AMERICAN NATIONAL STANDARD

Spade Drill Blades and Spade Drill Holders

ANSI B94.49 - 1975

SECRETARIAT

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

PUBLISHED BY

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

United Engineering Center 345 East 47th Street New York, N. Y. 10017

FOREWORD

Flat type drills have been used to produce holes since the dawn of recorded history. In recent times a flat drill commonly called a spade drill, has been used for producing larger size holes. Generally above 26mm diameter.

The type of spade drill presently in use was first introduced commercially in 1945 and was called a "Z" type. In 1947 a three hole blade, called "X" type, and a single bolt hole, called "Y" type, spade drills were introduced. During 1948 a second concern introduced a two bolt hole design along with a single bolt hole design that was not completely compatible with the other single hole blade.

This situation did not create a problem as long as there were very few producers of spade drills. During the next two decades the use of spade drills increased along with the number of suppliers. A Department of Commerece report in 1965 stated that there were 42 suppliers of spade drills. There was much confusion among users regarding interchangeability between the different types and between the same types of spade drill blades and holders from the various suppliers.

Technical Committee 18 was established during the 1970 Annual Meeting of the American National Standards Institute Committee B94 to develop an American Standard for Spade Drill Blades and Spade Drill Holders. The first meeting of TC-18 was held in April 1971. Because the two hole, three hole, "Z", and other types of spade drills were not universally used it was decided that only the single bolt hole spade drill blade and holder would be considered for this standard.

The draft of the completed standard for Spade Drill Blades and Spade Drill Holders was submitted to the Secretariat, The American Society of Mechanical Engineers, for review in June 1974.

This document was adopted as an American National Standard on September 10, 1975.

Intentionally left blank

AMERICAN NATIONAL STANDARDS COMMITTEE B94
Standardization of Cutting Tools, Holders, Drivers and Bushings

OFFICERS

Harry McLinden, *Chairman*

A.H. Mezey, *Vice-Chairman* Kurt Wessely, *Secretary*

AMERICAN GEAR MANUFACTURERS ASSOCIATION, THE
P.M. Dean, Jr., Mechanical Technology, Inc., Latham, New York
G.L. Scott, Alternate, American Gear Mfrs. Assn., Washington, D.C.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS, THE
M.E. Merchant, Cincinnati Milacron, Inc., Cincinnati, Ohio
G.M. Monacelli, General Electric Co., Detroit, Michigan
C.J. Oxford, Jr., National Twist Drill & Tool Co., Rochester, Michigan
G.F. Wilson, Alternate, Consultant, Wheeling, Illinois

CEMENTED CARBIDE PRODUCERS ASSOCIATION
W.E. Montgomery, Firth Sterling, Inc., McKeesport, Pennsylvania
A.P. Wherry, Alternate, Cemented Carbide Producers Assn., Cleveland, Ohio

GENERAL SERVICES ADMINISTRATION
W.R. Wacker, General Services Administration, Washington, D.C.

HACK & BAND-SAW MANUFACTURERS ASSN. OF AMERICA
Richard Schrade, Clemson Bros., Inc., Middletown, New York
J.E. Bates, Alternate, Hack & Band Saw Manufacturers Association, Mt. Prospect, Illinois

METAL CUTTING TOOL INSTITUTE
W.A. Wagner, Cleveland Twist Drill Co., Cleveland, Ohio
R.M. Byrne, Alternate, Metal Cutting Institute, New York, New York

NATIONAL ASSOCIATION OF PUNCH MANUFACTURERS
R.E. Smith, Dayton Progress Corp., Dayton, Ohio

NATIONAL BUREAU OF STANDARDS
J.R. Pidgeon, National Bureau of Standards, Washington, D.C.

NATIONAL MACHINE TOOL BUILDERS' ASSOCIATION
G.F. Wilson, Consultant, Wheeling, Illinois
E.J. Loeffler, Alternate, National Machine Tool Builders' Association, McLean, Virginia

SOCIETY OF AUTOMOTIVE ENGINEERS
To be appointed

SOCIETY OF CARBIDE ENGINEERS
C.H. Lang, c/o Society of Carbide Engineers, Bridgeville, Pennsylvania

SOCIETY OF MANUFACTURERS ENGINEERS
K.A. Lundell, The Producto Machine Co., Jamestown, New York
H.J. Moffatt, Bartonville, Illinois
W.N. Moore, The Ford Motor Co., Dearborn, Michigan

TELEPHONE GROUP, THE
R.A. Agnew, Western Electric Co., Chicago, Illinois
S.P. Rogacki, Alternate, Western Electric Co., Inc., Kearney, New Jersey

U.S. DEPARTMENT OF THE AIR FORCE
To be appointed

U.S. DEPARTMENT OF THE ARMY
D.L. York, Liaison, General Thomas J. Rodman Laboratory, Rock Island, Illinois

U.S. DEPARTMENT OF THE NAVY
J.N. Cornette, Liaison, Naval Ship Systems Command, Washington, D.C.

