitsGSFU
 Glazed structural unit baseGSUB
 Glazed structural unitsGSU
 Glazed wallboardGLWB
 Glazed wall tileGWT
 Glazed wall tile baseGWTB
 Glide angleG A
 GliderGLI
 Globe stop valveGSV
 Globe valveGLV
 Glucinum
 (Beryllium) (1) Be

Gold (aurum) (1)Au
 GoverningGOVG
 GovernmentGOVT
 Government-furnished
 equipmentGFE
 Government-furnished
 propertyGFP
 GovernorGOV
 Grab rodGR
 GradeGR
 Grade abilityGR AB
 GraduationGRAD
 GrainGR
 Grains per gallonGPG
 GramG
 Gram calorieGCAL
 GraniteGRAN
 Granolithic baseGRB
 Granolithic finish floorGFF
 GraphiteGPH
 GratingGRTG
 GravelGVL
 Gravel-surface built-up roofGSBR
 GravityG
 GrayGY
 GreaseGRS
 Grease nozzleG NOZ
 Grease trapGT
 Greatest common dividerGCD
 GreenGRN
 GridG
 GrindGRD
 GrommetGROM
 GrossGRO
 Gross tonGT
 GroundGRD
 Ground controlled approachGCA
 Ground controlled
 interceptionGCI
 Ground detectorGRD
 Ground-glassG GL
 Ground lampGR LP
 Ground position indicatorGPI
 Ground speedGS
 Ground-to-airG A
 Ground-to-groundG G
 GroupGR
 GuardGD
 Guard railGDR
 Guided missileGM
 Guide lightGLT
 Gun carriageG CRG
 Gun motor carriageGMC
 Gun-metalG MET.
 GunneryGUN.
 Gun sight aiming pointGSAP

GypsumGYP.
 Gypsum-plaster ceilingGPC
 Gypsum-plaster wallGPW
 Gypsum sheathing boardGSB
 Gypsum wallboardGWB
 GyroscopeGYRO

H

Hafnium (1)Hf
 Half breadthHB
 Half gross½ GRO
 Half-hard½ H
 Half-round½ RD
 Half trackHTRK
 Halpern's anti-radar pointHARP.
 HandbookHNDBK
 Hand controlHC
 Hand generatorHG
 HandholeHH
 Hand lanternHL
 HandleHDL
 HandlingHAND.
 Handling roomHR
 Hand railHDR
 Hand wheelHD WHL
 HangerHGR
 Harbor defenseHD
 HardH
 Hard chromiumHD CR
 Hard-drawnHD
 HardenHDN
 Harden & grindH&G
 HardwareHDW
 Hardware clothHDW C
 HardwoodHDWD
 HarmonicHAR
 Harness leatherHARN LTHR
 HatchH
 HaversineHAV
 HeadHD
 HeadlessHDLS
 HeadquartersHQ
 Head SuppressionHD-SUPPR
 Head windHW
 HeatHT
 HeaterHTR
 Heating cabinetHC
 Heat resistingHR
 Heat treatHT TR
 HeavyHVY
 Heavy barrel (reference
 to rifle)HB

Continued

ABBREVIATIONS

Heavy end aviation fuelHEAF

Heavy machine gunHMG

HectareHA

HectoliterHL

Heel Line (3)HL

Heel to heelH TO H

HeightHGT

HeliumHE

Helium (1)He

Henry (electrical)H

HexachlorethaneHC

HexagonHEX.

Hexagonal headHEX HD

HighH

High altitudeHA

High-capacity (projectile)HC

High carbonHC

High-carbon steelHCS

High-carbon steel,
heat-treatedHCSHT

High-explosiveHE.

High-explosive,
anti-aircraftHEAA

High-explosive antitankHEAT.

High-explosive
armor-piercingHEAP.

High-explosive,
discarding sabotHEDS

High-explosive incendiary ...HEI

High-explosive
incendiary with tracer ...HEIT

High-explosive, plasticHEP

High-explosive ramjetHERJ

High-explosive
rocket assistedHERA

High explosive spottingHES

High-explosive with tracer ...HET

High frequencyHF

High frequency oscillator ...HFO

High-grade plow steelHGPS

High passHP

High pointH PT

High potentialH POT.

High pressureHP

High-pressure steamHPS

High pressure testHPT

High speedHS

High-speed steelHSS

High-tensile steelHTS

High tensionHT

High-velocity,
aircraft rocketHVAR

High-velocity,
armor-piercingHVAP

High-velocity,
target practiceHVTP

High voltageHV

High-water lineHWL

HighwayHWY

Hinged plotting boardHPB

Hinged seatHS

Hinge lineHL

Hinge pillarHPLR

HogsheadHHD

HoistHO

HollowHOL

Hollow metalHM

Hollow metal door and
frameHMDF

Hollow tileHT

Holmium (1)Ho

HomingHOM

Hone-finish monolithic floor ...HFMF

Honeycomb (3)HCOMB

Hook railHR

Horizon, HorizontalHORIZ

Horizontal center lineHCL

Horizontal location of center
of gravityHCG

Horizontal reference
lineHRL

Horizontal shearHS

Horizontal volute spring
suspensionHVSS

Horn gap switchHGSW

HorsepowerHP

Horsepower-hourHP HR

Hose bibHB

Hose rackHR

HospitalHOSP

Hospital CorpsHC

Hot-galvanizeH GALV

Hot-pressHP

Hot-rolled steelHRS

Hot waterHW

Hot-water circulatingHWC

HourHR

HousingHSG

HowitzerHOW

Howitzer motor carriageHMC

HundredweightCWT

HydraulicHYD

Hydrocyanic acidHCN

HydroelectricHYDROELEC

Hydrogen (1)H

HydrostaticHYDRO

Hyperbolic constantCSCH

Hyperbolic cosineCOSH

Hyperbolic cotangentCOTH

Hyperbolic sineSINH

Hyperbolic tangentTANH

Hypervelocity,
armor-piercingHVAP

Hypervelocity, armor-piercing
discarding sabotHVAPDS

Hypervelocity, target
practiceHVTP

Hypervelocity, target
practice, discarding sabot ...HVTPDS

IdentificationIDENT

Identification friend or foe ...IFF

Identification lightID LT

Identification of positionIP

IgnitionIGN

Illinium (Promethium) (1).....II

IlluminateILLUM

Illuminating (projectiles) ...SS

Illuminating Engineers
SocietyIES

IllustrateILLUS

ImpactIMP.

ImpellerIMP.

ImperialIMP.

ImpregnateIMPG

Improved plow steelIMP PS

ImpulseIMP.

InboardINBD

IncendiaryINC

Incendiary bombIB

InchIN.

Inches per secondIPS

Inch-poundIN.LB

IncineratorINCIN

InclinedINCL

Inclined ladderIL

InclosureINCL

IncludeINCL

InclusiveINCL

IncomingINC

Incone (3)ICL

IncorporatedINC

IncreaseINCR

IndependentINDEP

IndicateIND

Indicated air speedIAS

Indicated horsepowerIHP

Indicated horsepower hour ...IHPH

IndicatingIG

IndicatorIND

Indirect wasteIW

Indium (1)In

Induced draftID

Inductance-capacitanceLC

Inductance-capacitance-
resistanceLCR

Inductance coilL

Inductance (self)IND

InductionIND

IndustrialIND

Industrial serviceIS.

InfantryINF

InflammableINFL

InformationINFO

InfraredIR

Initial velocityIV

Inject, InjectionINJ

Inlet manholeIMH

ABBREVIATIONS

Inner (3) INR
 Inner bottom IB
 Inner keel IK
 Inscription INSC
 Insect screen IS
 Inside diameter ID
 Inside layer IL
 Inside mold line IML
 Inside radius IR
 Inspect INSP
 Inspector General's
 Department IGD
 Install, Installation INSTL
 Instantaneous INST
 Instantaneous automatic
 gain control IAGC
 Instantaneous automatic
 volume control IAVC
 Institute of Aeronautical
 Sciences IAS
 Institute of Radio
 Engineers IRE
 Institute of Traffic
 Engineers ITE
 Instruction INST
 Instrument INST
 Instrument flight rules IFR
 Instrument landing system ILS
 Instrument Society of
 America ISA
 Insulate INS
 Insulated Power Cable
 Engineers Association IPCEA
 Insulation, Insulator INS
 Intake INT
 Integral INT
 Integrating INT
 Intercept INTCP
 Interchangeable INTCHG
 Interchangeable solid and
 screen panels IP
 Intercommunication INTERCOM
 Intercooler INCLR
 Intercylinder INTCYL
 Interference INTFER
 Interior INT
 Interior communication IC
 Interlock INTIK

 Intermediate INTMED
 Intermediate distributing
 frame IDF
 Intermediate frequency IF
 Intermediate power
 amplifier IPA
 Intermediate pressure IP
 Intermittent INTMT

