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STANDARDS PUBLICATION NO. OS 2

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Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports

NEMA

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION ■ 2101 L STREET, N.W., WASHINGTON, D.C. 20037

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NEMA OS 2-1986 (R1991)

OS 2

NONMETALLIC OUTLET BOXES, DEVICE BOXES, COVERS, AND BOX SUPPORTS

Published by

National Electrical Manufacturers Association
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NONMETALLIC OUTLET BOXES, DEVICE BOXES, COVERS AND BOX SUPPORTS

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FOREWORD

The purpose of this Standards Publication is to provide a guide to the types and sizes of nonmetallic outlet boxes, device boxes, covers, and supports which are in general use or suggested for future design, or both. The standards present dimensional data needed for the safety and convenience of interchangeability with associated equipment. All items when properly installed and properly used contribute to safety.

Properly manufactured boxes and covers are, however, only one factor in minimizing the hazards which may be associated with the use of electricity. The reduction of hazard involves the joint efforts of the various equipment manufacturers, the system designer, the installer, and user. Information is provided herein to assist users and others in the proper selection of boxes and covers.

The manufacturer has limited or no control over the following factors which are vital to a safe installation.

1. Environmental conditions
2. System design
3. Equipment selection and application
4. Installation
5. Operating practices
6. Maintenance

This publication is not intended to instruct the user of the boxes and covers with regard to these factors except insofar as suitable equipment to meet needs can be recognized in this publication.

These standards are necessarily limited to defining the construction requirements for the products covered herein. The publication has been promulgated with a view towards reducing the hazard to persons and property when boxes and covers conforming with these standards are properly selected and installed in accordance with the *National Electrical Code.*

This Standards Publication has been reviewed with input obtained from independent testing laboratories and major consumer representatives.

The publication will be reviewed periodically by the Outlet and Switch Box Section of NEMA so that it will be kept up to date with advancing technology. Comments will be welcomed and should be sent to:

Vice President, Engineering Department
National Electrical Manufacturers Association
2101 L Street, N.W., Suite 300
Washington, DC 20037

OS 2-1986 (R1991) revises and supersedes OS 2-1980 and OS 2-1986. New or revised portions of the text are followed by their appropriate designations (NEMA Standard, Authorized Engineering Information, or Suggested Standard for Future Design) and the approval date of 10-23-1991. Unrevised portions were reaffirmed on 10-23-1991 but carry their initial dates of approval.

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HISTORY

This NEMA Standards Publication is the result of many years of research and investigation by members of NEMA. It was developed through continuing consultation among manufacturers, users, and testing laboratories. It reflects study of the following standards which were helpful in the preparation of the document.

American National Standards Institute
11 West 42nd Street
New York, NY 10036

ANSI/NFPA 70-1990 *National Electrical Code*

Canadian Standards Association, Inc.
178 Rexdale Boulevard
Rexdale, Ontario, Canada

ANSI/NEMA OS 1-1984 *Sheet-Steel Outlet Boxes, Device Boxes, Covers, and Box Supports*

Underwriters Laboratories, Inc.
333 Pfingsten Road Box 347
Northbrook, IL 60062

ANSI/UL 514C-1988 *Nonmetallic Outlet Boxes, Flush Device Boxes, and Covers*

SCOPE

This Standards Publication covers those general-purpose nonmetallic outlet boxes, device boxes, covers and box supports that are widely used by the consumer. These items are designed to facilitate the pulling of wires, to protect and facilitate wiring splices and taps, to provide a means of mounting and protecting wiring devices, and to provide a connection for nonmetallic sheathed cable, nonmetallic tubing (loom), rigid nonmetallic conduit, and electrical nonmetallic tubing.

Excluded from this Standards Publication are "conduit bodies" and similar types of boxes; cabinets or cutout boxes; pull boxes; floor boxes; flush device plates; boxes, plates and covers designed for use with surface metal raceway systems only; and boxes larger than 100 cubic inches in volume except multiple-gang device boxes.

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NONMETALLIC OUTLET BOXES, DEVICE BOXES, COVERS AND BOX SUPPORTS

SECTION 1
REFERENCED STANDARDS AND DEFINITIONS

1.1 REFERENCED STANDARDS

In this publication, reference is made to the standard listed below. Copies are available from the indicated source.

American National Standards Institute
11 West 42nd Street
New York, NY 10036

ANSI/NFPA 70-1990 *National Electrical Code*

1.2 DEFINITIONS

BOX (ELECTRICAL)

A box is a container without a cover, but with means for mounting a cover.

NEMA Standard 11-20-1980.

BOX SUPPORT

A box support is a means for securing an outlet or device box to the building structure or finished surface. Supports can be an integral part of the box, attached to the box, or entirely separate.

NEMA Standard 11-20-1980.

BRACKET

A bracket is a means for securing an outlet box or device box in place in walls or ceilings, or to wall studs, building structures, or structural members.

NEMA Standard 11-20-1980.

CABLE BOX

A cable box is intended to be used with non-metallic sheath cable.

NEMA Standard 1-15-1986.

CLAMP

A clamp is a part of, or an accessory to, a cable box to secure flexible nonmetallic tubing (loom) or cable to the box.

NEMA Standard 11-20-1980.

DEVICE BOX

A device box is designed to receive and support switches, receptacles, and similar devices. The term "device box" includes the following specific types:

1. Single gang
2. Single gang offset
3. Two gang
4. Three gang
5. Four gang

NEMA Standard 10-23-1991.

FLOOR BOX

A floor box is an outlet box specifically designed for flush installation in a floor.

NEMA Standard 5-28-1981.

FLUSH-DEVICE COVER PLATE

A flush-device cover plate is a cover, decorative or plain, designed to be fastened directly to a wiring device. It is intended to close a flush-device box and to cover the edges of the wall opening in which the box is located.

NEMA Standard 11-20-1980.

FLUSH-MOUNTED BOX

A flush mounted box is so designed as to have a minimal front projection from the surface surrounding the box opening.

NEMA Standard 11-20-1980.

JUNCTION BOX

A junction box is an outlet box intended to provide space for conductor splices and taps.

NEMA Standard 10-23-1991.

KNOCKOUT

A knockout is a portion of the wall of a box that can be removed readily in order to provide an opening for the entry of tubing, conduit, cable, or fitting.

NEMA Standard 10-23-1991.

OUTLET BOX

An outlet box is used in an electrical wiring system for containing wire, taps, splices, or devices. It has provisions for the entry of conduit, tubing or cable assemblies and for the attachment of a separate cover which is used to close the box or provide support for devices or fixtures.

NEMA Standard 10-23-1991.

Nonmetallic outlet boxes should be made of suitable nonmetallic material.

Authorized Engineering Information 1-15-1986.

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The function of an outlet box when completely closed by a cover or part of a wiring device acting as a cover is to guard live parts against outside incidental contact, to protect the surrounding environment from faults occurring within the outlet box, to permit inspection of the wiring system, and to provide a safe means for replacement of wiring devices. Normally, outlet boxes have provisions for the entrance of conductors through nonmetallic conduit, cable, or tubing. Outlet boxes also have provision for fastening covers which are separate or a part of a wiring device. The fastening means is not a hinge and provides for future removal. An outlet box also provides one or more of the following:

1. Support for fixture assemblies and lamp holders.
2. Access to the raceway system for which it is designed.
3. Extension of existing raceway or wiring systems.
4. Ground continuity within the raceway or via the wiring system for which it is designed.
5. Utilization of accessories such as fixture studs, clamps, bar hangers, extension rings, and such.

NEMA Standard 1-15-1986

OUTLET BOX COVER

An outlet box cover is a cover which is intended to close the face of a box. The cover can be blank or provided with means for support of a wiring device, light fixture pendant cord, etc. Covers have slots, holes, or mounting provision for attaching to outlet boxes of the sizes and types for which they are designed.

NEMA Standard 11-20-1980.

SINGLE GANG BOX

A box for mounting in walls and no larger than a nominal size 2¼ × 4 inch.

NEMA Standard 1-15-1986.

SURFACE-MOUNTED BOX

A surface-mounted box is a box designed and intended to be mounted on a surface and to be exposed to sight rather than recessed in a wall, ceiling, or partition.

NEMA Standard 11-20-1980.

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GENERAL STANDARDS

2.1 MATERIAL

2.1.1 Thermosetting Resins

Thermosetting resins are plastics which in their final state as finished articles are substantially infusable and insoluble. They are often liquids at some state of their manufacture or processing, which are cured by heat, catalysis or other chemical means. After being fully cured, thermosets cannot be resoftened by heat.

2.1.2 Thermoplastic Resins

A thermosplastic resin is a plastic that repeatedly can be softened by heating and hardened by cooling through a temperature characteristic of the plastic, and in the softened state can be shaped by flow into articles by molding or extrusion.

Authorized Engineering Information 11-20-1980.

2.2 CORROSION PROTECTION

All ferrous metal surfaces of brackets, ears, and adjustable bar hangers used in conjunction with a nonmetallic box shall be protected against corrosion by a zinc coating of 0.0005 inch average thickness or equivalent corrosion protection. The corrosion protection of any ferrous metal clamp, grounding plate, or strap, if the protective coating is of zinc, shall be not less than 0.00015 inch average thickness or of equivalent corrosion protection.

NEMA Standard 1-15-1986.

EXCEPTION: The cut edges, punched holes and the threaded surfaces of tapped holes of a part formed from galvanized stock do not need additional protection.

Authorized Engineering Information 1-15-1986.

2.3 SCREWS

The most commonly used screws used in conjunction with outlet boxes, device boxes, set-up boxes, and covers are shown in Table 2-1.

Authorized Engineering Information 1-15-1986.

Table 2-1

Nominal Size	Device Mounting Screws	Cover Mounting and Fixture Support	Ground Screws	Bar Hanger
6 × 32	X	...	...	...
8 × 32	...	X	X	X (or larger)
10 × 32	...	...	X	...

Authorized Engineering Information 11-20-1980.

Ferrous screws shall have visible corrosion protection. The heads of grounding screws shall be identified by a green color.

NEMA Standard 1-15-1986.

2.4 OPENINGS

2.4.1 Cable-Size Knockouts

Cable-size knockouts provided in boxes shall be so designed that they can be removed without deforming the box. The openings thus created shall be free of sharp and jagged edges which could destroy the integrity of the cable insulation.

2.4.2 Knockouts

A knockout shall effectively cover the opening in which it is located, and the clearance between the knockout and the opening shall be not more than 0.030 inch.

2.4.3 Open Holes

No dimension of an open hole in a box shall exceed $^{17}/_{64}$ inch, with the exception of prying out slots.

NEMA Standard 11-20-1980.

2.5 SUPPORTS

Outlet boxes shall be so designed that they can be securely fastened in place without depending on the support furnished by any system of wiring.

NEMA Standard 11-20-1980.

A box support, when provided as a part of a box, should have ample strength and rigidity. Provision for supporting a device within the box should be independent of the means used to support the box. Supporting ears, brackets and bar hangers should be suitable for the purpose.

Authorized Engineering Information 1-15-1986.

2.6 MARKINGS

Boxes and covers shall be marked with the name or trademark of the manufacturer and cubic capacity as required by the *National Electrical Code*. The marking shall be readily visible after the installation of the box.

NEMA Standard 11-20-1980.

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Section 3

SPECIFIC REQUIREMENTS

3.1 GENERAL

The drawings in this part give minimum and maximum dimensions to assure safe interchangeability with other components.

NEMA Standard 11-20-1980.

Specific details and dimensions for outlet boxes, device boxes, covers, box supports, and accessories should be obtained from the manufacturer.

Authorized Engineering Information 11-20-1980.

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4" Square Single Device	3-21	27
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Authorized Engineering Information 1-15-1986.