U.S. MACHINE SCREW BUREAU

Herman Muenchinger, Continental Screw Co., New Bedford, Massachusetts
D.E. Chase, Alternate, Continental Screw Co., New Bedford, Massachusetts

INDIVIDUAL COMPANIES

Harold Cooper, Chrysler Corp., Detroit, Michigan
William Hofbauer, Mohawk Tools, Inc., Montpelier, Ohio
Kenneth Hull, The Ingersoll Milling Machine Co., Rockford, Illinois
A.M. Mezey, Richards Brothers Punch Co., Detroit, Michigan

TECHNICAL COMMITTEE 18 – SPADE DRILLS

G.F. Wilson, Chairman, Consultant, Wheeling, Illinois
Warren Gill, Secretary, Muskegon Tool Industries, Inc., Muskegon, Michigan
D.J. Bohac, Madison Industries, Providence, Rhode Island
P.S. Erickson, Deere & Co., Moline, Illinois
T.R. Erickson, Alternate, Erickson Tool Co., Solon, Ohio
G.C. Green, DeVlieg Microbore, Royal Oak, Michigan
W.F. Morgan, Caterpillar Tractor Co., E. Peoria, Illinois
C.J. Oxford, Jr., National Twist Drill & Tool Co., Rochester, Michigan
A.V. Peterson, International Harvester Co., Hinsdale, Illinois
A.A. Schiller, Waukesha Cutting Tools Inc., Waukesha, Wisconsin
A. Totarelio, Erickson Tool Co., Solon, Ohio

CONTENTS

Page

1. Scope 1
2. Spade Drill Blade–Nomenclature and Definitions 1
3. Spade Drill Blade–Dimensional Tolerances 6
4. Spade Drill Holder–Nomenclature and Definition 8
5. Spade Drill Holder–Dimensional Tolerances 12

FIGURES

1. Spade Drill Blade Nomenclature 3
2. Spade Drill Holder Nomenclature 9

TABLES

1. Spade Drill Blades–Type I 4
2. Spade Drill Blades–Type II 5
3. Spade Drill Holder–Type I 10
4. Spade Drill Holder–Type II 11

APPENDIX

A. Conversion Tables from Inch to Millimeter 13
B. Explanation of Spade Drill Components 17

Intentionally left blank

AMERICAN NATIONAL STANDARD

SPADE DRILL BLADES AND SPADE DRILL HOLDERS

1. SCOPE

This standard covers nomenclature, definitions, sizes and tolerances for spade drill blades and spade drill holders insofar as the holder locates and holds the spade drill blade. All dimensions are in inches. Conversion tables from inch to millimetre are given in Appendix A.

2. SPADE DRILL BLADE–NOMENCLATURE AND DEFINITION

2.1 Spade Drill Blade

A flat end cutting tool, having two cutting faces used for producing, enlarging, or finishing holes. The blade is located in and driven by a suitable tool holder.

2.2 Axis

The imaginary straight line which forms the longitudinal centerline of the blade.

2.3 Back Taper

A slight decrease in cutting diameter (or width) from the outer corners of the cutting lips to the back of the blade measured as an angle or reduction in blade diameter.

2.4 Blade Diameter

The width of the blade measured across the circular od (outside diameter) land (margins) at the point.

2.5 Blade Length

The axial length of the blade measured from the chisel edge to the locating surface or seating pads on the back of the blade.

2.6 Blade Thickness

Thickness of tthe blade.

2.7 Chip Splitters

Notches or grooves produced on the front lip clearance surface (sometimes called chip breaker grooves) for splitting the chip into segments for easier removal from the workpiece. Usually staggered in location from one lip to the other.

2.8 Chisel Edge

The edge at the tip of the spade drill blade that is formed by the intersection of the two lip clearance surfaces.

2.9 Chisel Edge Angle

The angle included between the chisel edge and the cutting lip as viewed from the cutting end of the blade.

2.10 Cutting Edge Angle

The angle formed by the cutting edge and the flat portion of the blade.

2.11 Cutting Lip

The cutting edges extending from the chisel edge to the periphery.

2.12 Ear Length

The length of the locating ears beyond the seating pads.

2.13 Front Lip Clearance

The clearance angle along the cutting edge of the blade. It is measured from a projected plane tangent to the lip. (See Figure 1)

2.14 Locating Ears

The projections on the back of the spade drill blade beyond the seating pads which locate and center the blade in the holder.

2.15 Locating Slot

The space between the locating ears that centralizes the blade in the holder.

2.16 Margin

Same as od land.

2.17 OD Clearance

The peripheral portion of the spade drill blade which has been cut away so it will not rub against the walls of the hole.

2.18 OD Land

The peripheral portion of the blade which is not cut away to provide clearance. This may also be referred to as the margin.

2.19 Point

The cutting end of the blade.

2.20 Point Angle

The angle included between the two cutting edges projected on the plane of the surface of the blade.

2.21 Rake Surface

That portion or surface cut into the spade drill blade to provide a rake angle and give curl to the chips produced. (Sometimes called a flute or gullet.)

2.22 Retaining Screw Hole

The hole in the body of the blade for the purpose of retaining the blade in the holder.

2.23 Retaining Screw Hole Location

Axial distance between the center of the retaining hole and seating pad surface.

2.24 Seating Pad

Surface(s) at the back of the blade which axially position and seat the blade in the holder.

2.25 Seating Pad Relief

The relieved portion between the seating pads. (optional)

2.26 Web

The central portion at the point of the blade which separates the two cutting lips.