Intermittent commercial and
 amateur service ICAS
 Internal INT
 Internal combustion engine ICE
 Internal pipe thread IPT
 International annealed copper
 standard IACS
 International Organization
 for Standardization ISO
 International Pipe Standard IPS
 International Red Cross IRC
 International Standard
 Thread (Metric) INT STD THD
 Interphone INPH
 Interphone control station ICS
 Interrogator-responder IR
 Interrupt INTER
 Interrupted continuous wave ICW
 Interruptions per minute IPM
 Interruptions per second IPS
 Intersect INT
 Interstate Commerce
 Commission ICC
 Intricate INTRC
 Inverse INV
 Invert INV
 Iodine (1) I
 Ionium (1) Io
 Iridium (1) Ir
 Iron (abbreviate only in con-
 junction with other mate-
 rials) I
 Iron (Ferrum) (1) Fe
 Iron body bronze-mounted IBBM
 Ironing board IB
 Iron pipe IP
 Iron pipe size IPS
 Irregular IRREG
 Island IS
 Isolation ward ISO WD
 Issue ISS

J

Jack J
 Jacket water JW
 Janitor's closet JC
 January JAN
 Japanned JAP
 Jet Assist Take-off (3) JATO
 Job order JO
 Joggle JOG.
 Join JN
 Joiner J
 Joiner pilaster fumetight JPFT
 Joiner pilaster nontight JPNT
 Joint JT

Joint Army - Navy
 (Specification) JAN
 Joint bar JTB
 Joint Chiefs of Staff JCS
 Joint compound JC
 Joist J
 Joists and planks J&P
 Joule J
 Journal JNL
 Judge Advocate General JAG
 Judge Advocate General's
 Department JAGD
 July JUL
 Junction JCT
 Junction box JB
 June JUN
 Junior Grade
 Warrant Officer WOJG
 Junior Officers JO

K

Kalamein KAL
 Kalamein door KALD
 Kalamein door and frame KDF
 Kallium
 (Potassium) (1) K
 Keene's cement plaster KCP
 Keene's cement
 plaster ceiling KCPC
 Kelvin K
 Key locker KL
 Keyseat KST
 Keyway KKY
 Kick plate KP
 Kick plate and drip KP&D
 Kiln-dried KD
 Kilo (10³) K
 Kilocycle KC
 Kilocycles per second KC/S
 Kiloelectron volt KEV
 Kilogram KG
 Kilogram calorie KG CAL
 Kilogram-meter KG M
 Kilograms per cubic meter KG/CUM
 Kilograms per second KGPS
 Kilohm K
 Kiloliter KL
 Kilo-mega (10⁶) KM
 Kilo-megacycles (10⁶) KMC
 Kilometer KM
 Kilometers per second KMPs
 Kilovar KVAR
 Kilovolt KV
 Kilovolt-ampere KVA
 Kilovolt-ampere hour KVAH
 Kilovolt peak KVP
 Kilowatt KW

Continued

ABBREVIATIONS

Kilowatt hourKWH
 Kilowatts reactiveKWR
 Kinetic energyKE
 Kip (1,000 lb)K
 Kips (per) Square Inch (3) ... KPI
 Knee braceKB
 Knife switchKN SW
 Knock downKD
 KnockoutKO
 KnotKN
 Krypton (1)Kr

L

LaboratoryLAB
 LacquerLAQ
 LadderLAD.
 Ladder rungLR
 LambertsL
 LaminateLAM
 LandingLDG
 Landing craft,
 controlLCC
 Landing craft,
 mechanizedLCM
 Landing craft,
 personnel (large)LCP(L)
 Landing craft,
 personnel (with ramp) ...LCP(R)
 Landing craft,
 rubber (large)LCR(L)
 Landing craft,
 rubber (small)LCR(S)
 Landing, craft, supportLCS(S)
 Landing craft, utilityLCU
 Landing craft, vehicleLCV
 Landing craft,
 vehicle and personnelLCVP
 Landing gearLG
 Landing observer's signal
 systemLOS SYS
 Landing ship, tankLST
 Landing signal officerLSO
 Landing signal wand light ...LSW LT
 Landing vehicle,
 tracked (armored)LVT(A)
 Landing vehicle,
 tracked (unarmored)LVT
 LandmarkLD MK
 Lanthanum (1)La
 LargeLGE
 Large tugLT
 LateralLAT

LatitudeLAT
 LauncherLCHR
 LaundryLAU
 Laundry chuteLC
 Laundry trayLT
 LavatoryLAV
 Lawn faucetLF
 Lawrencium (1)Lw
 Lead (plumbum) (1).....Pb
 Lead-coated metalLCM
 Lead-coveredLC
 Leading edgeLE

Least common multipleLCM
 LeatherLTHR
 LeftL
 Left handLH
 Left hand driveLH DR
 Left-right indicatorLRI
 LengthLG
 Length between
 perpendicularsLBP
 Length of lead (actual)LOL
 Length over-allLOA
 LetterLTR
 Letter boxLB
 LeverLEV
 LewisiteL
 LieutenantLT
 Lieutenant ColonelLT COL
 Lieutenant CommanderLCDR
 Lieutenant GeneralLT GEN
 Lieutenant(Junior Grade) ...LT(JG)
 LifeboatLB
 Life floatLF
 Life jacketLJ
 Lifting eyeLE
 Lift-up doorLUD
 LightLT
 Light caseLC
 Light distribution boxLDB
 LighteningLTG
 Lightening holeLTG H
 LightingLTG
 Light lockLL
 Lightning arresterLA
 Lightproof louverLPL
 Lightproof shadeLPS
 Lightproof ventLPV
 Light tankLT TK
 Light trapLT
 Lightweight concreteLWC
 Lightweight insulating
 concreteLWIC
 LimberLIM
 LimestoneLS
 LimitLIM
 LimitedLTD
 LimiterLIM
 Limit switchLS
 LinearLIN
 Line-carryingLC

LinkLK
 LinoleumLINOL
 Linoleum baseLB
 Linoleum floorLF
 LintelLINTL
 LiquidLIQ
 Liquid HeliumLIQ-HE
 Liquid HydrogenLH2
 Liquid NitrogenLN2
 Liquid Oxygen (3)LOX
 LiterL
 Lithium (1)Li
 LithographLITHO
 LitterLIT
 Litter hookLH
 Live loadLL
 Load carrierLC
 LoadingLDG
 Load limiting resistorLLR
 Load water lineLWL
 Local, LocalizerLCL
 Local oscillatorLO
 LocateLOC
 LockedLKD
 Locked closedLC
 Locked openLO
 LockerLKR
 LockingLKG
 Lock pillarLPLR
 Lock washerLK WASH.
 LocomotiveLOCO.
 Locus of radiusL/R
 LogarithmLOG.
 Logarithm, naturalLN
 LongLG
 Longer onLONGN
 LongitudeLONG.
 LongitudinalLONG.
 Longitudinal expansion joint.LEJ
 Longitudinal position of
 center of buoyancyLCB
 Longitudinal position of
 center of floatationLCF
 Longitudinal position of
 center of gravityLCG
 Long leaf yellow pineLLYP
 Long range navigationLORAN.
 Long taperLG TPR
 Long wheelbaseLWB
 LookoutLKT
 LoudspeakerLS
 Louvered doorLVD
 LowL
 Low-alloy steelLAS
 Low altitude bombingLAB
 Low carbonLC
 LowerLWR
 Lower caseLC
 Lower deckLDK
 Lower sidebandLSB
 Lowest usable high
 frequencyLUHF
 Low explosiveLE

Continued

ABBREVIATIONS

Low frequencyLF
 Low-frequency oscillatorLFO
 Low passLP
 Low pointLP
 Low pressureLP
 Low speedLS
 Low tensionLT
 Low torqueLT
 Low voltageLV
 Low voltage protectionLVP
 Low voltage releaseLVR
 Low-water lineLWL
 LubricateLUB
 Lubricating oilLO
 Lubrication orderLO
 LumberLBR
 LumenL
 Lumens per wattLWP
 LuminousLUM
 LunetteLUN
 Lutecium (1)Lu

M

MachineMACH.
 Machine gunMG
 Machine rifleMR
 Machine screwMS
 Machine steelMS
 MagazineMAG
 Magazine flooding and
 sprinklingMF&S
 MagnafluxM
 MagnesiumMAG or Mg (1)
 MagnetMAG
 Magnetic amplifierMAG AMPL
 Magnetic modulatorMAG MOD
 Magnetic particle inspection..MPI
 MagnetoMAG
 Magnetomotive forceMMF
 MagnetostrictionM/S
 MagnetronMAG
 Mail boxMB
 Mail chutesMCH
 Mail trayMT
 MainMN
 Main "bang" suppressorMBS
 Main battery (guns)MB
 Main distributing frameMDF
 Main feedMF
 Main landing gearMLG