*May be factory assembled to bar hangers, or mounting brackets.
Options available:
1. Adjustable or Nonadjustable bar
2. With or without grounding strap

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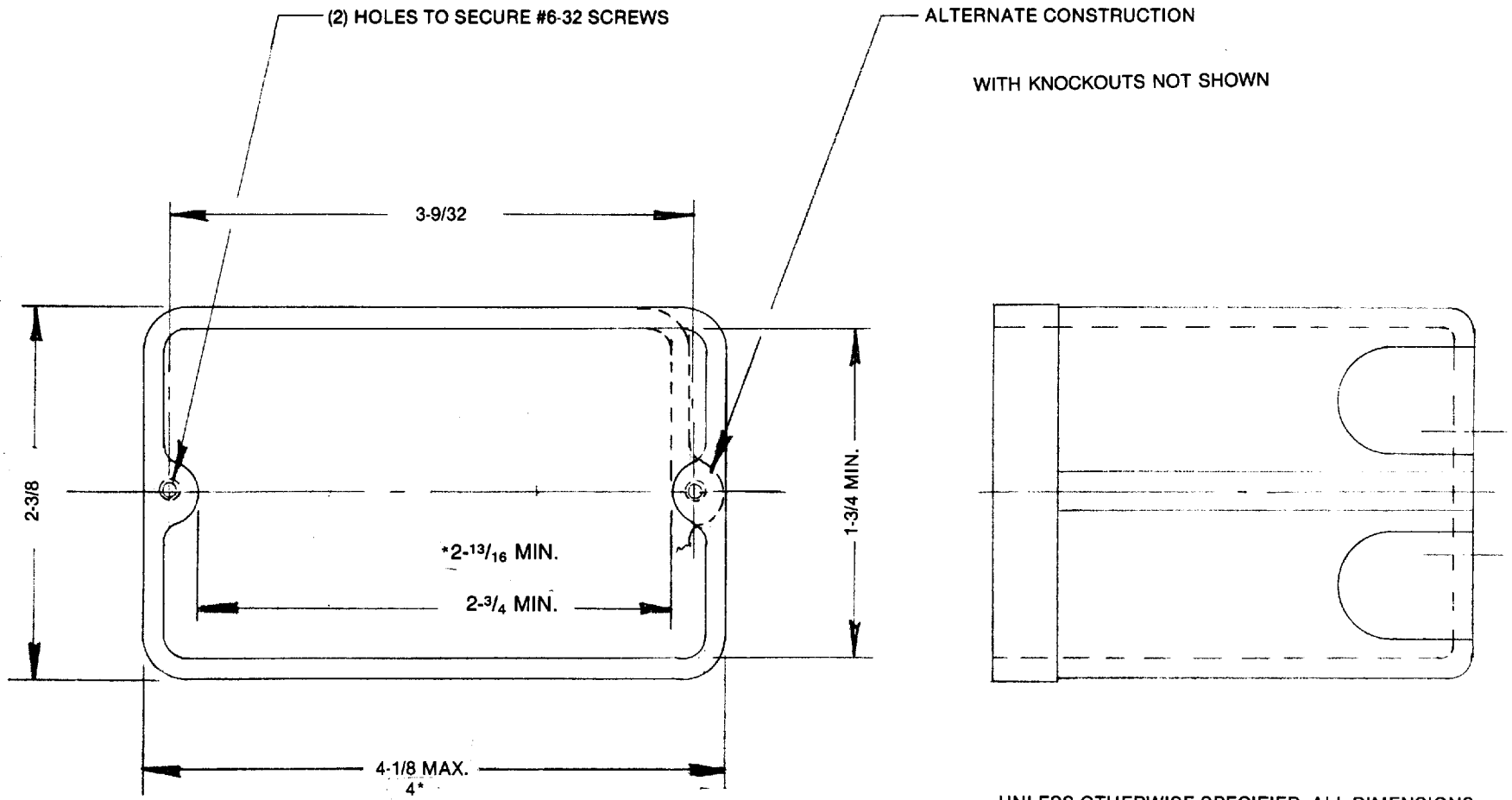
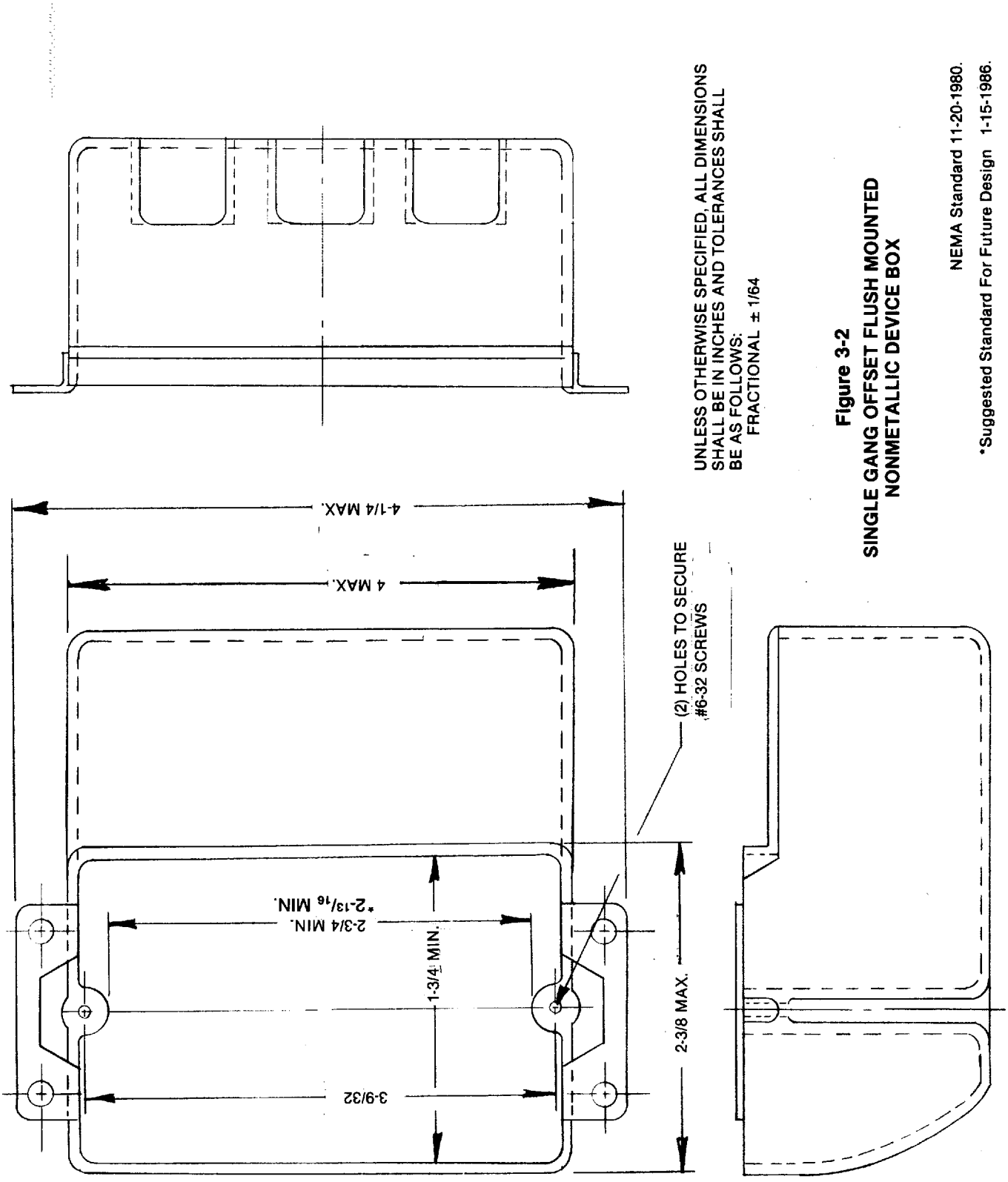


Figure 3-1
SINGLE GANG FLUSH OR SURFACE MOUNTED NONMETALLIC DEVICE BOX
(NO KNOCKOUT LOCATIONS SHOWN)

NEMA Standard 11-20-1980.

*Suggested Standard For Future Design 1-15-1986.



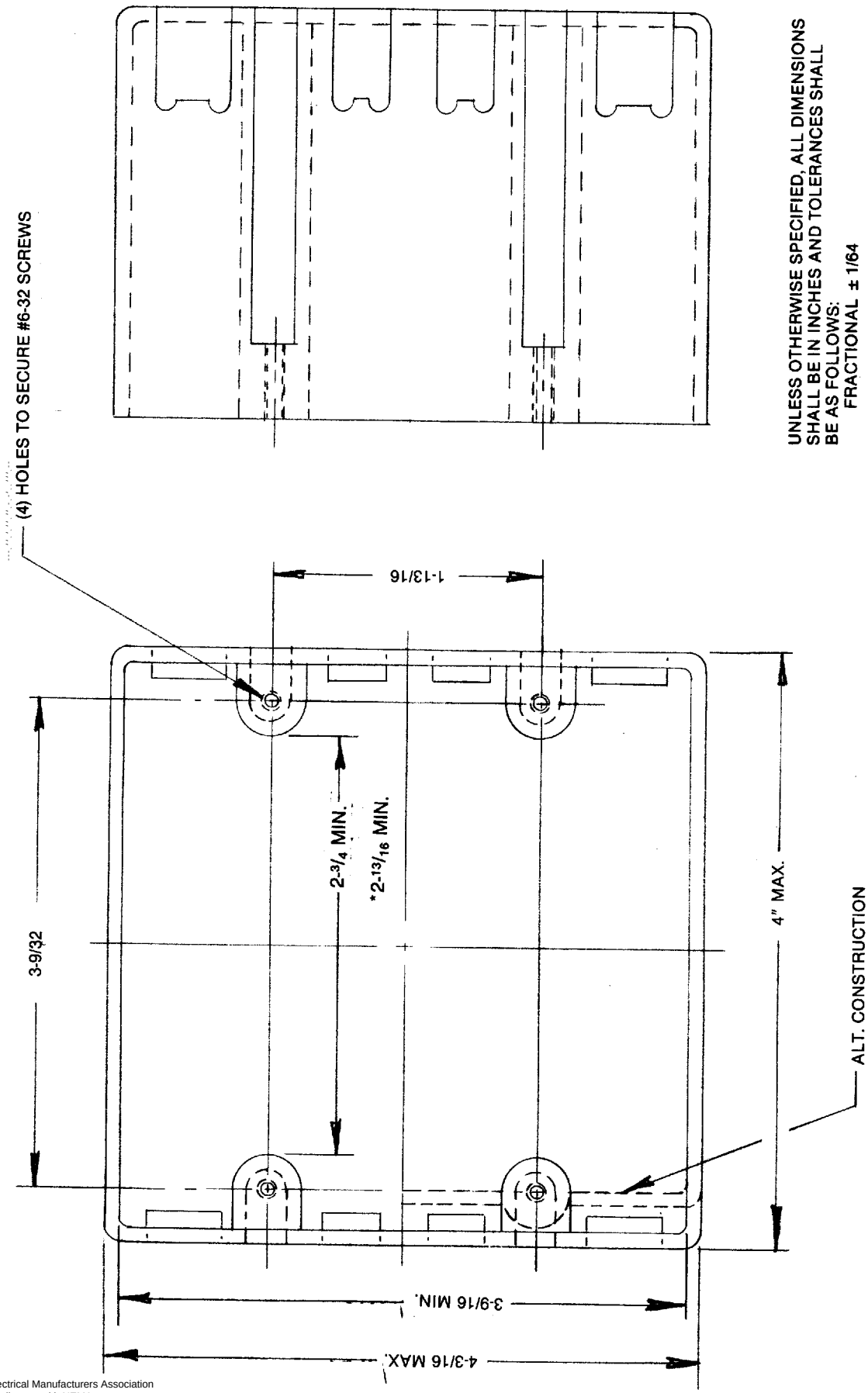
UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS SHALL BE IN INCHES AND TOLERANCES SHALL BE AS FOLLOWS:
FRACTIONAL ± 1/64

Figure 3-2
SINGLE GANG OFFSET FLUSH MOUNTED NONMETALLIC DEVICE BOX

NEMA Standard 11-20-1980.

*Suggested Standard For Future Design 1-15-1986.