2.27 Web Thickness

The thickness of the web, at the point, measured normal to the blade axis.

2.28 Web Thinning

The operation of reducing the web thickness at the point to reduce the thrust force.

2.29 Wedge Angle (optional)

An angular reduction of the blade thickness at the point (See Figure 1)

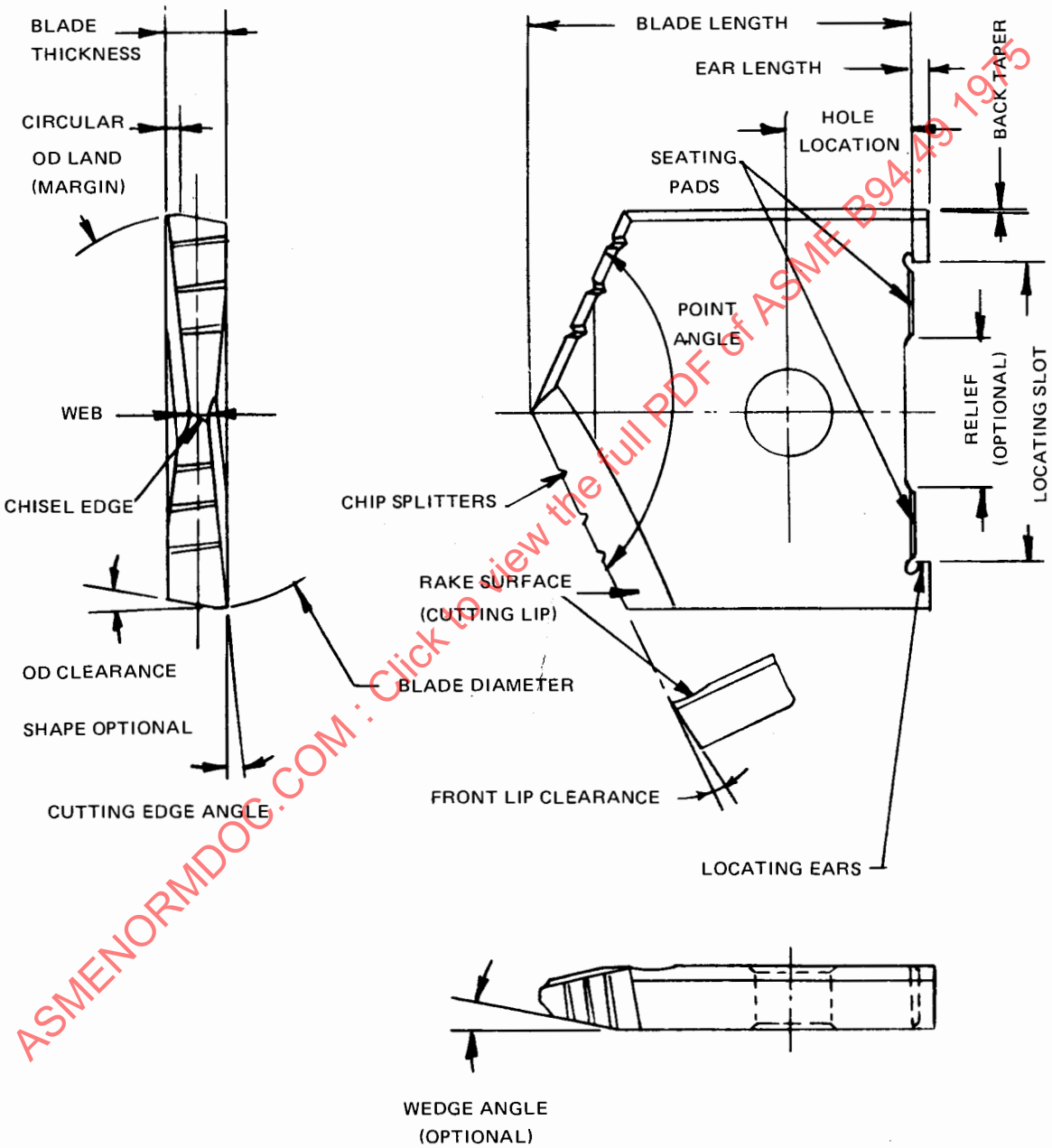


FIG. 1 SPADE DRILL BLADE NOMENCLATURE

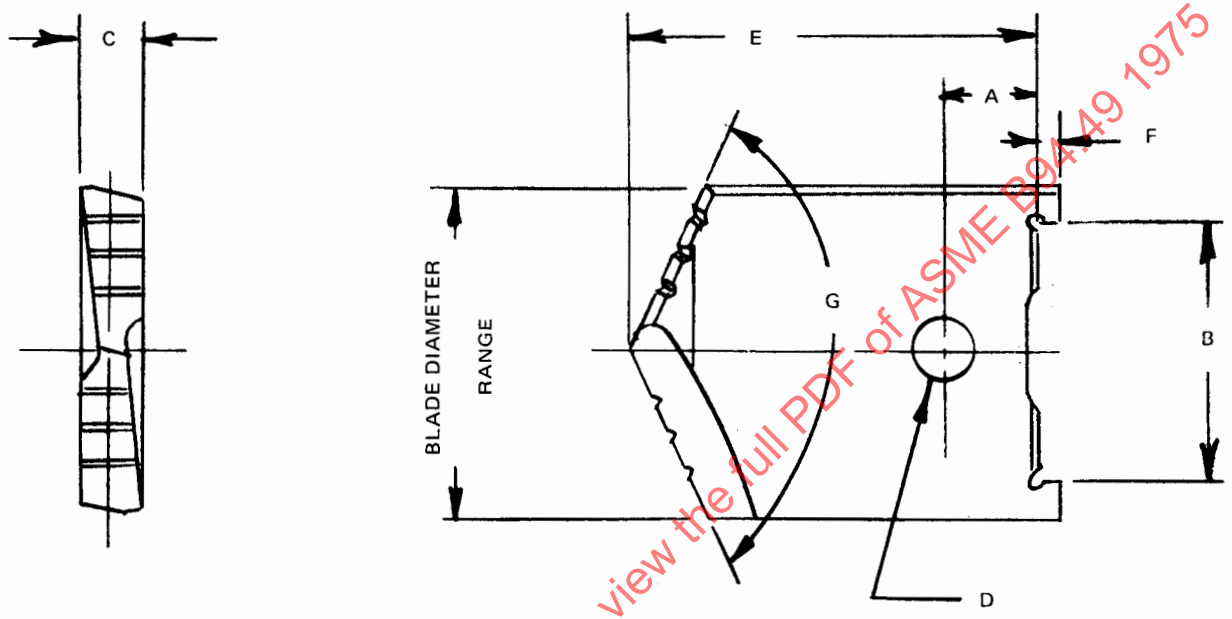


Table 1 Spade Drill Blades—Type I

Blade Series	Blade Diameter Range	Decimal Equivalent	A	B	C	D	E	F	G
A	1" to 1 1/4"	1.000 – 1.250	0.28*	0.75*	0.187*	0.25	1.15	0.09	130°
B	1 17/64" to 1 1/2"	1.265 – 1.500	0.28	1.06	0.281	0.31	1.40	0.09	130°
C	1 33/64" to 2"	1.515 – 2.000	0.43	1.25	0.312	0.31	2.00	0.12	130°
D	2 1/64" to 2 1/2"	2.015 – 2.500	0.81*	1.75	0.375	0.43	2.37	0.12	130°
E	2 33/64" to 3"	2.515 – 3.000	0.87*	2.06	0.437	0.56*	2.62	0.12	130°
F	3 1/64" to 3 1/2"	3.015 – 3.500	1.00*	2.62	0.500	0.68*	3.12	0.12	130°
G	3 33/64" to 4"	3.515 – 4.000	1.12*	3.06	0.625	0.81*	3.37	0.12	130°
H	4 1/64" to 6"	4.015 – 6.000	1.25*	3.50	0.687	0.81*	3.68	0.18	130°

*Indicates variations between type I and type II blades.