MaintenanceMAINT
 Maintenance and repairM&R
 Maintenance and supplyM&S
 Maintenance of close
 contactMCC
 Maintenance of true
 bearingMTB
 MajorMAJ
 Major GeneralMAJ GEN
 Male and femaleM&F
 MalleableMALL.
 Malleable ironMI
 ManeuveringMANUV
 Manganese (1)Mn
 ManholeMH
 ManifoldMANF
 Manila (in relation to rope) ..M
 Man overboard and
 breakdown lightMOB LT
 ManualMAN.
 Manual gain controlMGC
 Manual volume controlMVC
 ManufactureMFR
 ManufacturedMFD
 ManufacturingMFG
 MarbleMR
 Marble baseMRB
 Marble floorMRF
 Marble thresholdMRT
 MarchMAR.
 MarginMARG
 Marginal (relay)MG
 MarineMAR.
 MarkMK
 MarkerMKR
 MaskingMASK.
 MasonryMSNRY
 Masonry openingMO
 Mass (3)M
 MasterMA
 Master change recordMCR
 Master Dimension
 (Specification) (3)MD
 Master oscillatorMO
 Master oscillator power
 amplifierMOPA
 Master SergeantM SGT
 Master switchMS
 Masthead lightMHD LT
 Mast hull loopMHL
 MasticMSTC
 Mastic floorMF
 Mastic jointMJ
 Masurium (1)Ma
 MaterialMATL
 Mathematical, Mathematics ..MATH
 Matt-finish structural
 facing unitsMFSFU
 MaximumMAX
 Maximum design meterMD
 Maximum material
 conditionMMC

Maximum torqueMT
 Maximum usable frequency ..MUF
 Maximum working
 pressureMWP
 Maximum working
 voltageMWV
 Mean aerodynamic chordMAC
 Mean effective pressureMEP
 Mean higher high waterMHHW
 Mean high tideMHT
 Mean high waterMHW
 Mean horizontal candlepower .MHCP
 Mean lower low waterMLLW
 Mean low tideMLT
 Mean low waterMLW
 Mean sea levelMSL
 Mean spherical candlepower .MSCP
 Mean tideMT
 Mean width ratioMWR
 MeasureMEAS
 MechanicalMECH
 Mechanical time fuzeMTF
 Mechanical time, superquick..MTSQ
 MechanismMECH
 MechanizeMECZ
 Mechanized flame thrower ..MFT
 MedianMED
 MedicalMED
 Medical CorpsMC
 Medical DepartmentMD
 Medical Service CorpsMSC
 Medicine cabinetMC
 MediumMED
 Medium frequencyMF
 Medium high frequencyMHF
 Medium pressureMP
 Mega (10⁶)M
 Mega (10⁹)MEG
 MegacycleMC
 Megacycle per secondMCS
 MegawattMEGW
 Megawatt-hourMEGWH
 MegohmMEGO
 Melting pointMP
 MembraneMEMB
 Membrane waterproofingMWP
 MemorandumMEMO
 Mendeleevium (1)Mv
 MerchantableMERCH
 MercuryHG
 Mercury (hydrargyrum) (1) .Hg
 MeridianMER
 MetacenterM
 MetalMET.
 Metal anchorMA
 Metal anchor slotsMAS
 Metal awning-type window ..MATW
 Metal baseMETB
 Metal casement windowMCW
 Metal corner beadMCB
 Metal-covered doorMCD

Continued

ABBREVIATIONS

Metal curbMETC
 Metal doorMETD
 Metal flashingMETF
 Metal gravel stopMGS
 Metal grillMETG
 Metal jalousieMETJ
 Metal lath and plasterMLP
 Metallic (3)MET
 Metal moldMETM
 Metal partitionMETP
 Metal rolling doorMRD
 Metal roofMETR
 Metal splash panMSP
 Metal stripMETS
 Metal thresholdMT
 Metal thru-wall flashingMTWF
 Metallurgy (3)MET
 MeteorologicalMET.
 MeterM
 MeteringMTRG
 Meter kilogram secondMKS
 MezzanineMEZZ
 Micro (10^{-6})U or μ (4)
 MicroampereUA or μ A
 Microampere (peak)Ua or μ a
 MicrofaradUF or μ F
 MicrogramUG or μ G
 MicrohenryUH or μ H
 MicrohmUOHM or μ OHM
 MicromhoUMHO or μ MHO
 MicroinchUIN or μ IN.
 MicrometerMIC
 Micro micro (10^{-12})UU or $\mu\mu$ (4)
 MicromicrohenryUHH or $\mu\mu$ H
 MicromicrofaradUUF or $\mu\mu$ F
 MicromicronUU or $\mu\mu$
 MicrominuteUMIN or μ MIN
 Micron (.001 millimeter)U or μ
 MicrophoneMIKE
 MicrosecondUSEC or μ SEC
 MicrovoltUV or μ V
 Microvolt per meterUV/M or μ V/M
 MicrowattUW or μ W
 MiddleMID
 Middle landingMLD
 MidshipmanMIDN
 Mildew-resistant threadMRT
 MileMI
 Miles per gallonMPG
 Miles per hourMPH
 Miles per hour per secondMPHPS
 MilitaryMIL.
 Military Air Transport ServiceMATS

Military characteristicsMC
 Military characteristics equipmentMCE
 Military characteristics motor vehiclesMCM
 Military PoliceMP
 Military Police CorpsMPC
 Military StandardMS
 Milli (10^{-3})M
 MilliamperereMA
 MillibarMB
 MillifaradMF
 MilligramMG
 MillihenryMH
 MillilambertML
 MilliliterML
 MillimeterMM
 MillimicronMU or $M\mu$
 Million electron voltsMEV
 Million gallons per dayMGD
 Million voltsMEGV
 Milliroentgens per hourMR/HR
 MillisecondMS
 MillivoltMV
 MilliwattMW
 Mineral-surface roofMSR
 Minesweeping lightMS LT
 MiniatureMINAT
 MinimumMIN
 Minimum discernable signalMDS
 MinorMIN
 MinuteMIN
 MirrorMIR
 MiscellaneousMISC
 MissileMSL
 Miter endME.
 MixtureMIX.
 ModeM
 Model (for use in military nomenclature)M
 Model (for general use)MOD
 ModificationMOD
 Modification work orderMWO
 ModifyMOD
 Modulated continuous waveMCW
 ModulatorMOD
 MoldedMLD
 MoldingMLDG
 Mold lineML
 Molecular weightMOL WT
 MolybdenumMO
 Molybdenum (1)Mo
 Momentary contactMC
 MonitorMON
 Monochlorodifluoro- methaneF-22
 MonthMO
 MonumentMON
 Mop rackMOPR
 Morse taperMOR T
 Mortar motor carrierMMC
 MotorMOT

MotorboatMB
 Motor fieldMF
 Motor generatorMG
 MotorizedMTZ
 Motor transportMT
 Motor whale boatMWB
 MountMT
 MountedMTD
 MountingMTG
 Moving target indicatorMTI
 Multi gageMG
 MultimeterMULTR
 MultipleMULT
 Multiple gun motor carriageMGMC
 Multiple unitMU
 MultiplexMX
 MultipoleMP
 MultivibratorMVB
 MunitionsMUN
 Music wireMUW
 Mustard gasH
 Mutual inductanceMI
 Muzzle velocityMV

N

NacelleNAC
 NamelyVIZ
 NarrowNAR
 Narrow bandNB
 Narrow gageNG
 NationalNATL
 National Advisory Committee for AeronauticsNACA
 National Aeronautics and Space AdministrationNASA
 National Aerospace StandardsNAS
 National Aerospace Standards CommitteeNASC
 National Association of Corrosion EngineersNACE
 National Association of ManufacturersNAM
 National Board of Fire UnderwritersNBFU
 National Bureau of StandardsNBS
 National coarse (thread)NC
 National Conservation BureauNCB
 National Electrical CodeNEC
 National Electrical Code StandardsNECS

ABBREVIATIONS

National Electric Light AssociationNELA
National Electrical Manufacturers AssociationNEMA
National Electric Safety CodeNESC
National extra fine (thread)NEF
National fine (thread)NF
National Fire Protection AssociationNFPA
National form (thread)N
National gas outlet (thread)NGO
National GuardNG
National Hardwood Lumber AssociationNHLA
National Lumber Manufacturers AssociationNLMA
National Lumbermen's AssociationNLA
National Machine Tool Builder's AssociationNMTBA
National Petroleum AssociationNPA
National pipeNP
National Safety CouncilNSC
National special (thread)NS
National taper pipe (thread)NPT
Natrium (Sodium) (1)Na
NaturalNAT
NauticalNAUT
Nautical milesNMI
Naval BronzeNAV BRZ
Naval Aircraft FactoryNAF
Naval Air Materiel CommandNAMC
Naval Gun FactoryNGF
Naval ShipyardNAVSHIPYD
NavigateNAV
NavyNAV
Near faceNF
Near sideNS
NeckNK
NegativeNEG
Neodymium (1)Nd
Neon (1)Ne
NeptuniumNP or Np (1)
Net-laying lightNL LT
NetworkNET.
NeuropsychiatricNP
NeutralNEUT
NeutralizingNEUT
New British Standard (imperial wire gage)NBS