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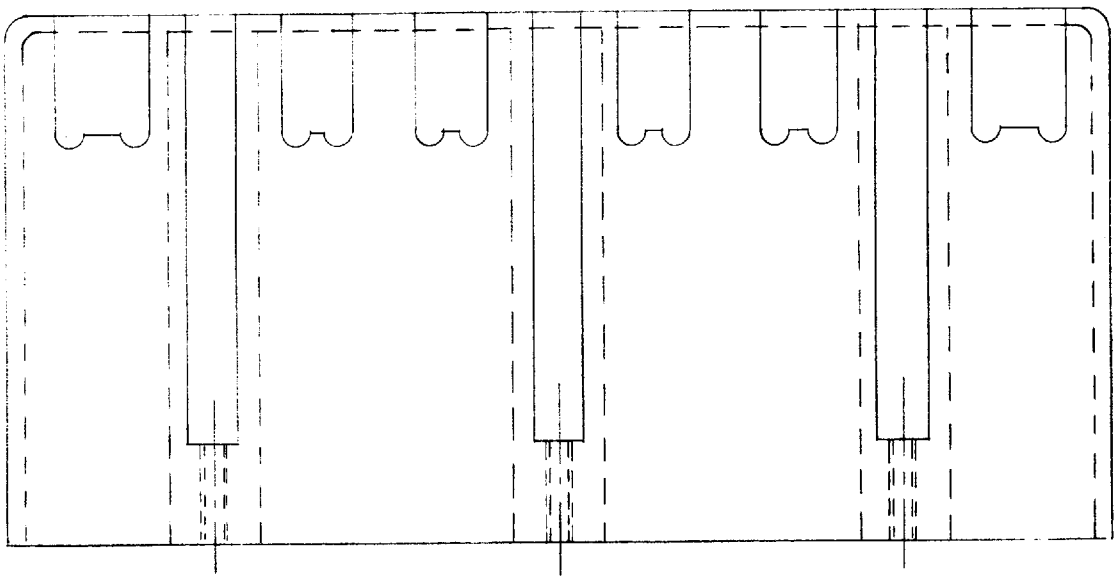
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Figure 3-3
TWO GANG FLUSH MOUNTED NONMETALLIC DEVICE BOX

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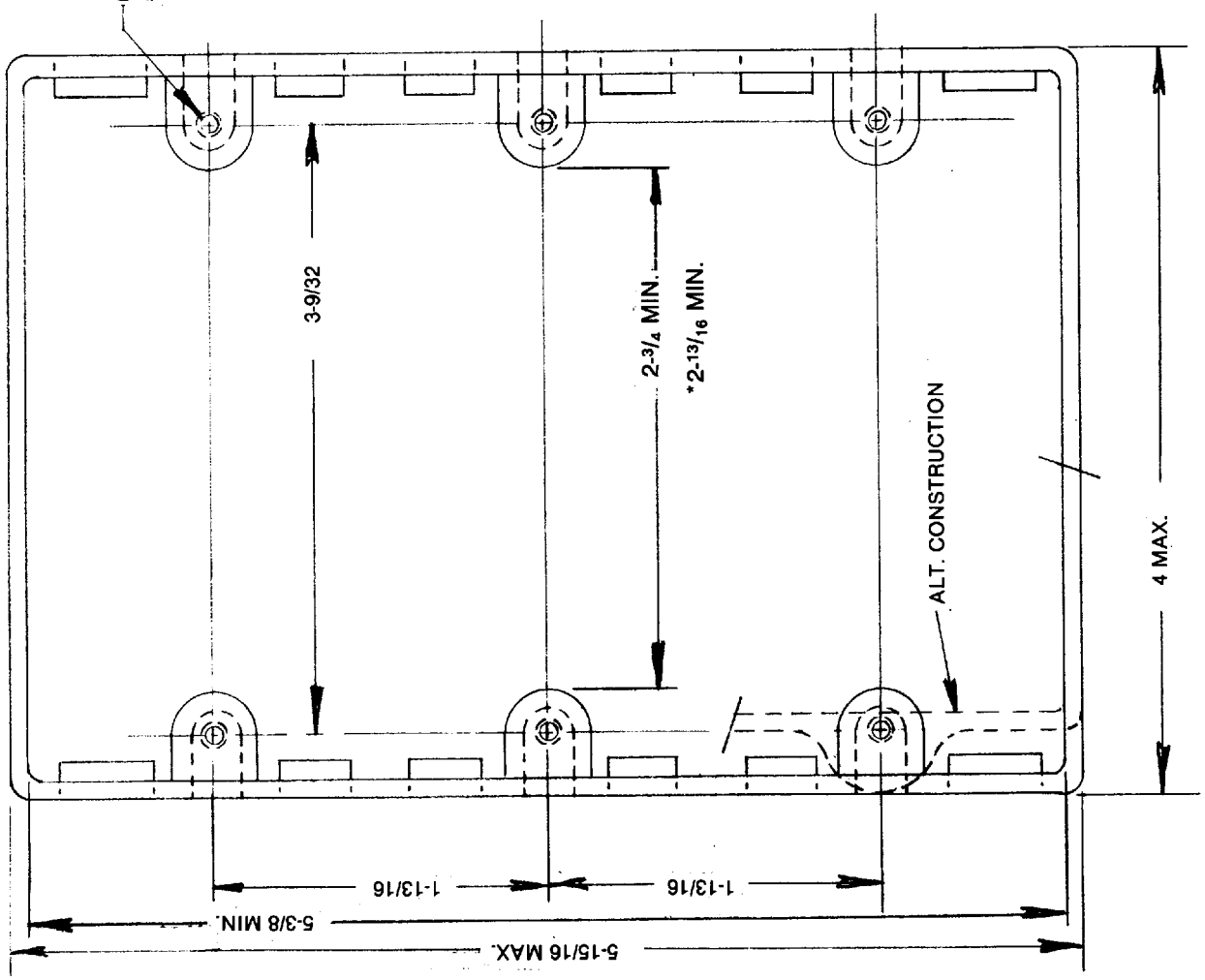


Figure 3-4
THREE GANG FLUSH MOUNTED NONMETALLIC DEVICE BOX

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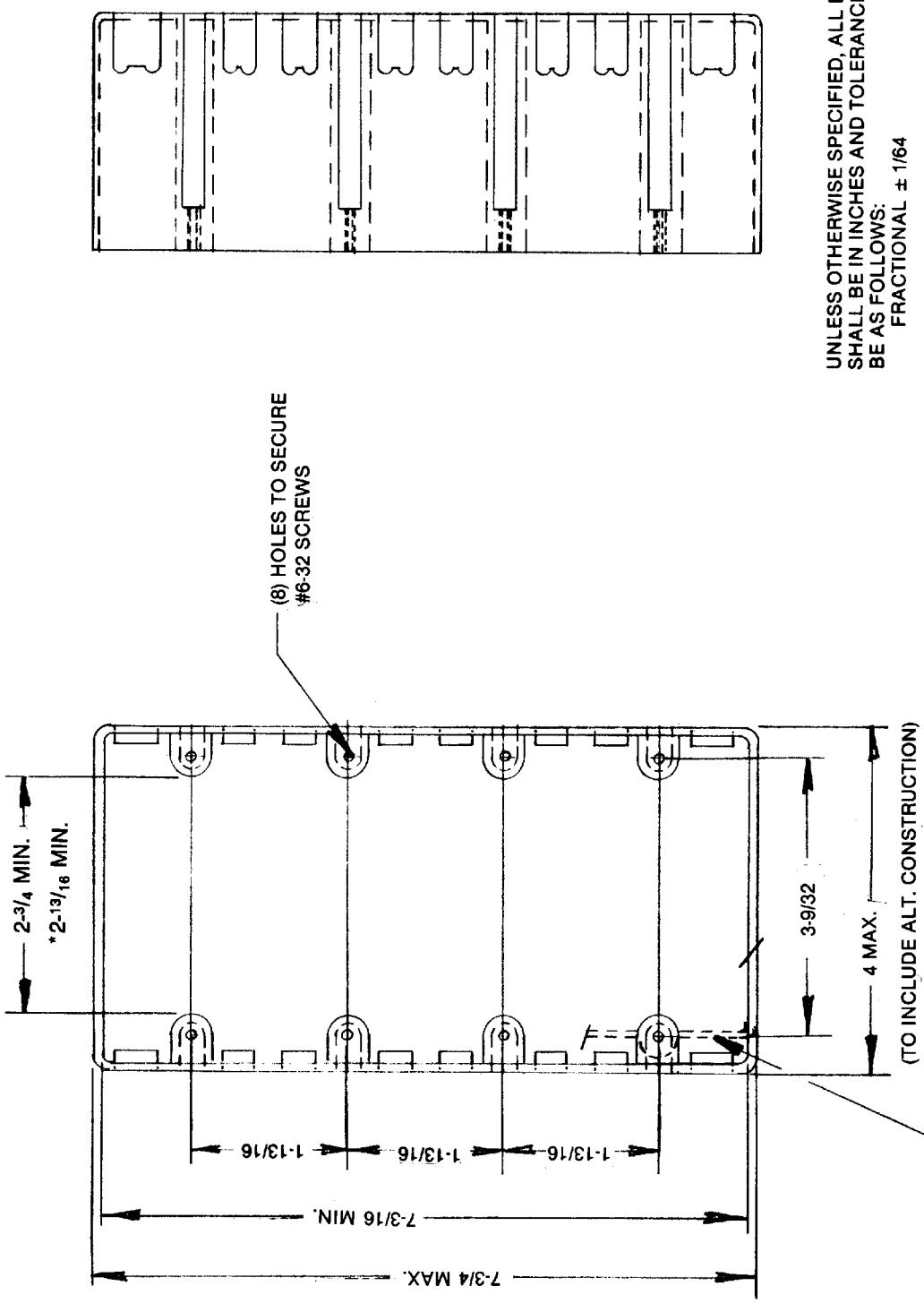
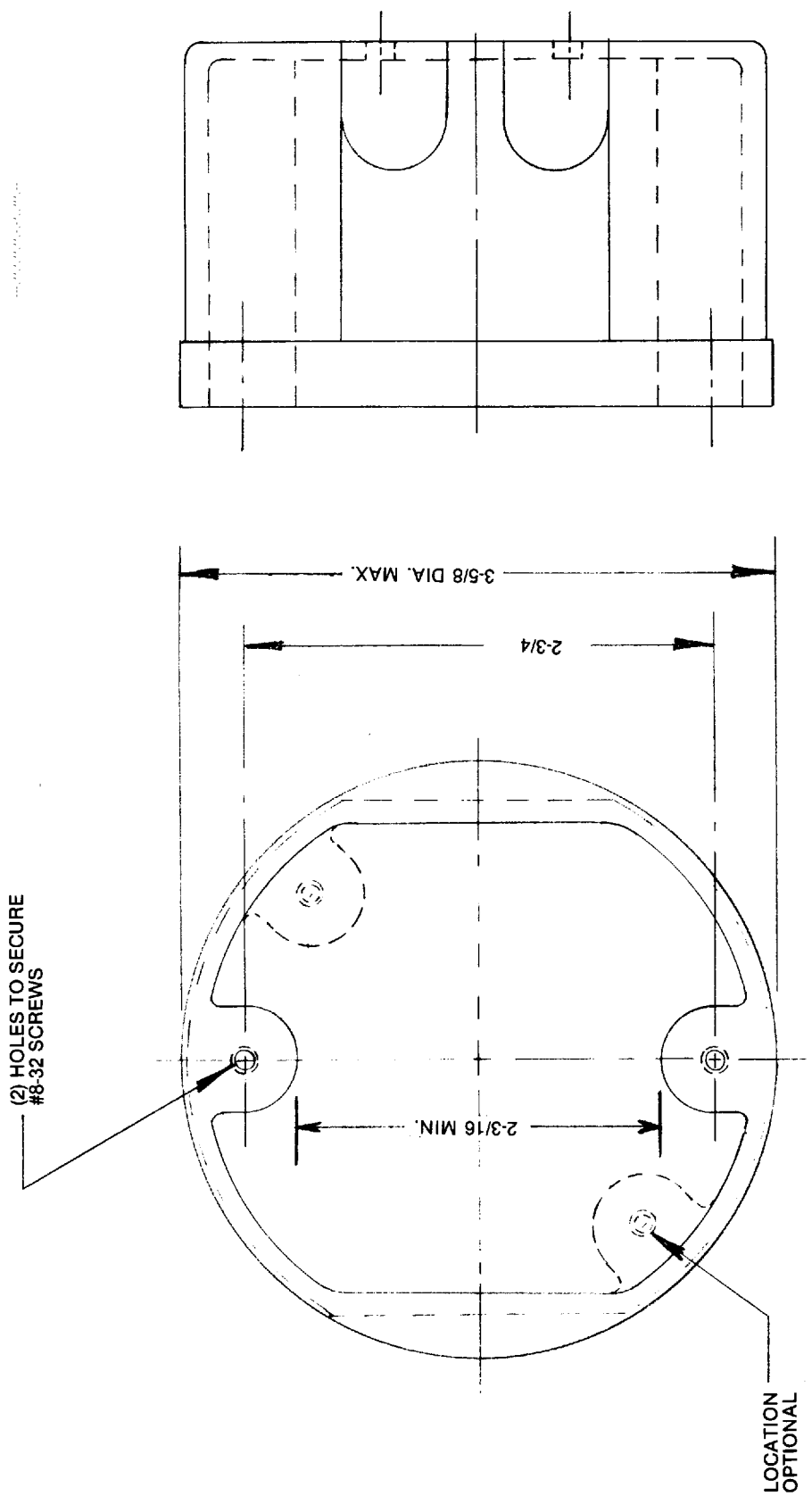