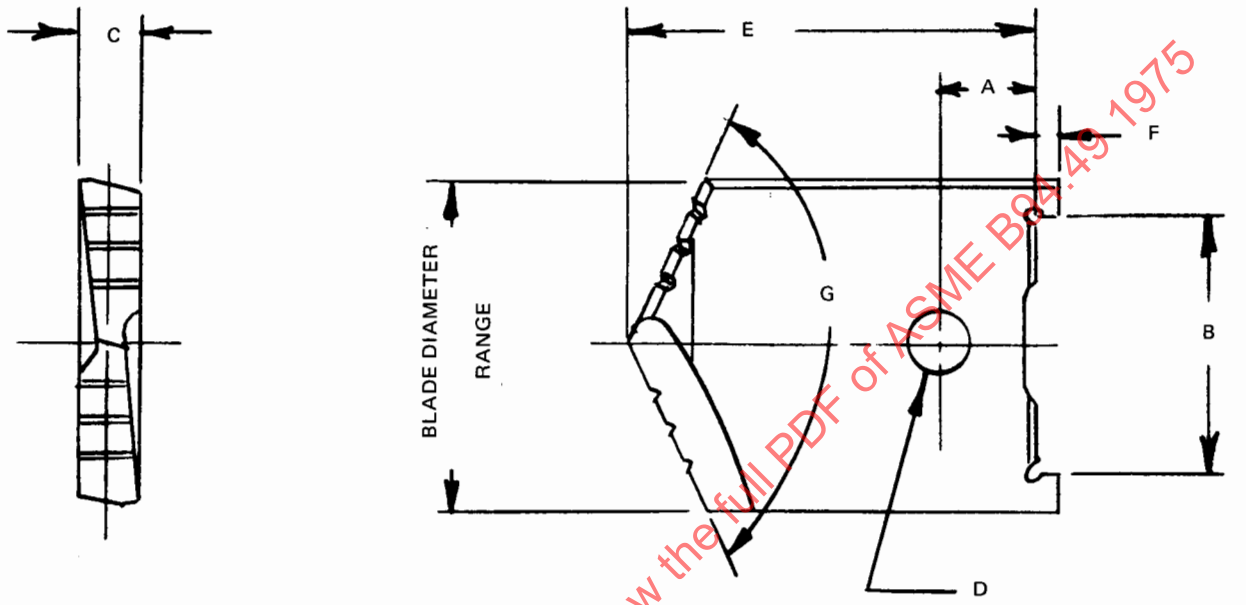


Table 2 Spade Drill Blades—Type II

Blade Series	Blade Diameter Range	Decimal Equivalent	A	B	C	D	E	F	G
A	1" to 1 1/4"	1.000 – 1.250	0.25*	0.81*	0.250*	0.25	1.15	0.09	130°
B	1 17/64" to 1 1/2"	1.265 – 1.500	0.28	1.06	0.281	0.31	1.40	0.09	130°
C	1 33/64" to 2"	1.515 – 2.000	0.43	1.25	0.312	0.31	2.00	0.12	130°
D	2 1/64" to 2 1/2"	2.015 – 2.500	0.50*	1.75	0.375	0.43	2.37	0.12	130°
E	2 33/64" to 3"	2.515 – 3.000	0.62*	2.06	0.437	0.43*	2.62	0.12	130°
F	3 1/64" to 3 1/2"	3.015 – 3.500	0.68*	2.62	0.500	0.50*	3.12	0.12	130°
G	3 33/64" to 4"	3.515 – 4.000	0.75*	3.06	0.625	0.62*	3.37	0.12	130°
H	4 1/64" to 6"	4.015 – 6.000	0.81*	3.50	0.687	0.75*	3.68	0.18	130°

*Indicates variations between type I and type II blades.

3. SPADE DRILL BLADE–DIMENSIONAL TOLERANCES

Blade Cutting Diameter			
Series	Size		Tolerance
A	1 to $1\frac{1}{4}$	Inclusive	Plus 0.0020 to Minus 0.0020
B	$1\frac{17}{64}$ to $1\frac{1}{2}$	Inclusive	Plus 0.0020 to Minus 0.0020
C	$1\frac{33}{64}$ to 2	Inclusive	Plus 0.0025 to Minus 0.0025
D	$2\frac{1}{64}$ to $2\frac{1}{2}$	Inclusive	Plus 0.0030 to Minus 0.0030
E	$2\frac{33}{64}$ to 3	Inclusive	Plus 0.0030 to Minus 0.0030
F	$3\frac{1}{64}$ to $3\frac{1}{2}$	Inclusive	Plus 0.0035 to Minus 0.0035
G	$3\frac{33}{64}$ to 4	Inclusive	Plus 0.0035 to Minus 0.0035
H	$4\frac{1}{64}$ to 6	Inclusive	Plus 0.0035 to Minus 0.0035

Back Taper	Tolerance
0.001 to 0.002 inch per inch per side	

Blade Length			
Series	Size		Tolerance
A	1 to $1\frac{1}{4}$	Inclusive	Plus 0.06 to Minus 0.06
B	$1\frac{17}{64}$ to $1\frac{1}{2}$	Inclusive	Plus 0.06 to Minus 0.06
C	$1\frac{33}{64}$ to 2	Inclusive	Plus 0.06 to Minus 0.06
D	$2\frac{1}{64}$ to $2\frac{1}{2}$	Inclusive	Plus 0.06 to Minus 0.06
E	$2\frac{33}{64}$ to 3	Inclusive	Plus 0.06 to Minus 0.06
F	$3\frac{1}{64}$ to $3\frac{1}{2}$	Inclusive	Plus 0.06 to Minus 0.06
G	$3\frac{33}{64}$ to 4	Inclusive	Plus 0.12 to Minus 0.12
H	$4\frac{1}{64}$ to 6	Inclusive	Plus 0.12 to Minus 0.12

Retaining Hole Location	Tolerance
All series and sizes	Plus 0.015 to minus 0.015

Locating Slot Widths	Tolerance
All series and sizes	Plus 0.001 to Nominal

Centrality of Blade Slot	Tolerance
All series and sizes	(Relative to Axis) 0.002 maximum variation

Blade Thickness	Tolerance
All series and sizes	Plus 0.000 to minus 0.001

Retaining Screw Hole Size	Tolerance
All series and sizes	Plus to supplier's specifications to minus 0.000

Point Angle	Variation
Plus 3° to minus 3°	Both sides equal ± ½°

Centrality of Web (tiv)	Total Indicator Variation
All series and sizes	0.005

Ear Length	Tolerance
All series and sizes	Plus 0.000 to minus supplier's specifications

4. SPADE DRILL HOLDER—NOMENCLATURE AND DEFINITIONS

4.1 Spade Drill Blade Holder

A holder used for locating, securing, and driving a blade. Used for producing, enlarging, or finishing holes.

4.2 Axis

The imaginary straight line which forms the longitudinal centerline of the holder.

4.3 Blade Retaining Screw

The blade retaining screw is used to secure the blade in position.

4.4 Blade Slot Width

The slot at the front of the holder used to hold the blade. The width is determined by the series blade being used.

4.5 Body Diameter

The diameter that covers the body length of the holder.

4.6 Body Length

The distance from the front point of the holder to the beginning point or front of the shank.

4.7 Coolant Holes (optional)

Coolant holes allow coolant to be placed directly on the blade.

4.8 Coolant Inductor (optional)

A unit designed to allow coolant to enter the holder when the holder is rotating.

4.9 Locating Flat Width

A distance determined by the dimension between the locating ears of the series blade being used.