Next higher assemblyNHA
NickelNI or Ni (1)
Nickel steelNS
Niobium (was Columbium) (1)Nb
NippleNIP.
Nitrogen (1)N
Nitron (Radon) (1)Rn
NitrostarchNITROS
Nobelium (1)No
No bias (relay)NB
No Change (drawing) (3)NC
No connectionNC
No drawingND
NomenclatureNOM
NominalNOM
Noncommissioned officerNCO
Noncorrosive metalNCM
NonhygroscopicNH
NonmetallicNM
NonpropelledNP
Nonreactive (relay)NR
Nonreinforced concrete pipeNRCP
Nonslip treadNST
Non standardNON STD
NontightNT
NonwatertightNWT
NormalNORM.
Normal chargeN CHG
NormalizeNORM.
Normally closedNC
Normally openNO.
Normal temperature and pressureNTP
NorthN
North American Aviation (Inc.)NAA
Nose fuzeNF
Nose landing gearNLG
Not applicableNA
Not in contractNIC
Not to scaleNTS
NovemberNOV
No voltage releaseNVR
NozzleNOZ
NumberNO.
Nurse CorpsNC
Nut plateNTPL

O

ObjectOBJ
Obscure glassOGL
Obscure wire glassOWGL
ObservationOBS
Observation windowOBW
ObsoleteOBS
OctagonOCT

OctaneOCT
OctoberOCT
OdometerODOM
Offensive (ammunition)OFFEN
OfficeOFF.
Office of the Chief of EngineersOCE
Office of the Chief of OrdnanceOCO
Office of the Chief of TransportationOCT
Office of the Chief Signal OfficerOCSIGO
Office of the Inspector GeneralOIG
Office of the Quartermaster GeneralOQMG
Office of the Secretary of the ArmyOSA
Office of the Under Secretary of the ArmyOUSOFA
Officers Reserve CorpsORC
Ohm (for use only on diagrams) (4)Ω
Ohm-centimeterOHM CM
OhmmeterOHM.
Oil circuit breakerOCB
Oil nozzleO NOZ
OiltightOT
Olive drabOD
On centerOC
On vehicle equipmentOVE
Open-close-openOCO
Open hearthOH.
OpeningOPNG
Open-joistedOJ
OperateOPR
Operator's tableOPR T
OppositeOPP
OpticalOPT
OptimumOPT
Optimum working frequencyOWF
OptionalOPT
OrangeORN
OrdnanceORD
Ordnance CorpsORD CORPS
OrificeORF
Origin, OriginalORIG
Oscillate (3)OSC
OscillatorOSC
OscilloscopeOSCP
Osmium (1)Os
OunceOZ
Ounce-inchOZ IN.
OutboardOUTBD
Outer (3)OUT.

Continued

ABBREVIATIONS

Outer wingOW
 OutletOUT.
 OutputOUPT
 Outside diameterOD
 Outside faceOF.
 Outside mold lineOML
 Outside radiusOR.
 Outside screw and yokeOS&Y
 Outstanding legOSL
 Out to outO TO O
 Oval headOV HD
 OverOV
 Over-allOA
 Overall TestOAT.
 OverboardOVBD
 OverflowOVFL
 OverhaulOVHL
 OverheadOVHD
 OverloadOVL
 OverrideOVRD
 OversizeOS
 OverspeedOVSP
 Own doppler nullifierODN
 OxideOX.
 OxygenOXY or O(1)

P

PackPK
 PackagePKG
 PackingPKG
 PadlockPL
 PageP
 PaintedPTD
 Painted basePB
 Painted metalPMET
 Paints and oilP&O
 PairPR
 Palladium (1)Pd
 PanelPNL
 Panel pointPP
 Panic boltPAN B
 PanoramicPAN.
 Panting stringerPANT STRGR
 PantryPAN.

ParagraphPARA
 ParallelPAR.
 ParavanePARV
 PartPT
 Parting line
 (Castings & Forgings)PL

PartitionPTN
 Part numberPN
 Parts per millionPPM
 PartyPTY
 PassagePASS.
 PassengerPASS.
 Passing scuttlePS
 Passing windowPW
 PassivatePASS.
 PatentPAT.
 Patrol yachtQ
 PatternPATT
 Pay loadPLD
 Peacoat lockerP LKR
 Peak to peakPP
 PeckPK
 PedestalPED
 PenetratePEN.

Pentaerythryte tetranitrate ..PETN
 PentodePENT.
 Per (4)/
 Per centumPCT
 PercussionPERC
 PerforatePERF
 PeriscopePERIS
 PermanentPERM
 Permanent-magnet
 (speaker)PM
 PerpendicularPERP
 PersonnelPERS
 Personnel carrierPC
 Perspective (3)PERSP
 PetroleumPETRO
 PewterPWTR
 PharmacyPHAR
 PhasePH
 Phase meterPHM
 Phase modulationPM
 PhenolicPHEN
 Phillips headPHL H
 PhonographPHONO
 PhosgeneCG
 PhosphatePHOS
 Phosphor bronzePH BRZ
 PhosphorescentPHOS
 Phosphorus (1)P
 Photoelectric scannerPES
 PhotoflashPHOFL
 PhotographPHOTO
 PhysicalPHYS
 Pickled and oiledP&O
 Pick-upPU
 PiecePC
 Piece markPC MK
 Pierced aluminum plankPAP
 Pierced steel plankPSP
 Piezoelectric-crystal unit ...CU
 PilasterP
 PilingPLG

PillarPLR
 PilotPLT
 PintPT
 PintlePTL
 PioneerPION
 Pipe railPR
 Pipe sleeveP SL
 PitchP
 Pitch circlePC
 Pitch diameterPD
 Pitch markPMK
 Pivoted doorPD
 Pivoted windowPW
 Plain Washer (3)PW
 Plane (3)PL
 PlankPLK
 Plan position indicatorPPI
 Plan View (3)PV
 PlasterPLAS
 PlasticPLSTC
 PlatePL
 Plate (electron tube)P
 Plate glassPLGL
 PlatformPLATF
 PlatinumPLAT or Pt
 PlottingPLOT.
 Plow-steel ropePSR
 PlugPL
 Plug cockPC
 PlumbingPLMB
 Plumbing and deck drainPLMB &
 DKDR
 Plumbum (Lead) (1)Pb
 Plus or minus (2)±
 Plutonium (1)Pu
 PlywoodPLYWD
 PneumaticPNEU
 Pneumatic tubePT
 PointPT
 Point detonatingPD
 Point detonating fuzePDF
 Point detonating self-
 destroyingPDSD
 Point initiatingPI
 Point initiating,
 base detonatingPIBD
 Point insulatingPI
 Point of curvePC
 Point of frogPF
 Point of intersectionPI
 Point of switchPS
 Point of tangencyPT
 PolarityPO
 PolarizePOL
 PoleP
 PolishPOL
 Polonium (1)Po
 PolyphasePYPH
 PontoonPON
 PorcelainPORC
 PortablePORT.

ABBREVIATIONS

Portable flame thrower PFT
 Port and starboard P&S
 Port of embarkation POE
 Port side light PS LT
 Position POS
 Position indicator PIN.
 Positive POS
 Post exchange PX
 Post Forming P-FRM
 Post indicator valve PIV
 Post Office PO
 Posts and timbers P&T
 Potable water POT W
 Potassium (kalium) (1) K
 Potential POT.
 Potential difference PD
 Potentiometer POT.
 Pound LB
 Pounder PDR
 Pound-foot LB FT
 Pound-inch LB IN.
 Pounds per brake
 horsepower PBHP
 Pounds per capita per day ... PCD
 Pounds per cubic foot PCF
 Pounds per horsepower PHP
 Pounds per hour PHR
 Pounds per minute PM
 Pounds per square foot PSF
 Pounds per square inch PSI
 Pounds per square inch
 absolute PSIA
 Pounds per square inch
 gage PSIG
 Powder PWD
 Power PWR
 Power amplifier PA
 Power directional relay PDR
 Power factor PF
 Power factor meter PFM
 Power house PH
 Power-line carrier PLC
 Power oscillator PO
 Power plant PP
 Power supply PWR SUP
 Power take-off PTO
 Practice PRAC
 Praseodymium (1) Pr
 Preamplifier PREAMP
 Precast PRCST
 Precision approach radar ... PAR.
 Prefabricated PREFAB
 Preferred PFD
 Prefix PREF
 Preheater PHR
 Pre-knock pulse PKP
 Preliminary PRELIM
 Premolded PRMLD
 Premolded expansion joint ... PEJ