Figure 3-5
FOUR GANG FLUSH MOUNTED NONMETALLIC DEVICE BOX

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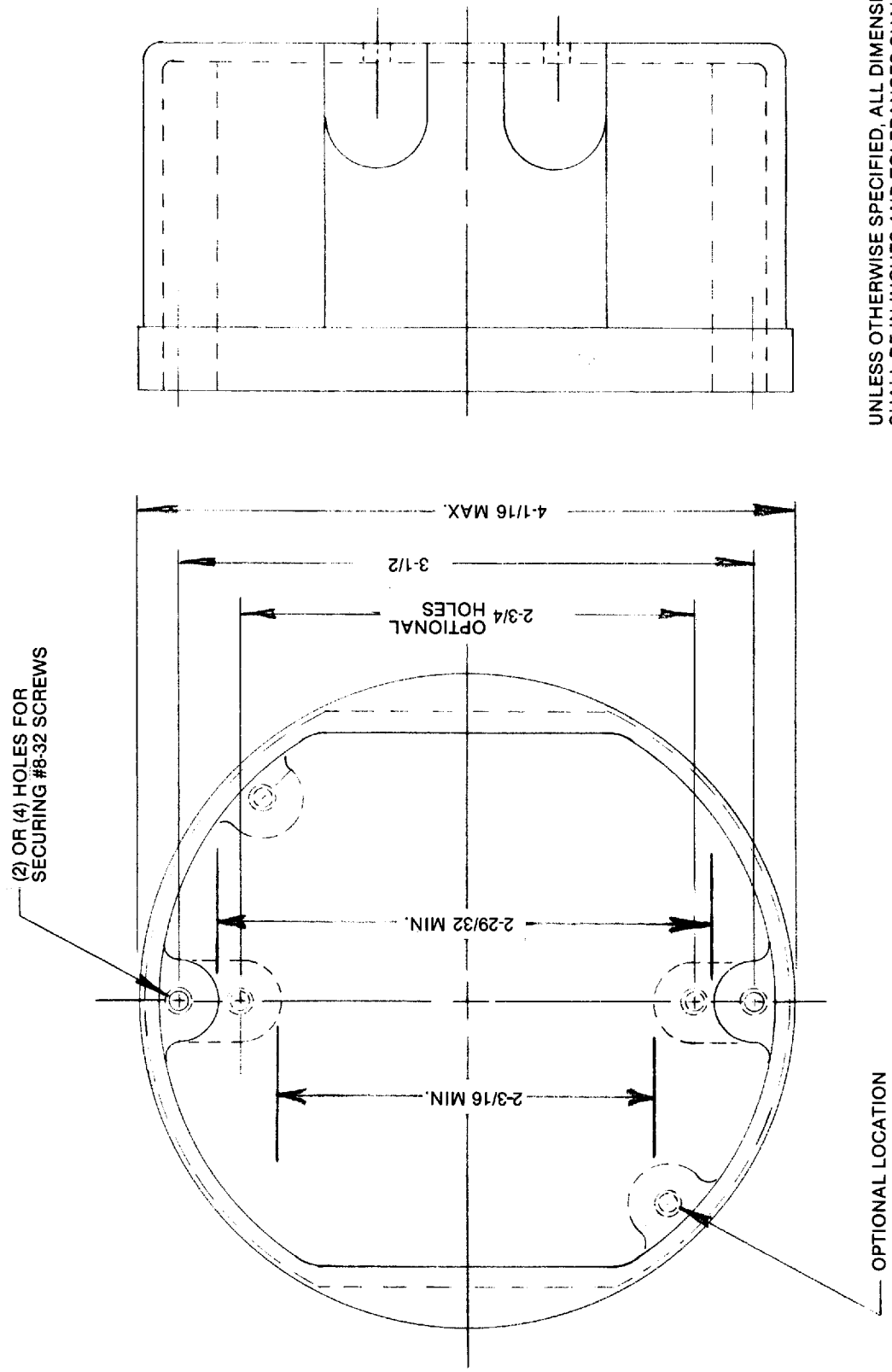


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Figure 3-6
NOMINAL 3-1/4″/3-1/2″ ROUND OR OCTAGONAL NONMETALLIC OUTLET BOX

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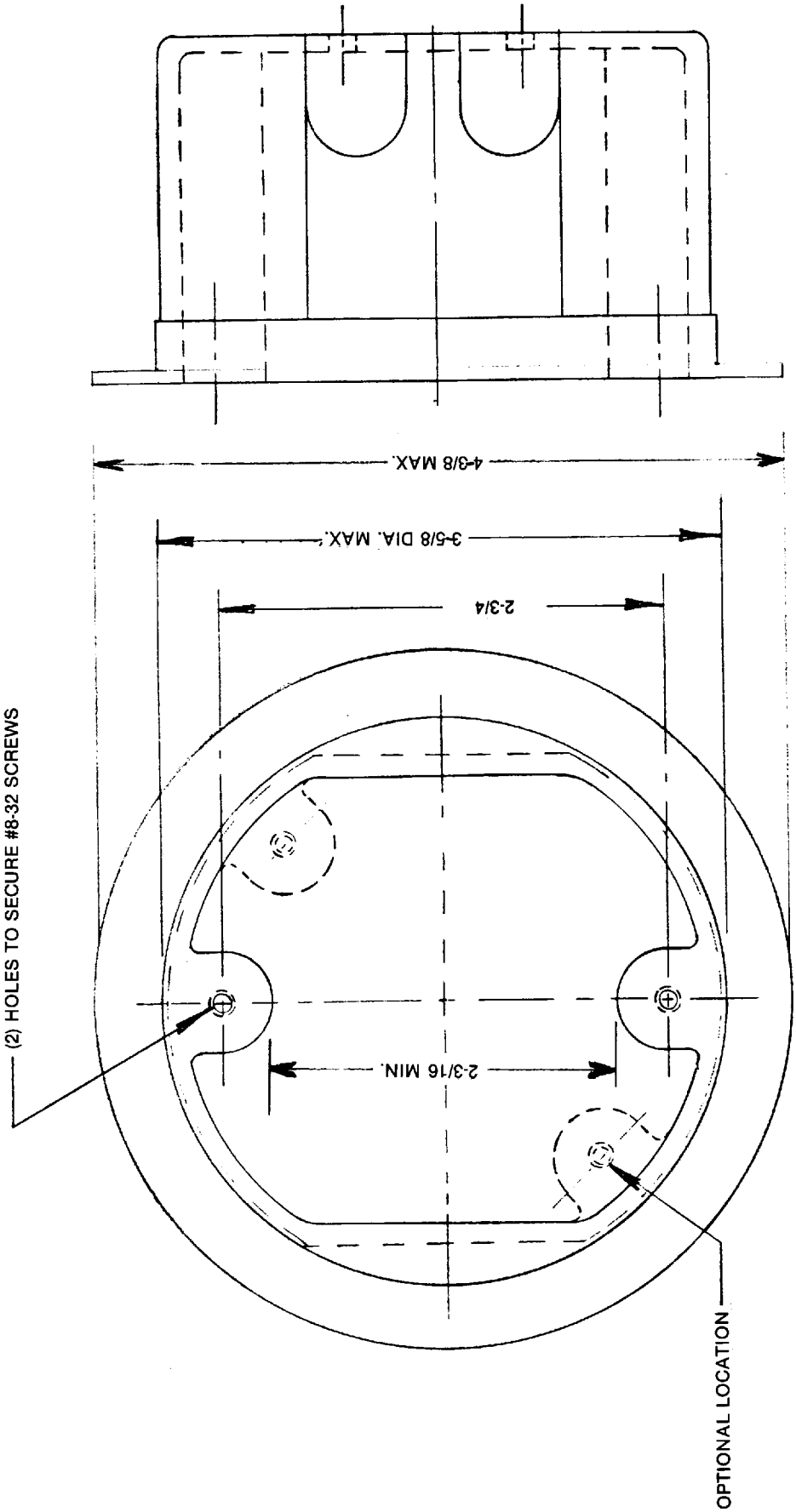


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Figure 3-7
NOMINAL 4" ROUND OR OCTAGONAL NONMETALLIC OUTLET BOX

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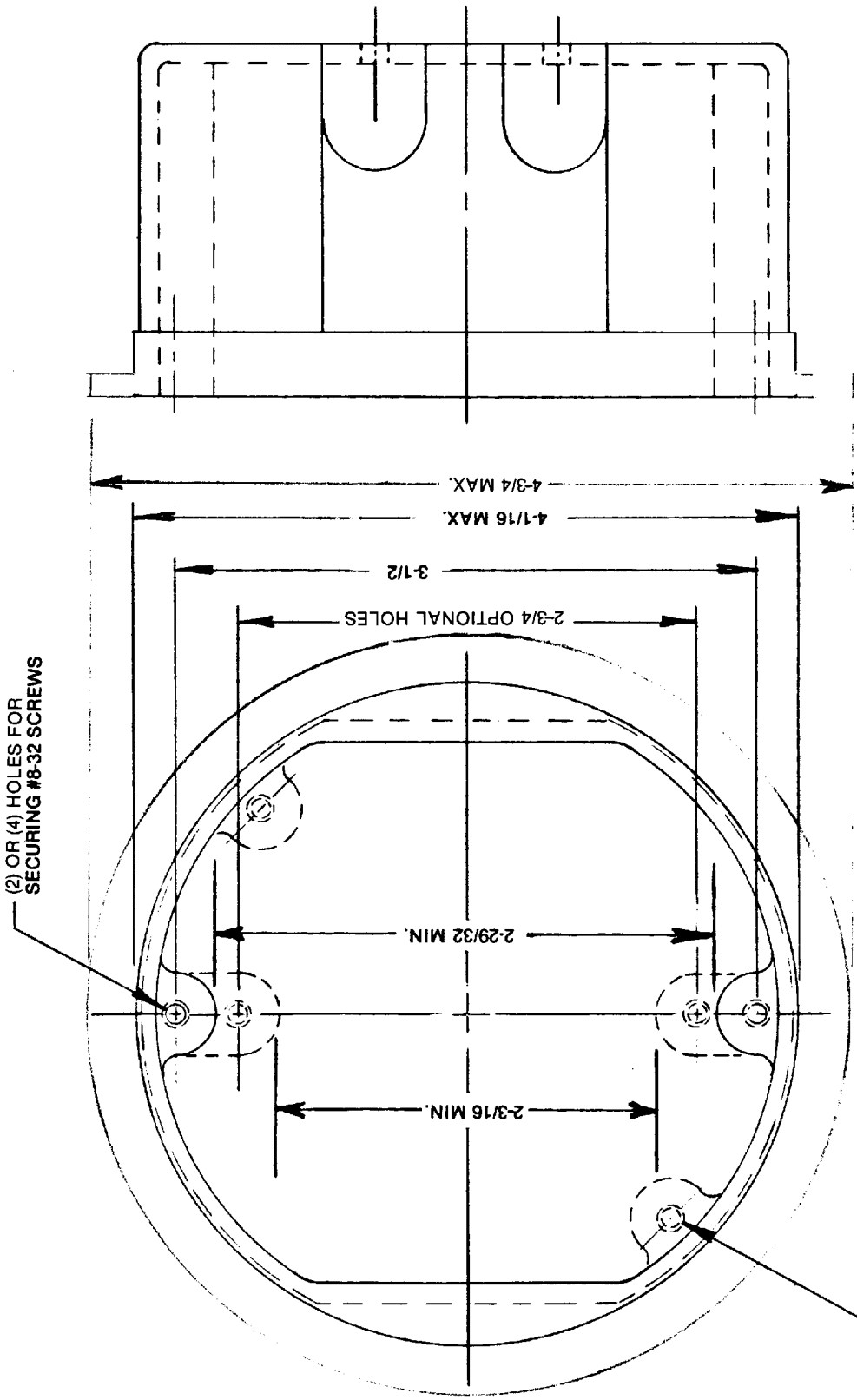


UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS SHALL BE IN INCHES AND TOLERANCES SHALL BE AS FOLLOWS:
FRACTIONAL ± 1/64

NEMA Standard 11-20-1980.