4.10 Flute (optional)

The flutes are two cut away areas 180° apart generally parallel to the axis of the holder and usually the full length of the body of the holder. The purpose is for easy chip removal.

4.11 Locating Flats

Two flat surfaces parallel to the axis of the holder and square to the blade slot. Located at the bottom of the blade slot.

4.12 Locating Flat Length

The locating flat length is determined by the series blade being used. The flat is located at the bottom of the blade slot.

4.13 Overall Length

The distance from the front point of the holder to the end point of the holder.

4.14 Screw Location

The distance from the bottom of the blade slot (seating surface) to center of screw hole.

4.15 Seating Surface

A surface square to the axis of the holder located at the bottom of the blade slot.

4.16 Shank

The portion of the holder by which it is being held and driven.

4.17 Slot Depth

The distance from the front end of the holder to the seating surface.

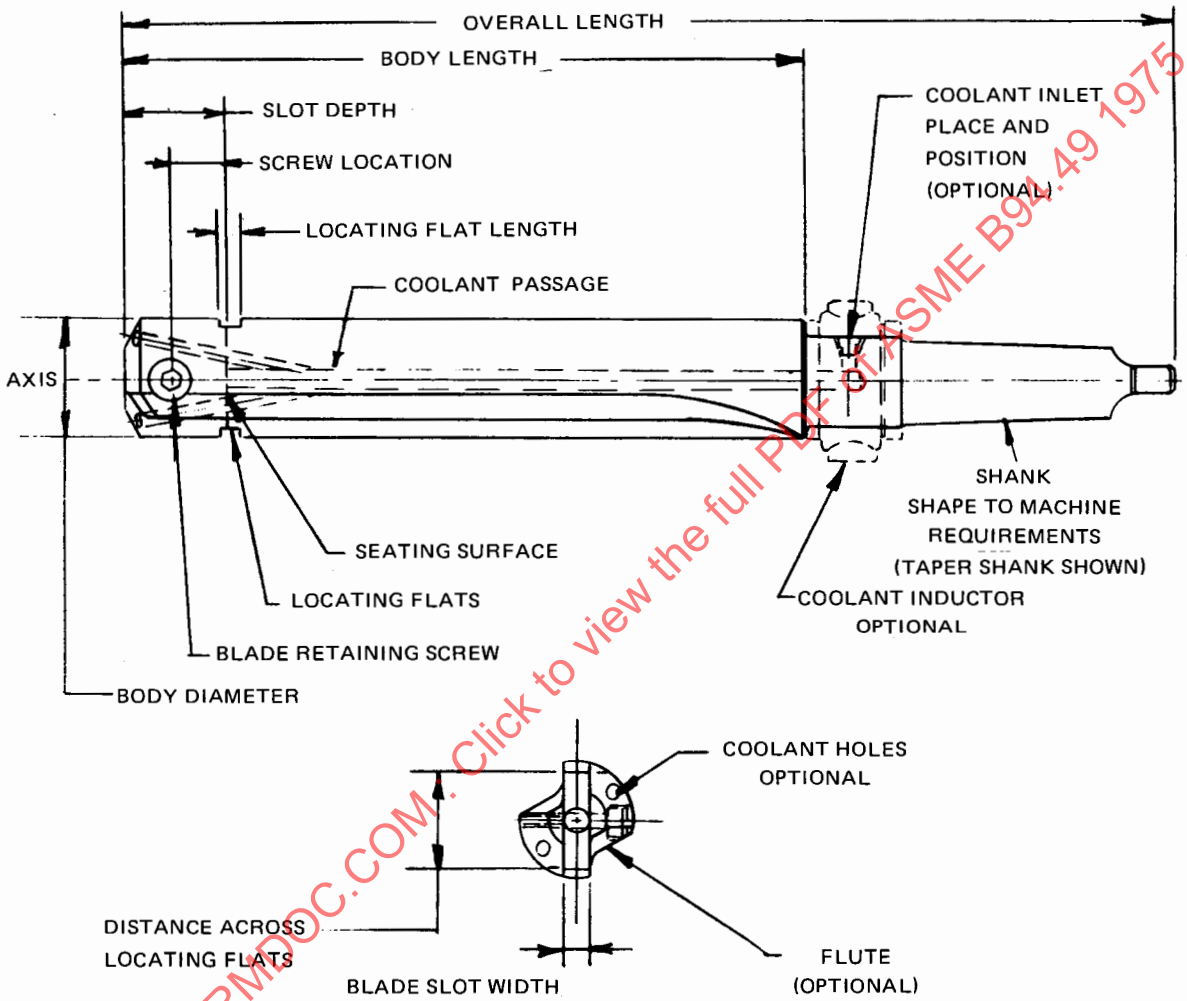
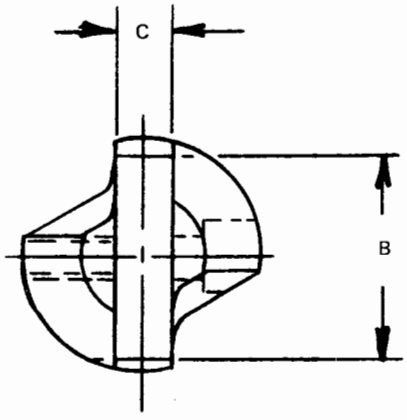