Prepare PREP
 Present PRES
 Pressed PRSD
 Pressed metal PRSD MET
 Pressure PRESS.
 Pressure-proof PP
 Pressure reducing valve PRV
 Primary PRIM.
 Prime (ing) PRM
 Prime mover P MVR
 Private automatic exchange .. PAX.
 Private branch exchange ... PBX
 Proactinium (1) Pa
 Process (3) PROC
 Procedure (3) PROC
 Procurement PROC.
 Product, Production PROD.
 Profile PF
 Project PROJ
 Projected window PW
 Projectile PROJ
 Projection PROJ
 Projector PROJ
 Promethium (was Illinium) (1) ... Pm
 Proof PRF
 Proof shot (projectile) PS
 Propelled PROP.
 Propeller PROP.
 Propeller horsepower PHP
 Propelling PROP.
 Property PROP.
 Proportional limit PL
 Proposed PROP.
 Propulsion PRPLN
 Protective PROT
 Protractor PROT
 Proving ground PG
 Provision PROV
 Provost Marshal General PMG
 Proximity (fuze) VT
 Public address PA
 Publication PUB.
 Pull and push plate P&PP
 Pull box PB
 Pull button PLB
 Pulley PUL.
 Pull switch PS
 Pulsating current PC
 Pulse-amplifier modulation ... PAM
 Pulse-amplitude modulation .. PAM
 Pulse-code modulation PCM
 Pulse-count modulation PCM
 Pulse-duration modulation ... PDM
 Pulse frequency PF
 Pulse per second PPS
 Pulse-position modulation PPM
 Pulse repetition frequency ... PRF
 Pulse-repetition rate PRR
 Pulse-repetition time PRT
 Pulse-time modulation PTM
 Pulse-width modulation PWM

Pulverizer PULV
 Purifier PUR
 Purple PR
 Push button PB
 Push-pull PP
 Pyrometer PYR
 Pyrotechnic PYRO

Q

Quadrangle QUAD.
 Quadrant QUAD.
 Quality QUAL
 Quantity QTY
 Quarry-tile base QTB
 Quarry-tile floor QTF
 Quarry-tile roof QTR
 Quart QT
 Quarter QTR
 Quarter-hard ¼ H
 Quartermaster QM
 Quartermaster Corps QMC
 Quartermaster General QMG
 Quarter-phase ¼ PH
 Quarter-round ¼ RD
 Quarters QTRS
 Quartz QTZ
 Quick-acting QA
 Quick disconnect Q DISC.
 Quick-firing QF
 Quick-opening device QOD
 Quire QR

R

Radar RDR
 Radar counter measure RCM
 Radar planning device RPD
 Radar transmitter RDR XMTR
 Radiator RAD
 Radio RAD
 Radio direction finding RDF
 Radio frequency RF
 Radio frequency choke RFC
 Radiographic inspection RAD I
 Radiological RADL
 Radiological defense RADDEF
 Radiological warfare RADWAR

Continued

ABBREVIATIONS

Radio Manufacturers Association RMA
 Radio operator RAD OPR
 Radium (1) Ra
 Radius R
 Radon (niton) (1) Rn
 Rail RL
 Railing RLG
 Railroad RR
 Railway RY
 Rainwater conductor RWC
 Raised RA.
 Range height indicator RHI
 Range light RA LT
 Range marks RM
 Range rate indicator RRI
 Rapid rectilinear RR
 Ratchet RTC
 Rate RT
 Rate of change RC
 Raw water RW

Reactive factor meter RFM
 Reactive,volt-ampere VAR
 Reactive volt-ampere meter RVA
 Reactor REAC
 Ready service RS
 Rear Admiral RADM
 Rear view RV
 Reassemble REASM
 Reaumur R
 Receive (3) RCV
 Received RECD
 Receiver RCVR
 Receptacle RECP
 Reception RECPT
 Reciprocating RECIP
 Recirculate RECIRC
 Recognition RECOG
 Recoil mechanism REC MECH
 Recommend RECM
 Reconnaissance RECON
 Recorder REC
 Recording demand meter RDM
 Recovery RECY
 Rectangle RECT
 Rectifier RECT
 Reduced charge R CHG
 Reducer RED.
 Reduction RED.
 Reduction of area RA
 Refer REF
 Reference REF
 Reference line REFL
 Reflectance REFL
 Reflective insulation RI
 Reflector REFL
 Refractory REFR
 Refrigerate REFR
 Refrigerated REFRD
 Refrigerator REFR

Regardless of feature size RFS
 Regenerative REGEN
 Register REG
 Regular REG
 Regulate, Regulator REG
 Reheater RHR
 Reid vapor pressure RVP
 Reinforce REINF
 Reinforced concrete RC
 Reinforced concrete
 culvert pipe RCCP
 Reinforced concrete pipe RCP
 Reinforced tile lintel RTL
 Reinforcing steel RST
 Relative humidity RH
 Relay REL
 Release REL
 Relief REL
 Relief valve RV
 Relocated RELOC
 Remote RMTE
 Remote control system RCS
 Removable REM
 Remove REM
 Repair REP
 Repeat REP
 Repeater REP
 Repellent (3) REP
 Replace REPL
 Request REQ
 Require REQ
 Required REQD
 Requirement REQ
 Requisition REQ
 Rescue RSQ
 Rescue equipment locker REL
 Research RES
 Research and Development R&D
 Reserve RES
 Reserve feed water RFW
 Reserve Officer's Training
 Corps ROTC
 Reservoir RSVR
 Residual RESID
 Residual field RESFLD
 Resistance RES
 Resistance capacitance RC
 Resistance-capacitance
 coupled R C CPLD
 Resistance inductance
 (circuit) RL
 Resistor RES
 Resolver RSVR
 Retain RET
 Retainer RET
 Retard RET
 Reticulated grating RG.
 Retracting (3) RETRG
 Retractable RETR
 Return RET
 Reverberation control
 of gain RCG

Reverse REV
 Reverse-current REV CUR.
 Revise REV
 Revision REV
 Revolution REV
 Revolutions per minute RPM
 Revolutions per second RPS
 Rhenium (1) Re
 Rheostat RHEO
 Rhodium (1) Rh
 Ribbed RIB.
 Right R
 Right hand RH
 Right hand drive RH DR
 Right of way R/W
 Ring R
 Riser R
 Rivet RIV
 Road RD
 Rocker RKR
 Rocket RKT
 Rocket assist take-off RATO
 Rocket launcher RL
 Rocket target RT
 Rockwell "C" Hardness (3) RC
 Rockwell hardness RH
 Rolled RLD
 Rolling steel door RSD
 Roll roofing RR
 Roof drain RD
 Roofing RFG
 Roof leader RL
 Room RM
 Root Diameter (3) RD
 Root mean square RMS
 Root-sum square RSS
 Rotary ROT.
 Rotating passing scuttle RPS
 Rotate ROT.
 Rough RGH
 Rough opening RO
 Round RD
 Roundhead RH
 Rounds per minute RDS/M
 Rubber RUB.
 Rubber base RB

Rubber insulation RI
 Rubber-tile floor RTF
 Rubble stone RS
 Rubidium (1) Rb
 Rudder RUD
 Running, signal and
 anchor lights RSALT
 Runway RWY
 Russet RUSS
 Ruthenium (1) Ru

S

SaddleSDL
 Safe lockerSL
 SafetySAF
 Safe working pressureSWP
 Sail areaSA
 Salinity indicatorSI
 Salt-glazed structural
 facing unitsSGSFU
 Salt-glazed structural
 unit baseSGSUB
 Salt waterSW
 SalutingSAL
 SalvageSALV
 SamariumSM
 Samarium (1)Sm
 SamplingSAMP
 Sand blastSD BL
 Sand-loadedSL
 Sandwich (3)SAN
 SanitarySAN
 Saturable reactorSR
 SaturateSAT.
 Saybolt seconds furoilSSF
 Saybolt seconds universalSSU
 Scandium (1)Sc
 ScavengeSCAV
 ScheduleSCH
 SchematicSCHEM
 ScleroscopeSCLER
 Scleroscope hardnessSH
 ScooterSCTR
 ScreenSCRN
 Screen doorSCD
 Screening smoke (mixture)HC
 ScrewSCR
 ScupperSCUP
 ScuttleS
 Sea floodSF
 Sea levelSL
 Sea loading pipe lineSLPL
 SeamlessSMLS
 Seamless steel tubingSSTU
 SearchSRCH
 SearchlightSLT
 SecantSEC
 SecondSEC
 Second (combining form)S
 SecondarySEC
 Second Lieutenant2ND LT
 Secretary bureauSEC BU
 Secretary of the Air ForceSAF
 Secretary of the ArmySA
 Secretary of the NavySECNAV
 SectionSECT.
 Sector scan indicatorSSI