Figure 3-8
NOMINAL 3-1/4″/3-1/2″ ROUND OR OCTAGONAL NONMETALLIC OUTLET BOX WITH FLANGE

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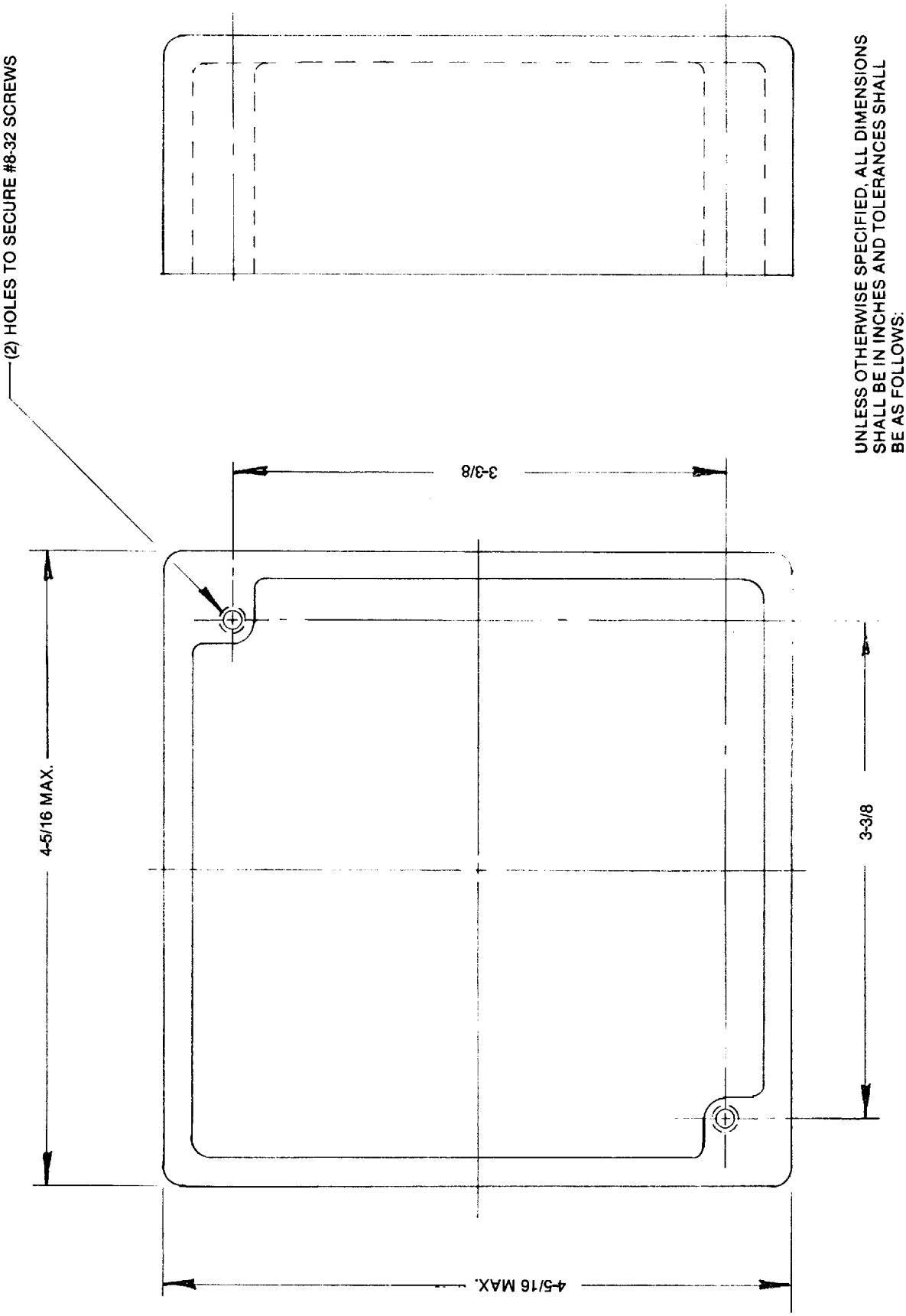


UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS SHALL BE IN INCHES AND TOLERANCES SHALL BE AS FOLLOWS:
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Figure 3-9
NOMINAL 4" ROUND OR OCTAGONAL NONEMTALLIC OUTLET BOX WITH FLANGE

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Figure 3-10
NOMINAL 4" SQUARE NONMETALLIC OUTLET BOX
(NO KNOCKOUT LOCATIONS SHOWN)

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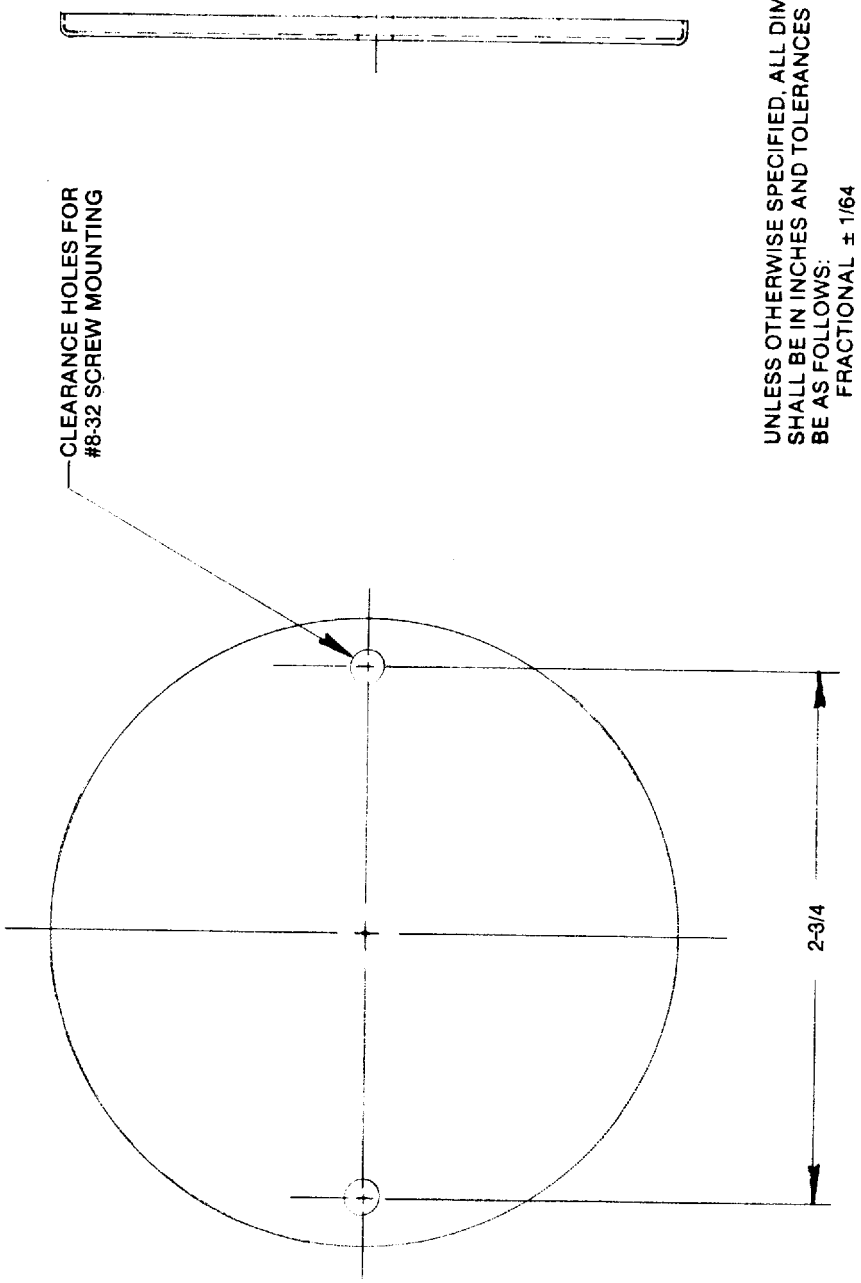


Figure 3-11
FLAT BLANK NONMETALLIC COVER FOR NOMINAL 3-1/4″/3-1/2″ ROUND OR OCTAGONAL OUTLET BOX

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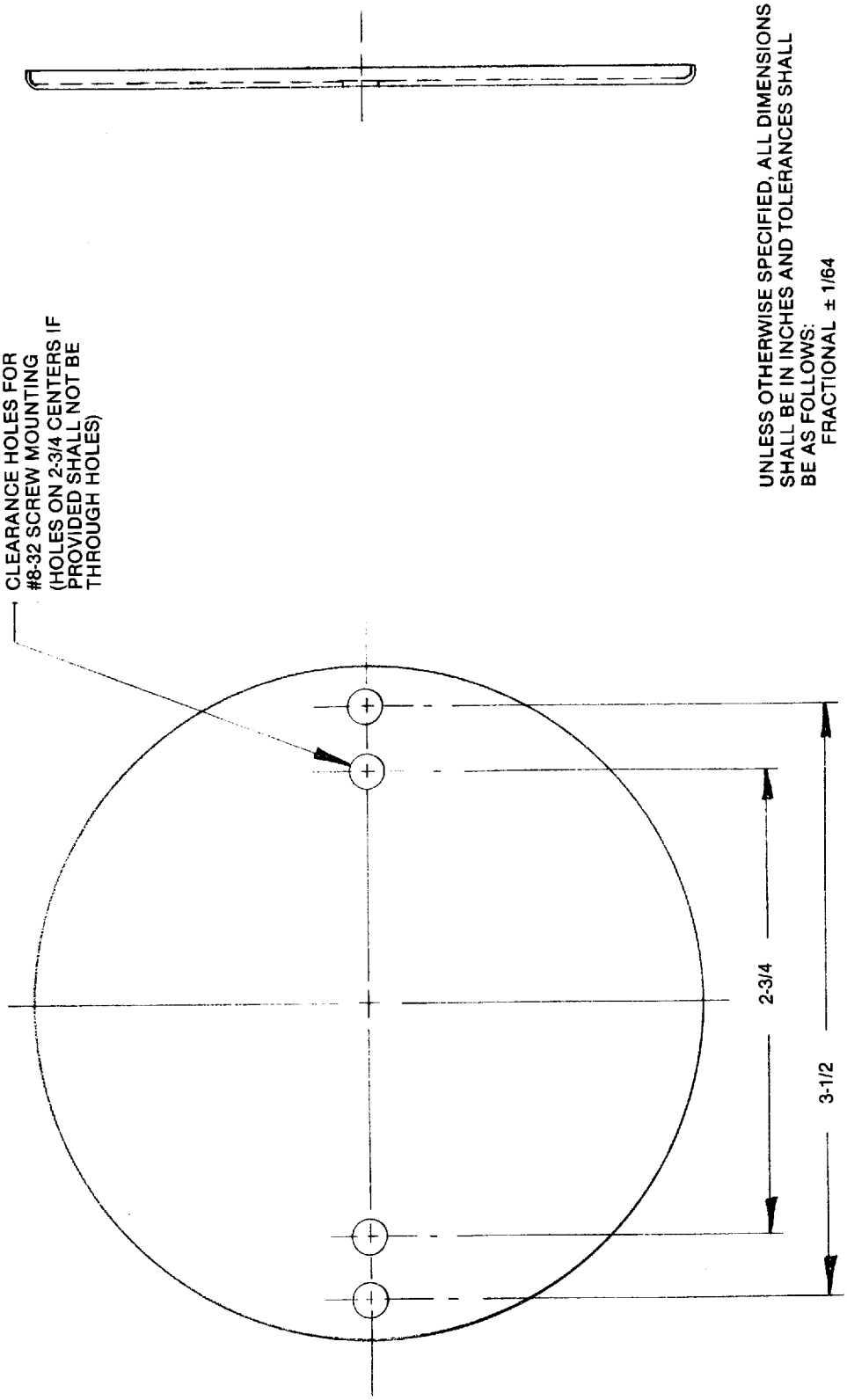