FIG. 2 SPADE DRILL HOLDER NOMENCLATURE



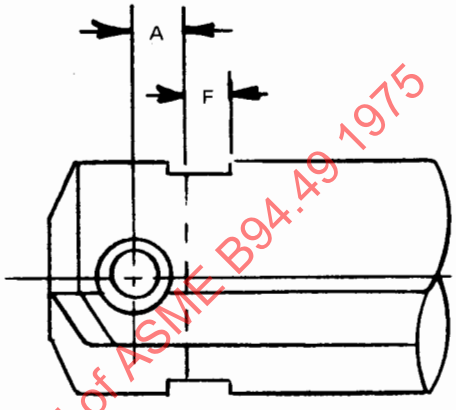
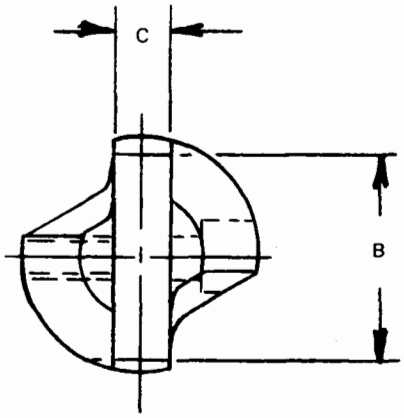


Table 3 Spade Drill Holder—Type I

Blade Series	Blade Cutting Range	A	B	C	F
A	1.000 – 1.250	0.28*	0.75*	0.187*	0.09
B	1.265 – 1.500	0.28	1.06	0.281	0.09
C	1.515 – 2.000	0.43	1.25	0.312	0.12
D	2.015 – 2.500	0.81*	1.75	0.375	0.12
E	2.515 – 3.000	0.87*	2.06	0.437	0.12
F	3.015 – 3.500	1.00*	2.62	0.500	0.12
G	3.515 – 4.000	1.12*	3.06	0.625	0.12
H	4.015 – 6.000	1.25*	3.50	0.687	0.18

*Indicates variations between type I and type II holders.



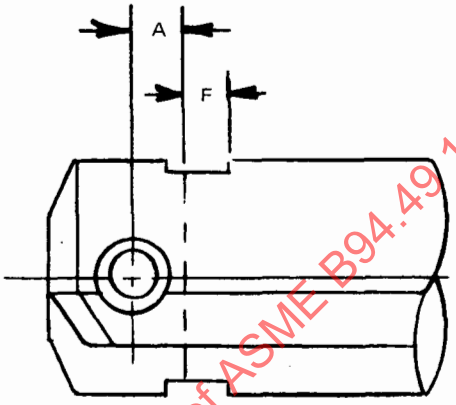


Table 4 Spade Drill Holder–Type II

Blade Series	Blade Cutting Range	A	B	C	F
A	1.000 – 1.250	0.25*	0.81*	0.250*	0.09
B	1.265 – 1.500	0.28	1.06	0.281	0.09
C	1.515 – 2.000	0.43	1.25	0.312	0.12
D	2.015 – 2.500	0.50*	1.75	0.375	0.12
E	2.515 – 3.000	0.62*	2.06	0.437	0.12
F	3.015 – 3.500	0.68*	2.62	0.500	0.12
G	3.515 – 4.000	0.75*	3.06	0.625	0.12
H	4.015 – 6.000	0.81*	3.50	0.687	0.18

*Indicates variations between type I and type II holders.

5. SPADE DRILL HOLDER–DIMENSIONAL TOLERANCES

Screw Location	Tolerance
All series and sizes	Plus 0.015 to minus 0.015

Distance Across Locating Flats	Tolerance
All series and sizes	Nominal to minus 0.001

Centrality Across Locating Flats	Tolerance
All series and sizes	(Relative to Axis) 0.002 maximum variation

Blade Slot Width	Tolerance
All series and sizes	Plus 0.002 to minus 0.000

Centrality of Blade Slot (tiv)	Total Indicator Variation
All series and sizes	(Relative to Axis) 0.005 tiv

Locating Flat Length	Tolerance
All series and sizes	Plus to supplier's specifications to minus 0.000

Appendix A

CONVERSION TABLES FROM INCH TO MILLIMETER

Any dimension in this standard can be converted by the addition of its components from the tables in this Appendix.

Consider the actual or implied precision of the values in customary units in determining the number of significant digits to be retained in the SI equivalents. (For an explanation of conversion techniques, see American National Standard Metric Practice Guide, ANSI Z210.1-1972)

inch	mm
1	25.40
2	50.80
3	76.20
4	101.60
5	127.00
6	152.40
7	177.80
8	203.20
9	228.60
10	254.00
11	279.40
12	304.80

inch	mm
1/64	0.40
1/32	0.79
3/64	1.19
1/16	1.58
5/64	1.98
3/32	2.38
7/64	2.78
1/8	3.18
9/64	3.57
5/32	3.97
11/64	4.37
3/16	4.76
13/64	5.16
7/32	5.56
15/64	5.95
1/4	6.35
17/64	6.75
9/32	7.14
19/64	7.54
5/16	7.94
21/64	8.33
11/32	8.73
23/64	9.13
3/8	9.52
25/64	9.92
13/32	10.32
27/64	10.72
7/16	11.11
29/64	11.51
15/32	11.91
31/64	12.30

inch	mm
1/2	12.70
33/64	13.10
17/32	13.49
35/64	13.89
9/16	14.29
37/64	14.68
19/32	15.08
39/64	15.48
5/8	15.88
41/64	16.27
21/32	16.67
43/64	17.07
11/16	17.46
45/64	17.86
23/32	18.26
47/64	18.65
3/4	19.05
49/64	19.45
25/32	19.84
51/64	20.24
13/16	20.64
53/64	21.04
27/32	21.43
55/64	21.83
7/8	22.22
57/64	22.62
29/32	23.02
59/64	23.42
15/16	23.81
61/64	24.21
31/32	24.61
63/64	25.00