ABBREVIATIONS

Security guard windowSGW
 Security Intelligence CorpsSIC
 Security window screen
 and guardSWSG
 SedanSED
 SegmentSEG
 SelectSEL
 Selective ringingSR
 SelectorSEL
 Selenium (1)Se
 Self-closingSELF CL
 Self-propelledSELF PROP
 Self-destroyingSD
 SelsynSELS
 Semi-armor-piercingSAP.
 SemifinishedSF
 SemifireproofS FPRF
 SemifixedSFXD
 SemitrailerSTLR
 SeniorSR
 Sensitivity time controlSTC
 SeparateSEP
 SeptemberSEP
 SequenceSEQ
 SerialSER
 Serial NumberSER-NO.
 SeriesSER
 Series relaySRE
 SerrateSERR
 ServiceSERV
 Service fuel oilSFO
 Service sinkSS
 ServoSVO
 ServomechanismSERVO
 Set screwSS
 SettlingSET.
 Seven-conductor7/C
 SewageSEW.
 SewerSEW.
 SewingSEW.
 ShackleSH
 Shaft alleySA
 Shaft horsepowerSHP
 ShankSHK
 Shape (3)SHP
 Shaped chargeSC
 Shear plateSP
 SheathingSHTHG
 SheetSH
 ShellSHL
 Shell destroyingSD
 ShieldSHLD
 ShipfitterSFTR
 ShipmentSHPT
 Ship serviceSS
 Shock absorberSH ABS
 Shop orderSO.
 Shore connectionSH CON.
 Shore terminal boxSTB
 Short circuitSHORT.
 Short leaf yellow pineSLYP

Short taperS TPR
 Short time constantSTC
 Short waveSW
 Short wheel baseSWB
 ShoulderSHLD
 ShowerSH
 Shower and toiletSH&T
 Shower drainSD
 ShrapnelSHRAP
 Shut-off valveSOV
 ShutterSHTR
 Side lightSI LT
 Side water depthSWD
 SidingSDG
 SignalSIG
 Signal and homing lightS&H LT
 Signal CorpsSIGC
 Signal light bareSLB
 Signal-to-noise ratioS/N
 Silico-manganese steelSMS
 Silicon (3)SI
 Silicon (1)Si
 SilverSIL
 Silver (argentum) (1)Ag
 Silver solderSILS
 SimilarSIM
 SineSIN.
 Sine of the amplitudeSN
 SingleS
 Single conductor1/C
 Single contactSC
 Single endSE
 Single feederSF
 Single groove (insulators)SG
 Single groove, single
 petticoat (insulators)SGSP
 Single phase1PH
 Single poleSP
 Single-pole, double throwSPDT
 Single-pole, single throwSPST
 Single Sideband (3)SSB
 Single sideboardSSB
 Single signalSS

Single throwST
 Single tireST
 Single weightSW
 SinkSK
 Sintered (3)SIN.
 SketchSK
 SkylightSLT
 SlateSL
 Slate-shingle roofSSR
 SleeveSLV
 SlideSL
 Sliding doorSLD

Continued

ABBREVIATIONS

Sliding expansion jointSEJ
 Slip jointSJ
 SlopeS
 Slop sinkSS
 SlottedSLOT.
 SlowdownSLD
 Slow operate (relay)SO.
 Slow releaseSR
 SmallSM
 Small armsSA
 SmokeSMK
 Smoke generatorSMK GEN
 SmokelessSMKLS
 Smokeless powderSP
 Smoke standSS
 Smooth contourSC
 Smooth-face structural
 clay tileSFSCT
 Smooth-surface built-up
 roofSSBR
 Society for Advancement
 of ManagementSAM
 Society of American
 Military EngineersSAME
 Society of Automotive
 EngineersSAE
 Society of Fire
 EngineersSFE
 Society of Industrial
 EngineersSIE
 Society of Naval Architects
 and Marine EngineersSNA&ME
 Society of Tractor
 EngineersSTE
 SocketSOC
 Socket headSCH
 Sodium (natrium) (1)Na
 Soft (combining)S
 Soil pipeSP
 Soil stackSSK
 SolenoidSOL
 Solid bodySB
 Solid height.....SOL HGT
 Solid neutralSN
 Solution (3)SOL
 Sonar nacelle (sonacelle)SONAC
 SonobuoySONO
 Soot blowerSB
 SoundSND
 Sounding machineSMACH
 Sounding tubeST
 Sound rangingSR
 SouthS
 Southern Pine AssociationSPA
 SpaceSP
 Space heaterSPH
 SpacerSPR
 SpannerSPNR
 SpareSP
 Spare partSP

SparkSP
 SpeakerSPKR
 SpecialSPL
 Special common (projectile).....SPC
 Special equipmentSE
 Special projectileSP
 Special purposeSP
 Special regulationsSR
 Special ServicesSPS
 Special treatment steelSTS
 SpecificSP
 SpecificationSPEC
 Specification Control
 DrawingSPEC CONT DWG
 Specific fuel consumptionSFC
 Specific gravitySP GR
 Specific heatSP HT
 SpecimenSPEC
 Spectrum analyzerSA
 Speed lightSP LT
 SpeedometerSPEEDO
 SphericalSPHER
 Spherical candlepowerSCP
 SpindleSPDL
 Spin-stabilized (rockets)SS
 Splash blockSB
 SplashproofSP
 Split ringSR
 Spot faceSF
 Spot weldSW
 Sprayed acoustical ceilingSAC
 SpraytightSPT
 SpringSPG
 SprinklerSPR
 SquadronSQ, SQDN,
 or SQN
 SquareSQ
 Square centimeterSQ CM
 Square footSQ FT
 Square inchSQ IN.
 Square kilometerSQ KM
 Square root of mean square....RMS
 Stabilized local oscillatorSTALO
 StabilizerSTAB.
 Staggered (3)STAGG
 Stainless steelSST
 StairwaySTWY
 Stake and platformS&P
 StanchionSTAN
 StandardSTD
 Standard nomenclature list....SNL
 StandbySTBY
 Standing wave ratio
 (voltage)SWR
 StandpipeSP
 Stannum (Tin) (1)Sn
 StarboardSTBD
 Starboard side lightSS LT
 StateroomSR
 Static pressureSP
 StationSTA

StationarySTA
 Station keeping lightsSK LT
 Statuary bronzeST BRZ
 SteamST
 SteelSTL
 Steel basement windowSBW
 SteeringSTEER.
 Steering lightSTG LT
 SterilizerSTER
 Stern lightST LT
 Stibium (Antimony) (1).....Sb
 StiffenerSTIFF.
 StirrupSTIR.
 StockSTK
 StoneSTN
 StorageSTOR
 StoreST
 Storm waterST W
 Stove boltSB
 Stove rodS ROD.
 StowageSTOW.
 StraightSTR
 Straight line wave lengthSLW
 Straight shankSS
 StrainerSTR
 StrakeSTK
 StrandedSTRD
 StrategicSTRAT
 StratosphereSTRATO
 StreamSTR
 StreetST
 StrengthSTR
 StringerSTGR
 Strip, -ingSTR
 Strontium (1)Sr
 StructuralSTR
 Structural carbon steel
 hardSCSH
 Structural carbon steel
 mediumSCSM
 Structural carbon steel
 softSCSS
 Structural clay tileSCT
 Structural glassSG
 StructureSTRUCT
 Stuffing boxSB
 Sub-Assembly.SUB-ASSY
 SubcaliberSUBCAL
 SubjectSUBJ
 SubmarineSUB.
 Submarine mine depotSMD
 SubmergedSUB.
 SubmersibleSBM
 SubsequentSUBS
 Subsoil drainSSD
 SubstituteSUB.
 SubstructureSUBSTR
 Sub-systemSUB-SYS

ABBREVIATIONS

SuctionSUCT
 SuffixSUFF
 Sulfur (1)S
 Sulfur trioxide chlor-
 sulfonic acidFS
 SuperchargeS CHG
 SuperheaterSUPHTR
 Super-high frequencySHF
 Superimposed currentSC
 SuperquickSQ
 SupersededSUPSD
 SupersensitiveSS
 SuperstructureSUPRSTR
 Supervisor of
 ShipbuildingSUPSHIP
 SupplementSUPPL
 SupplySUP.
 Supply CorpsSC
 SupportSPT
 SuppressionSUPPR
 SurfaceSURF.
 Surfaced or dressed
 four sidesS4S
 Surfaced or dressed
 one sideS1S
 Surfaced or dressed
 one side and one edgeS1S1E
 Surfaced or dressed
 two edgesS2E
 Surfaced or dressed
 two sidesS2S
 Surface-to-air missileSAM
 Surface-to-surface missileSSM
 Surface-to-underwater
 missileSUM.
 Surgeon GeneralSG
 SurgicalSURG
 SurveySURV
 SuspendSUSP
 Suspended acoustical-
 plaster ceilingSAPC
 Suspended acoustical-
 tile ceilingSATC
 Suspended plaster ceilingSPC
 Suspended sprayed
 acoustical ceilingSSAC
 Swamp gliderSG
 Swash (used with other
 words or abbreviations) ...SW
 Sweep integratorSW INTGR
 SwingSWG
 SwitchSW
 Switchband wound (relay) ..SW
 SwitchboardSWBD
 SwitchgearSWGR
 Switch railsSWR
 Switch standSWS
 Switch tiesSWT