Figure 3-12
FLAT BLANK NONMETALLIC COVER FOR NOMINAL 3-1/4″, 3-1/2″, 4″ ROUND OR OCTAGONAL OUTLET BOX

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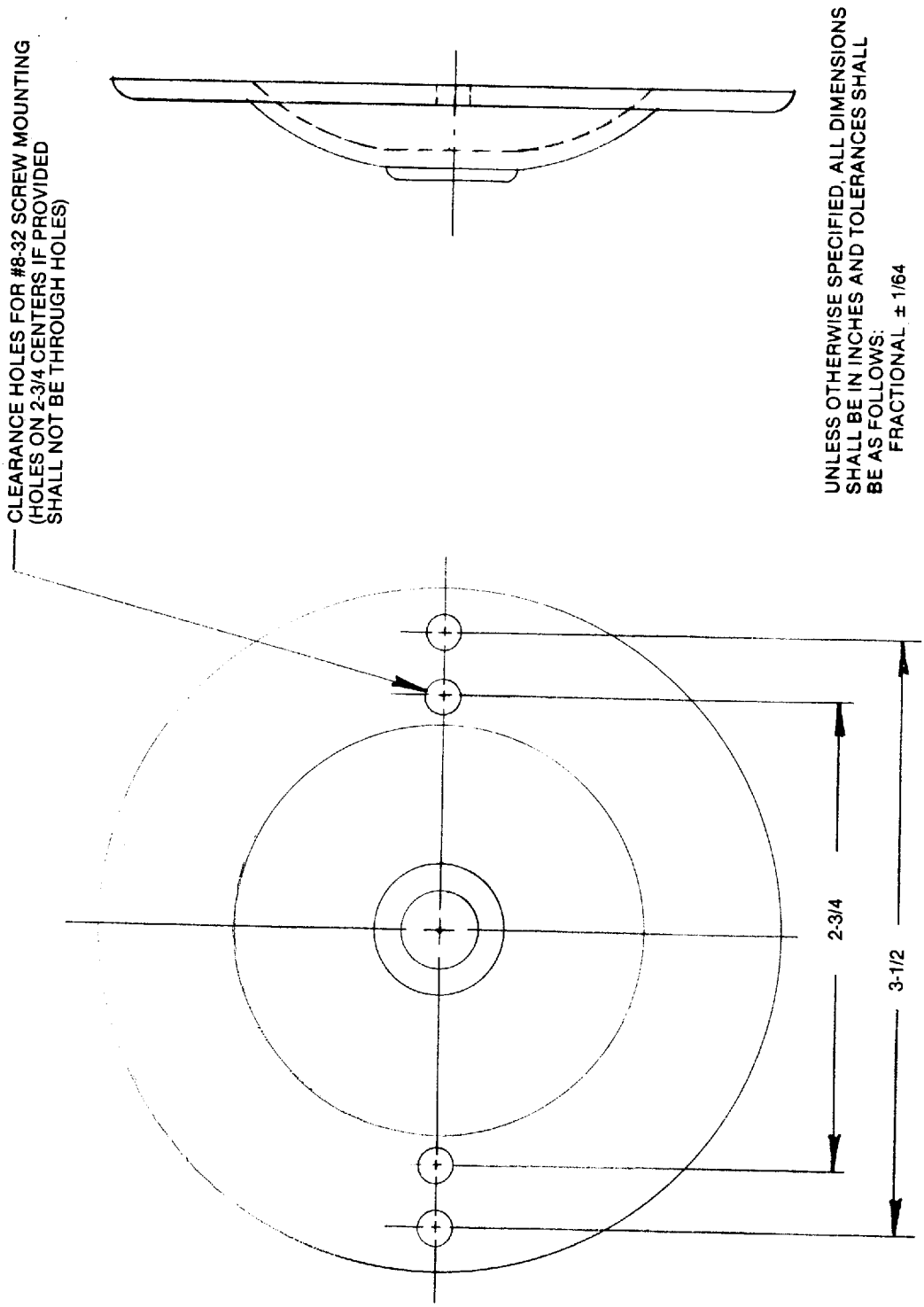
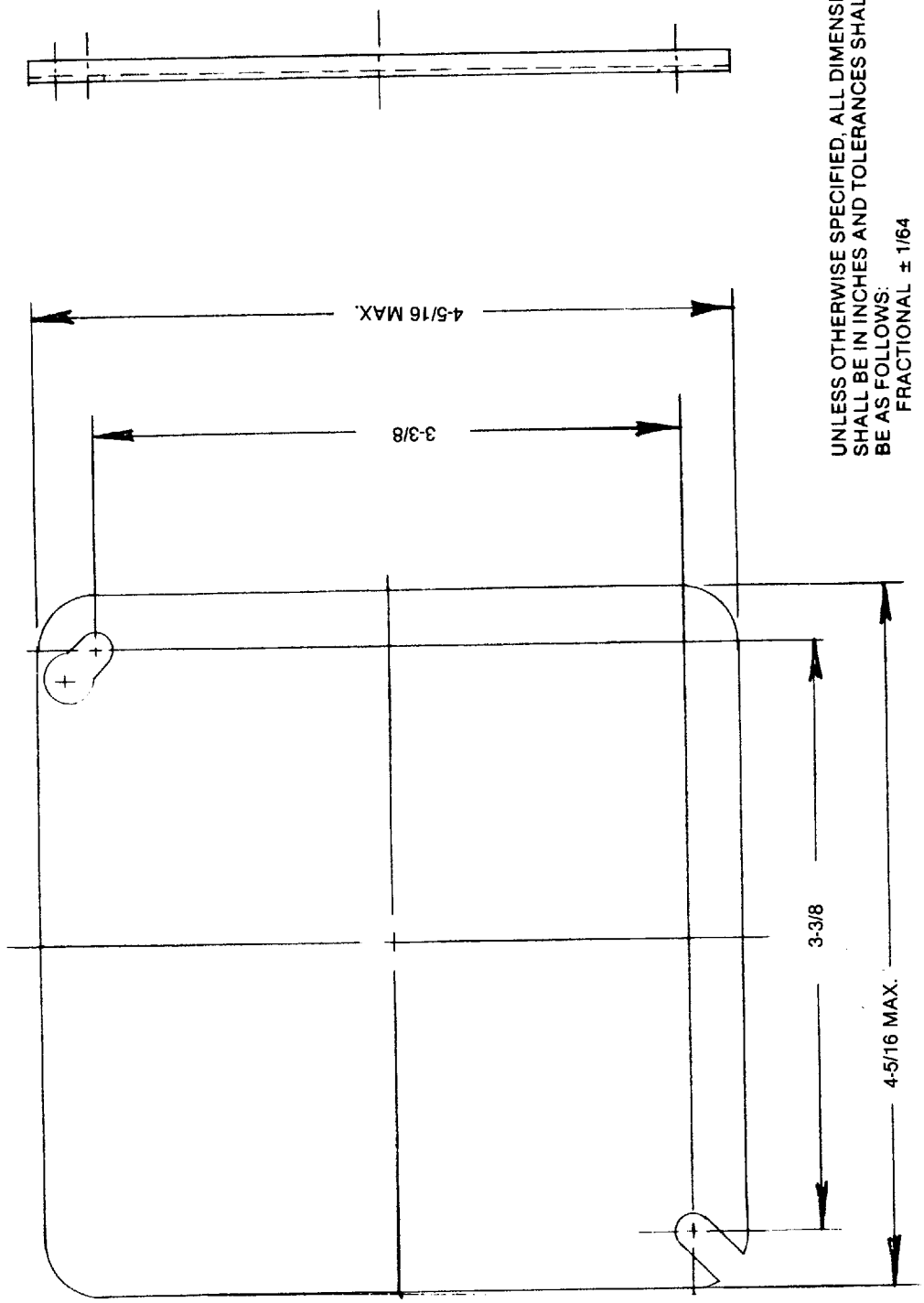


Figure 3-13
RAISED BLANK OR CORD DROP NONMETALLIC COVER FOR 3-1/4", 3-1/2", AND 4" ROUND OR OCTAGONAL OUTLET BOX

NEMA Standard 11-20-1980.

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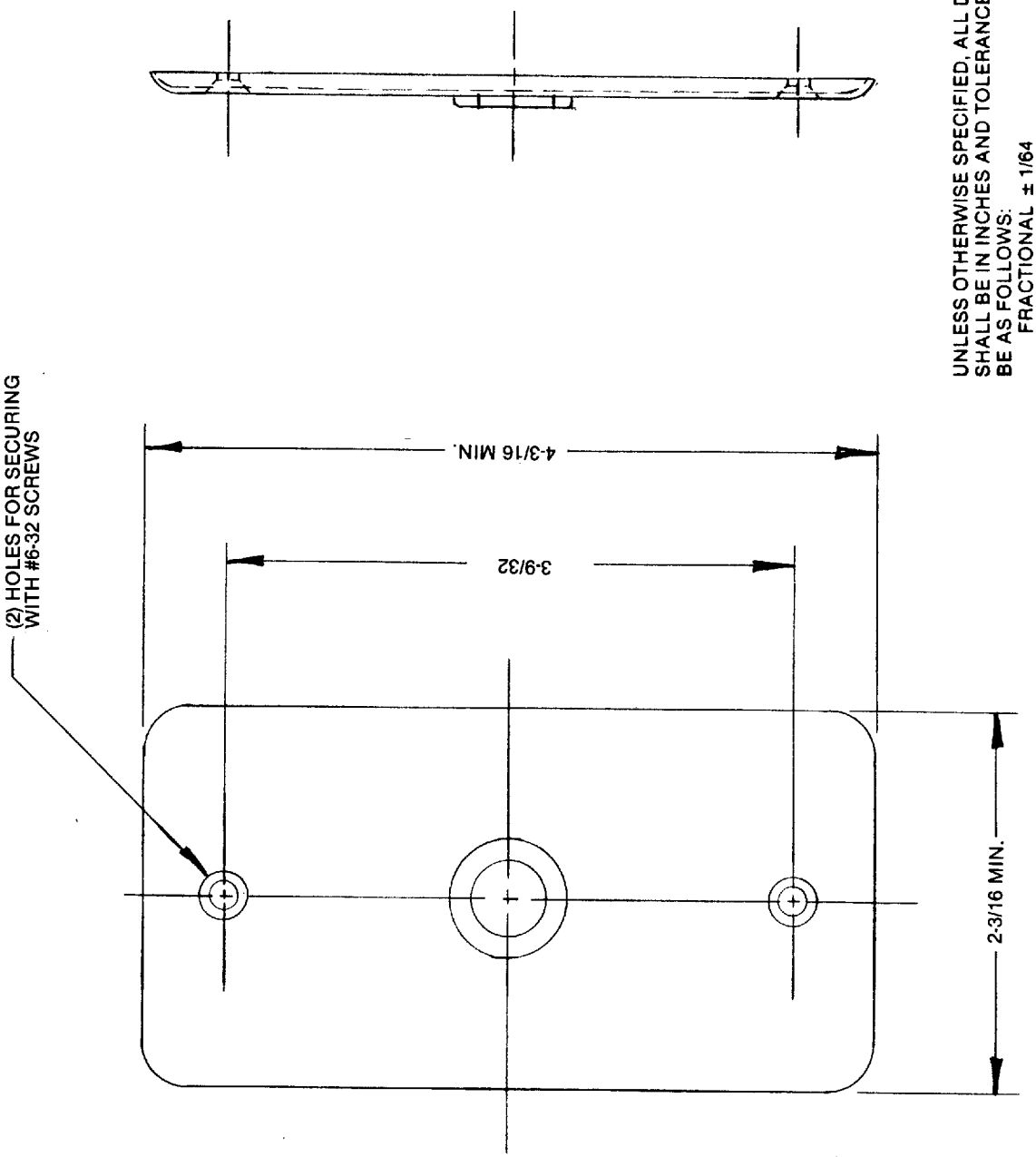


UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS SHALL BE IN INCHES AND TOLERANCES SHALL BE AS FOLLOWS:
FRACTIONAL ± 1/64

Figure 3-14
FLAT BLANK NONMETALLIC COVER FOR 4" SQUARE OUTLET BOX

NEMA Standard 11-20-1980.

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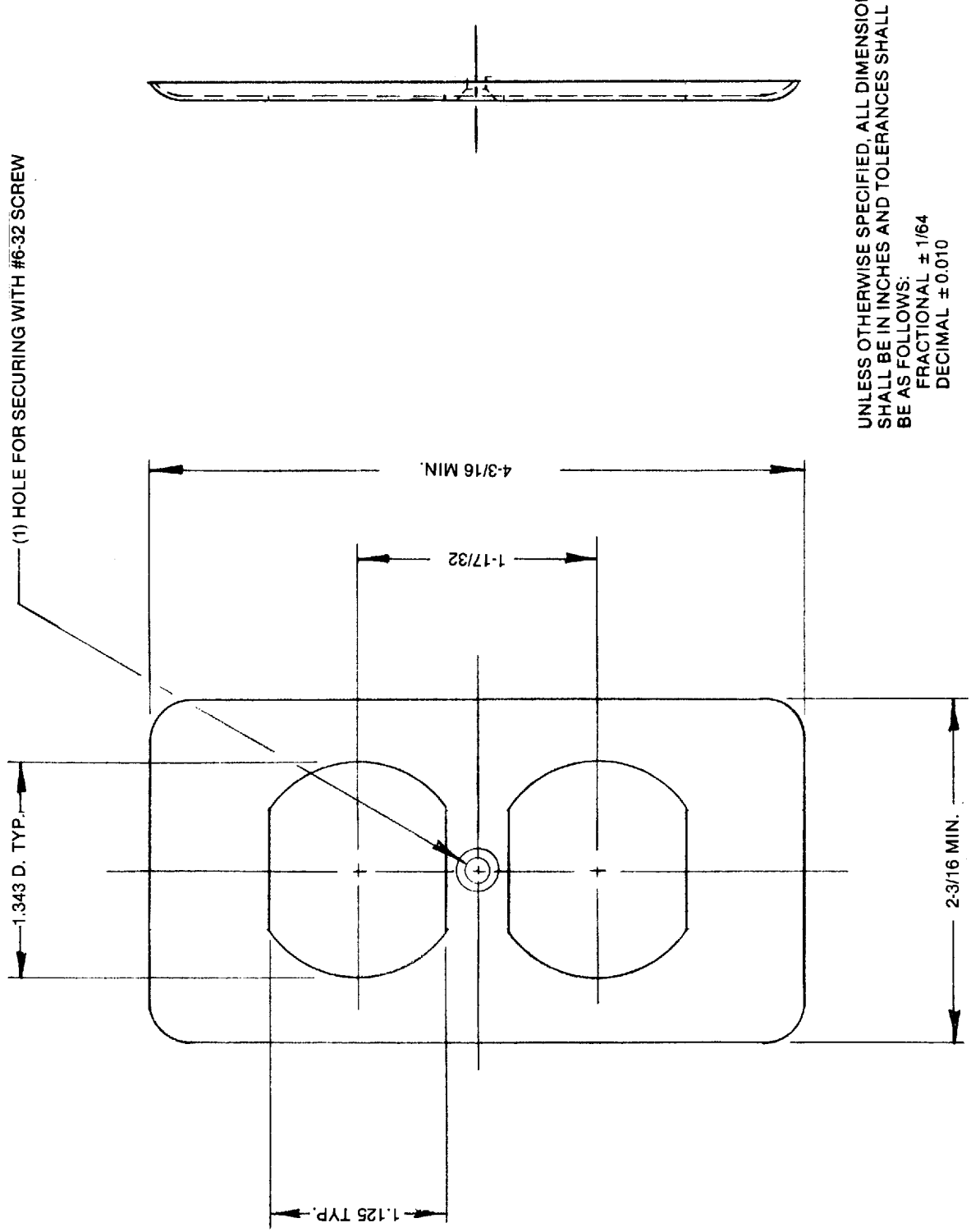


UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS SHALL BE IN INCHES AND TOLERANCES SHALL BE AS FOLLOWS:
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NEMA Standard 11-20-1980.

Figure 3-15
NONMETALLIC BLANK OR PENDANT COVER FOR SURFACE MOUNTED DEVICE BOXES

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UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS SHALL BE IN INCHES AND TOLERANCES SHALL BE AS FOLLOWS:
FRACTIONAL ± 1/64
DECIMAL ± 0.010

NEMA Standard 11-20-1980.

Figure 3-16
NONMETALLIC DUPLEX RECEPTACLE COVER FOR SURFACE MOUNTED DEVICE BOXES

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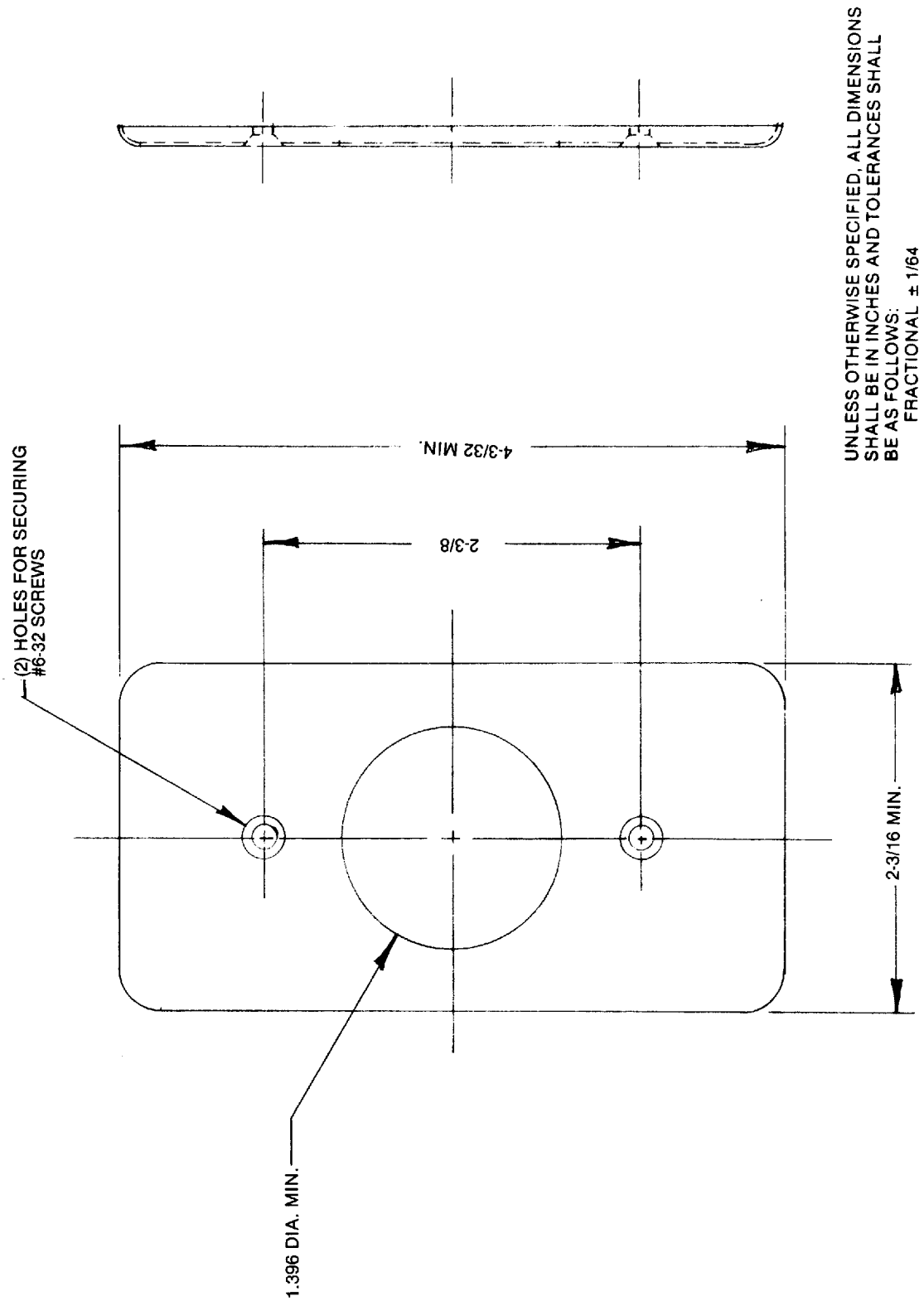
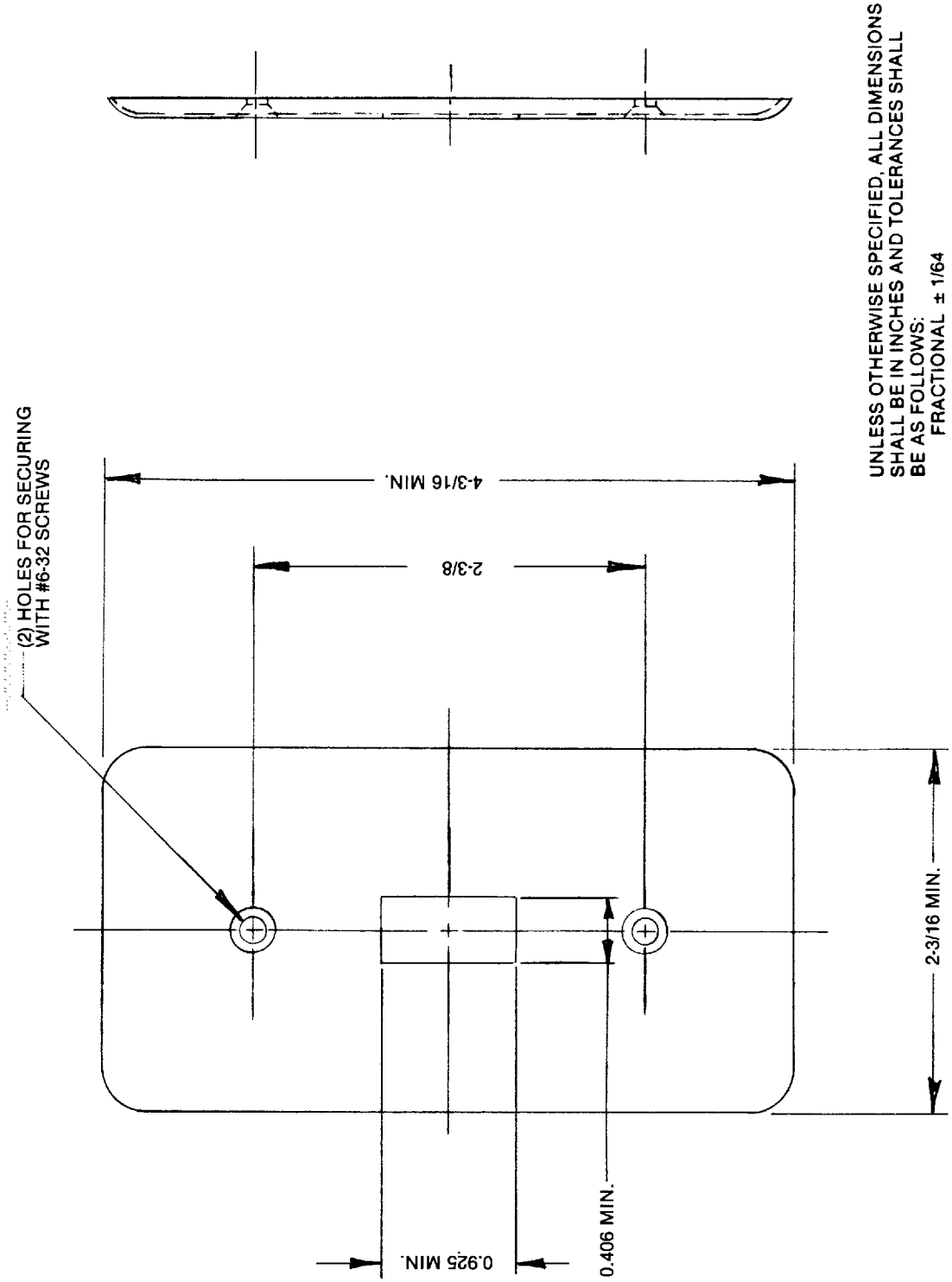