Inch to Millimeter (for decimal inch values of less than one inch) [Do not interpolate]

Inch	0.xx0	0.xx1	0.xx2	0.xx3	0.xx4	0.xx5	0.xx6	0.xx7	0.xx8	0.xx9
0.00	0.00	0.03	0.05	0.08	0.10	0.13	0.15	0.18	0.20	0.22
0.01	0.25	0.28	0.30	0.33	0.36	0.38	0.41	0.43	0.46	0.48
0.02	0.51	0.53	0.56	0.58	0.61	0.64	0.66	0.69	0.71	0.74
0.03	0.76	0.79	0.81	0.84	0.86	0.89	0.91	0.94	0.96	0.99
0.04	1.02	1.04	1.07	1.09	1.12	1.14	1.17	1.19	1.22	1.24
0.05	1.27	1.30	1.32	1.35	1.37	1.40	1.42	1.45	1.47	1.50
0.06	1.52	1.55	1.57	1.60	1.63	1.65	1.68	1.70	1.73	1.75
0.07	1.78	1.80	1.83	1.85	1.88	1.90	1.93	1.96	1.98	2.01
0.08	2.03	2.06	2.08	2.11	2.13	2.16	2.18	2.21	2.24	2.26
0.09	2.29	2.31	2.34	2.36	2.39	2.41	2.44	2.46	2.49	2.51
0.10	2.54	2.57	2.59	2.62	2.64	2.67	2.69	2.72	2.74	2.77
0.11	2.79	2.82	2.84	2.87	2.90	2.92	2.95	2.97	3.00	3.02
0.12	3.05	3.07	3.10	3.12	3.15	3.18	3.20	3.23	3.25	3.28
0.13	3.30	3.33	3.35	3.38	3.40	3.43	3.45	3.48	3.50	3.53
0.14	3.56	3.58	3.61	3.63	3.66	3.68	3.71	3.73	3.76	3.78
0.15	3.81	3.84	3.86	3.88	3.91	3.94	3.96	3.99	4.01	4.04
0.16	4.06	4.09	4.11	4.14	4.17	4.19	4.22	4.24	4.27	4.29
0.17	4.32	4.34	4.37	4.39	4.42	4.44	4.47	4.50	4.52	4.55
0.18	4.57	4.60	4.62	4.65	4.67	4.70	4.72	4.75	4.78	4.80
0.19	4.83	4.85	4.88	4.90	4.93	4.95	4.98	5.00	5.03	5.05
0.20	5.08	5.11	5.13	5.16	5.18	5.21	5.23	5.26	5.28	5.31
0.21	5.33	5.36	5.39	5.41	5.44	5.46	5.49	5.51	5.54	5.56
0.22	5.59	5.61	5.64	5.66	5.69	5.72	5.74	5.77	5.79	5.82
0.23	5.84	5.87	5.89	5.92	5.94	5.97	5.99	6.02	6.05	6.07
0.24	6.10	6.12	6.15	6.17	6.20	6.22	6.25	6.27	6.30	6.32
0.25	6.35	6.38	6.40	6.43	6.45	6.48	6.50	6.53	6.55	6.58
0.26	6.60	6.63	6.65	6.68	6.71	6.73	6.76	6.78	6.81	6.83
0.27	6.86	6.88	6.91	6.93	6.96	6.98	7.01	7.04	7.06	7.09
0.28	7.11	7.14	7.16	7.19	7.21	7.24	7.26	7.29	7.32	7.34
0.29	7.37	7.39	7.42	7.44	7.47	7.49	7.52	7.54	7.57	7.59
0.30	7.62	7.64	7.67	7.70	7.72	7.75	7.77	7.80	7.83	7.85
0.31	7.87	7.90	7.92	7.95	7.98	8.00	8.03	8.05	8.08	8.10
0.32	8.13	8.15	8.18	8.20	8.23	8.26	8.28	8.31	8.33	8.36
0.33	8.38	8.41	8.43	8.46	8.48	8.51	8.53	8.56	8.59	8.61
0.34	8.64	8.66	8.69	8.71	8.74	8.76	8.79	8.81	8.84	8.86
0.35	8.89	8.92	8.94	8.97	8.99	9.02	9.04	9.07	9.09	9.12
0.36	9.14	9.17	9.19	9.22	9.25	9.27	9.30	9.32	9.35	9.38
0.37	9.40	9.42	9.45	9.47	9.50	9.52	9.55	9.58	9.60	9.63
0.38	9.65	9.68	9.70	9.73	9.75	9.78	9.80	9.83	9.85	9.88