SwivelSWV
 SymbolSYM
 SymmetricalSYM
 Synchronize, Synchronizer
 SynchronizingSYNC
 Synchronizing lampsSYN LP
 SynchronousSYN
 SynchroscopeSYNSCP
 SyntheticSYN
 SystemSYS

T

Tables of equipmentT/E
 Tables of organizationT/O
 Tables of organization
 and equipmentT/O&E
 TabulateTAB.
 TachometerTACH
 TacticalTAC
 Tactical range recorderTRR
 Tail gateTGT
 Tail gearTG
 Tail landing gearTLG
 Tail windTW
 TandemTDM
 TangentTAN.
 TankTK
 Tank destroyerTD
 TankerTKR
 Tantalum (1)Ta
 Taper shankTS
 TappingTAP.
 TargetTGT
 Target doppler nullifierTDN
 Target identificationTI.
 Target practiceTP
 Target practice with tracer ..TP T
 TarpaulinTARP
 TaxiwayTWY
 T-bar (structural shape) ...T
 Technetium (1)Tc
 TechnicalTECH
 Technical ammunitionTAM
 Technical bulletinTB
 Technical circularTC
 Technical manualTM
 Technical noteTN
 Technical orderT O
 TeeT
 TeethT
 TelegraphTLG
 TelemeterTLM
 TelephoneTEL

Telephone boothTELB
 TeleprinterTPR
 TelescopeTEL
 Teletype (3)TTY
 TeletypewriterTTY
 Teletypewriter exchangeTWX
 TelevisionTV
 Tellurium (1)Te
 Temper, -ingTEMP
 TemperatureTEMP
 Temperature meterTM
 Temperature switchTS
 TemperedTEMP
 Tempered waterTW
 TemplateTEMP
 TemporaryTEMPO.
 Temporary construction hole..TCH
 Tennessee Valley Authority ..TVA
 Tensile strengthTS
 TensionTENS
 TentativeTENT.
 Terbium (1)Tb
 TerminalTERM.
 TerneplateTRPL
 Terra cottaTC
 Terrain-clearance indicator ..TCI
 TerrazzoTER
 Terrazzo baseTERB
 TertiaryTER
 Test linkTL
 Test switchTSW
 TetrachlorideTET
 Thallium (1)TI
 The Adjutant GeneralTAG
 The Assistant Secretary
 of the ArmyTASA
 TheoreticalTHEO
 Theoretical point of frogTPF
 ThermalTHRM
 ThermistorTMTR
 ThermocoupleTC
 ThermoidTH
 ThermometerTHERM.
 Thermosetting (3)TMOS
 ThermostatTHERMO
 ThickTHK
 Thorium (1)Th
 Thousand circular milsMCM
 ThreadTHD
 Threads per inchTPI
 Three-conductor3/C
 Three-phase3PH
 Three-pole3P
 Three-way3 WAY
 ThrottleTHROT
 ThroughTHRU
 Thrust horsepowerTHP
 Thrust lineTL
 Thulium (1)Tm
 Tie plateTP
 Tile baseTB

Continued

ABBREVIATIONS

Tile drain.....TD
Tile floor.....TF
Tile-shingle roof.....TSR
Tile threshold.....TT
Tile wainscot.....TW
Timber.....TMBR
Time.....T
Time and super quick.....TSQ
Time closing.....TC
Time delay.....TD
Time division multiplex.....TDM
Time meter.....TIM
Time opening.....TO
Timer.....T

Time variation of gain.....TV
Tin (stannum) (1).....Sn
Titanium.....Ti or Ti (1)
Titanium chloride.....TM
Titanium tetrachloride.....FM
Title block.....T/B
Tobin bronze.....TOB BRZ
Toboggan.....TOB
Toggle.....TGL
Toilet case.....TC
Toilet-paper holder.....TH
Tolerance.....TOL
Ton.....T
Tongue and groove.....T&G
Tongueless.....TGLS

Tool steel.....TS
Toothed ring.....TR
Top and bottom.....T&B
Top and bottom bolt.....T&BB
Top chord.....TC
Top of frame.....T/FR
Torpedo.....TORP
Torpedo group.....TG
Torpedo part of beam.....TP
Torque.....TOR
Total dynamic head.....TDH
Total indicator reading.....TIR
Total load.....TL
Total trim.....T
Towel rack or rod.....TR
Tower.....TWR
Towing light.....TO LT

Tracer.....TCR
Track.....TCK
Tractor (3).....TR
Trailer.....TLR
Trailing.....TRG
Trailing edge.....TE
Train.....TN
Trainer.....TNR
Trailing.....TNG
Trajectory.....TRAJ
Transceiver.....XCVR
Transfer.....TRANS
Transformer.....XMFR

Transistor.....TSTR
Transmission.....XMSN
Transmit.....XMIT
Transmit-receive.....TR
Transmittance.....TRANS
Transmitter.....XMTR
Transmitter receiver.....TR
Transmitting.....XMTG
Transom.....TR

Transportation.....TRANS
Transportation Corps.....TC
Transport vehicle.....TV
Transposition.....TPSN
Transverse.....TRANSV
Transverse electric.....TE
Transverse electromagnetic.....TEM
Transverse expansion joint.....TEJ
Transverse magnetic.....TM
Traveling wave.....TW
Traversing.....TRAV
Tread.....TRD
Tread (stair details).....T

Treated hard-pressed
fiberboard.....THPFB
Treatment.....TREAT.
Trichloromonofluoro-
methane.....F-11
Trigger.....TRIG.
Trinitrotoluene.....TNT
Triode.....TRI
Trip coil.....TC

Triple pole.....3P
Triple throw.....3T
Tritium (Hydrogen
isotope H³) (1).....T
Truck.....TRK
True airspeed.....TAS
True position.....TP
True profile.....TP
Trunk.....TRK

Trunnion.....TRUN
Tubing.....TUB.
Tune-controlled gain.....TCG
Tuned plate tuned grid.....TPTG
Tuned radio frequency.....TRF
Tungsten.....TUNG
Tungsten (wolframium) (1).....W
Tuning.....TUN.
Turbine.....TURB
Turbine-driven.....TD
Turbine generator (driver).....TURBO GEN
Turbo alternator.....TURBO ALT
Turbo-jet propulsion.....TJP
Turnbuckle.....TRNBKL
Turned.....TND
Turning light.....TRN LT
Turnout.....TO.
Turret.....TUR
Twin sideband.....TSB

Twisted.....TW
Two-conductor.....2/C
Two-phase.....2PH
Two-way.....2 WAY
Type (3).....TP
Type model series.....TMS
Typewriter.....TW
Typical.....TYP

U

Ultimate.....ULT
Ultra-high frequency.....UHF
Ultraviolet.....UV
Ultra-violet floodlight.....UVF LT
Unbleached muslin.....U MUS
Under.....UND
Undercurrent.....UNC
Underground.....UG
Under Secretary of the
Air Force.....US OF AF
Under Secretary of the
Army.....US OF A
Under Secretary of the
Navy.....UNDER-
SECNAV
Undersize.....US.
Under voltage.....UV
Underwater.....UNDW
Underwater battery.....UB
Underwater object locator.....UOL
Underwater-to-air missile.....UAM
Underwater-to-surface
missile.....USM
Underwriters'
Laboratories, Inc.....ULI
Unfinished.....UNFIN
Unfuzed.....UNF
Unglazed ceramic mosaic
tile.....UCMT
Unglazed structural
facing units.....USFU
Unglazed structural
unit base.....USUB
Unified.....UN
Unified coarse thread.....UNC
Unified extra fine thread.....UNEF
Unified fine thread.....UNF
Unified special thread.....UNS
Uniformity coefficient.....UNIF COEF
Unit cooler.....UC
United States.....US
United States Air Force.....USAF
United States Army.....USA

ABBREVIATIONS

United States Coast and
Geodetic SurveyUSC & GS
United States Coast Guard ...USCG
United States gageUSG
United States Geological
SurveyUSGS
United States Marine Corps..USMC
United States NavyUSN
United States
PharmacopoeiaUSP
United States
Public Health ServiceUSPHS
United States standardUSS
United States
Weather BureauUSWB
Unit heaterUH
UniversalUNIV
Unsatisfactory reportUR
Untreated hard-pressed
fiberboardUHPFB
Ultimate Tensile Stress (3) ... UTS
UpperUP.
Upper sidebandUSB
Uranium (1)U
UrinalUR
Used withU/W
UtilityUT

V

VacuumVAC
Vacuum tubeVT
Vacuum tube voltmeterVTVM
ValveV
Valve boxVB
Vanadium (1)V
VandykeVD
VaporproofVAP PRF
Vapor sealVS
Var-hour meterVRH
VariableVAR
Variable frequency oscillator..VFO
VarmeterVARM
VarnishVARN

Vault doorVD
VegetableVEG
VehicleVEH
VelocityV
Vent holeVH
VentilateVENT.

Ventilating deadlightVD.
VentilatorVENT.
Vent pipeVP
Vent stackVS
VernierVER
Versed sineVERS
VersusVS
VertexVTX
VerticalVERT
Vertical center lineVCL
Vertical ladderVL
Vertical location of the
center of buoyancyVCB
Vertical location of the
center of gravityVCG
Vertical reference lineVRL
Vertical volute spring
suspensionVVSS
Very-high frequencyVHF
Very-high frequency omni-
directional radio rangeVOR
Very long rangeVLR
Very low altitudeVLA
Very-low frequencyVLF
VestibuleVEST.
Vestigial sidebandVSB
Veterans AdministrationVA
Veterinary CorpsVC
Vibrate, VibrationVIB
Vice AdmiralVADM
Vickers hardnessVH
VideoVID
Video frequencyVDF
VioletVIO
ViscosityVISC
VisualVIS
Visual-aural radio rangeVAR
Visual flight rulesVFR
VitreousVIT
Vitrified clayVC
Vitrified clay tileVCT
VoiceVO
Voice frequencyVF
Voice tubeVT
VoidVD
VoltV
Voltage control transferVCT
Voltage regulatorVR
Voltage relayVR
VoltammeterVAM
Volt ampereVA
Volt-ampere reactiveVAR
VoltmeterVM
Volt ohm milliammeterVOM
Volt per meterV/M
Volt per milV/MIL
VolumeVOL
Volume of compartmentVC
Volume unitVU
VulcanizeVUL

W

WaferWAF
WagonWAG.
Wagon boxWB
WainscotWA
Wake lightWALT
Wall boardWLB
Wall hydrantWH
Wall ventWV
WaniganWAN.
WardrobeWRB
Ward roomWR
WarehouseWHSE
WarheadWARHD
Warrant OfficerWO
Wash bucketWB
WasherWASH.
Wash fountainWF
WashroomWR
WasteW
Waste pipeWP
Waste stackWS
Water closetWC
WatercooledWCLD
WatercoolerWCR
Water lineWL
Water meterWM
WaterproofWP
WaterproofingWPG
Water surfaceWS
WatertightWT
WattW
Watt-hourWHR
Watt-hour meterWHM
WattmeterWM
Watts per candleWPC
WaveguideWG
Weakened plane jointWPJ
WeaponWPN
Weapon carrierWC

Weather sealWSL
WeatherstrippingWS
Weather-tightWEA T
WebbingWEB.
WeekWK
Week second feetWSF
WeightWT
Weld (3)WLD
WestW
Wet bulbWB
Wetted surfaceWS
Whale boatWB
WheelWHL
WheelbaseWB
WhiteWHT
White phosphorusWP

Continued

ABBREVIATIONS

Wide, WidthW
 Wide bandWB
 WinchWN
 Wind loadWL
 Window dimensionWD
 Window guardWG
 Window unitWU
 WindshieldWSHLD
 WingWG
 Wing chord planeWCP
 Wing reference lineWRL
 WinterizeWTRZ
 Wire (abbreviate only in con-
 junction with other mate-
 rials)W

 Wire glassWGL
 Wire meshWM
 Wire ropeWR
 Wire wayWW
 Wire-woundWW
 With (abbreviate only in con-
 junction with other abbrevi-
 ations)W/
 WithdrawnW/D
 WithoutW/O
 Wolfram (Tungston) (1)W
 Women's Army CorpsWAC
 Women's Medical Specialist
 CorpsWMSC
 WoodWD
 Wood awning-type window ..WATW
 Wood baseWB
 Wood block floorWBF
 Wood blockingWBL
 Wood casement windowWCW
 Wood doorWD
 Wood door and frameWDF
 Wood furring stripsWFS
 Wood jalousieWJ
 Wood panelWDP

WoodruffWDF
 Wood-shingle roofWSR
 Wood thresholdWT
 Work benchWB
 Working circleWC
 Working pointWP
 Working pressureWP
 Working steam pressureWSP
 WorkshopWKS
 Workshop assembly
 (torpedo)WA
 Workshop unit (torpedo)WU
 WreckerWKR
 WreckingWRK
 Wrought brassW BRS
 Wrought ironWI

X

Xenon (1)Xe

Y

YardYD
 YearYR
 YellowYEL
 Yield point (psi)YP
 Yield strength (psi)YS
 Ytterbium (1)Yb
 Yttrium (1)Yt

Z

ZeeZ
 Zinc (1)Zn
 Zirconium (1).....Zr
 ZoneZ
 Zone of InteriorZI

ABBREVIATIONS-REVISIONS BLOCK

1. LIMITED APPLICATION

1.1 The terms and abbreviations listed in this subject are used in the Revisions block on Engineering drawings. They may also be used on Engineering Orders and documents other than Engineering drawings, as desired. They may not be used in any area outside the Revisions block on Engineering drawings unless identified by a General Note or unless specific application is indicated in the DRM.

1.2 Abbreviations listed in Subject 7711 may also be used in the Revisions block area.

1.3 The following rules apply to the abbreviations given:

- A. Only the combinations shown shall be used.
- B. Upper case letters only shall be used.
- C. Do not use if meaning is not clear in text.
- D. Applicable word endings and singular and plural forms are covered by the same abbreviation.

Application (Usage) Data Block	U/B
Engineering Order	EO
Face of Drawing	F/D
Field of Drawing	F/D
General Note	G/N
Heat Treat (-ed, -ing, -ment)	H/T
Identification & Traceability	I&T
List of Material	L/M
Master Change Record	MCR
Next Assembly (Next Using Drawing)	N/A
No Change (drawing)	NC
Quantity	QTY
Request for Drawing Change	RDC
Required	REQD
Requirement	REQ
Serial Block	S/B
Service Note	S/N
Tabulation (-ed) Block	TA/B
Title Block	T/B
Usage Block	U/B

DRILL SIZES

SIZE	DECIMAL EQUIV.	SIZE	DECIMAL EQUIV.	SIZE	DECIMAL EQUIV.	SIZE	DECIMAL EQUIV.
1/2	.5000	G	.2610	23	.1540	1/16	.0625
31/64	.4844	F	.2570	24	.1520	53	.0595
15/32	.4687	E 1/4	.2500	25	.1495	54	.055
29/64	.4531	D	.2460	26	.1470	55	.0520
7/16	.4375	C	.2420	27	.1440	3/64	.0469
27/64	.4219	B	.2380	9/64	.1406	56	.0465
Z	.4130	15/64	.2344	28	.1405	57	.0430
13/32	.4062	A	.2340	29	.1360	58	.0420
Y	.4040	1	.2280	30	.1285	59	.0410
X	.3970	2	.2210	1/8	.1250	60	.0400
25/64	.3903	7/32	.2187	31	.1200	61	.0390
W	.3860	3	.2130	32	.1160	62	.0380
V	.3770	4	.2090	33	.1130	63	.0370
3/8	.3750	5	.2055	34	.1110	64	.0360
U	.3680	6	.2040	35	.1100	65	.0350
23/64	.3594	13/64	.2031	7/64	.1094	66	.0330
T	.3580	7	.2010	36	.1065	67	.0320
S	.3480	8	.1990	37	.1040	1/32	.0313
11/32	.3437	9	.1960	38	.1015	68	.0310
R	.3390	10	.1935	39	.0995	69	.0292
Q	.3320	11	.1910	40	.0980	70	.0280
21/64	.3281	12	.1890	41	.0960	71	.0260
P	.3230	3/16	.1875	3/32	.0937	72	.0250
O	.3160	13	.1850	42	.0935	73	.0240
5/16	.3125	14	.1820	43	.0890	74	.0225
N	.3020	15	.1800	44	.0860	75	.0210
19/64	.2969	16	.1770	45	.0820	76	.0200
M	.2950	17	.1730	46	.0810	77	.0180
L	.2900	11/64	.1719	47	.0785	78	.0160
9/32	.2812	18	.1695	5/64	.0781	1/64	.0156
K	.2810	19	.1660	48	.0760	79	.0145
J	.2770	20	.1610	49	.0730	80	.0135
I	.2720	21	.1590	50	.0700		
H	.2660	22	.1570	51	.0670		
17/64	.2656	5/32	.1562	52	.0635		

DECIMAL EQUIVALENT CHART

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$\frac{15}{16}$.9375
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