Figure 3-17
NONMETALLIC SINGLE RECEPTACLE COVER FOR SURFACE MOUNTED DEVICE BOXES

NEMA Standard 11-20-1980.

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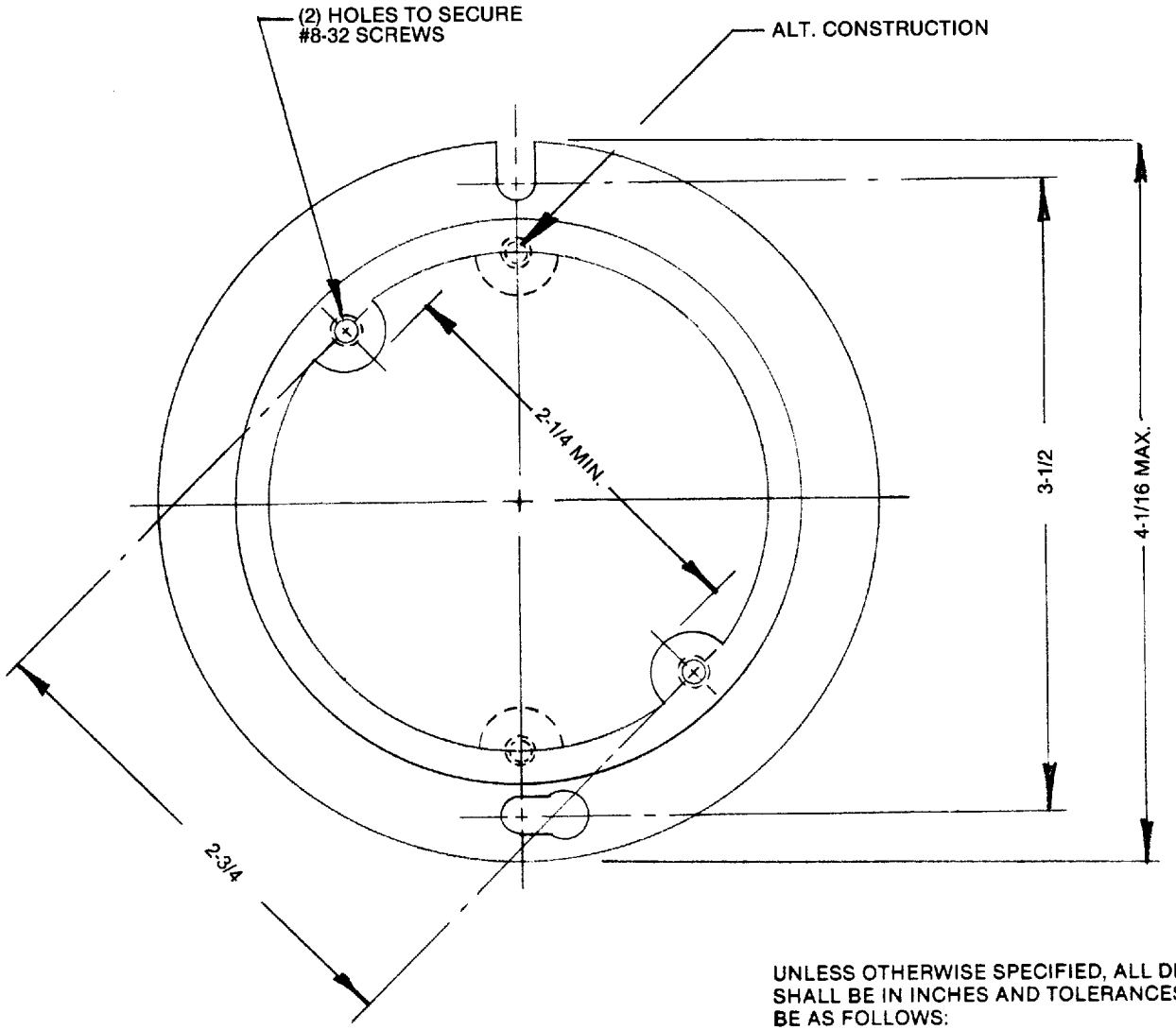
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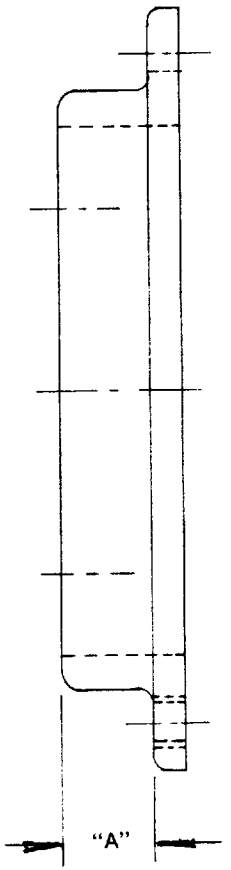
NEMA Standard 11-20-1980.

Figure 3-18
NONMETALLIC TOGGLE SWITCH COVER FOR SURFACE MOUNTED DEVICE BOXES

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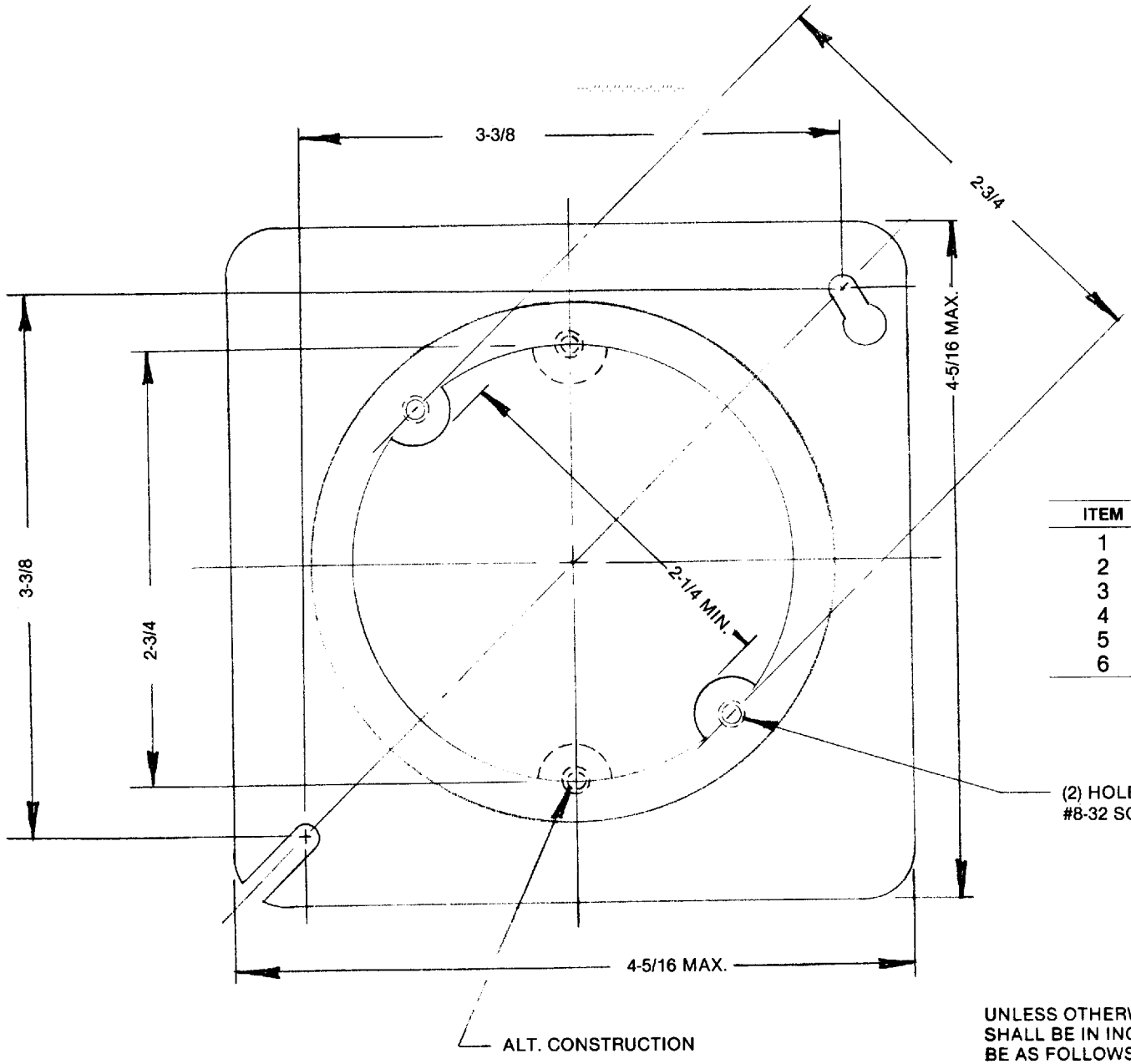


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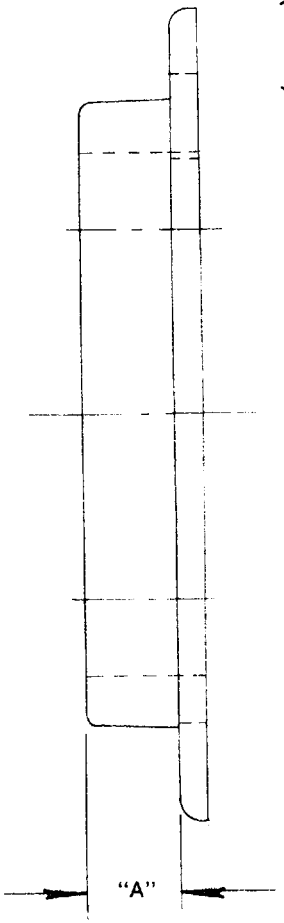
ITEM	A
1	3/8
2	1/2
3	5/8
4	3/4
5	1
6	1-1/4

Figure 3-19
RAISED FIXTURE ATTACHMENT NONMETALLIC COVER FOR 4″ ROUND OR OCTAGONAL OUTLET BOX

NEMA Standard 11-20-1980.



ITEM	A
1	3/8
2	1/2
3	5/8
4	3/4
5	1″
6	1-1/4



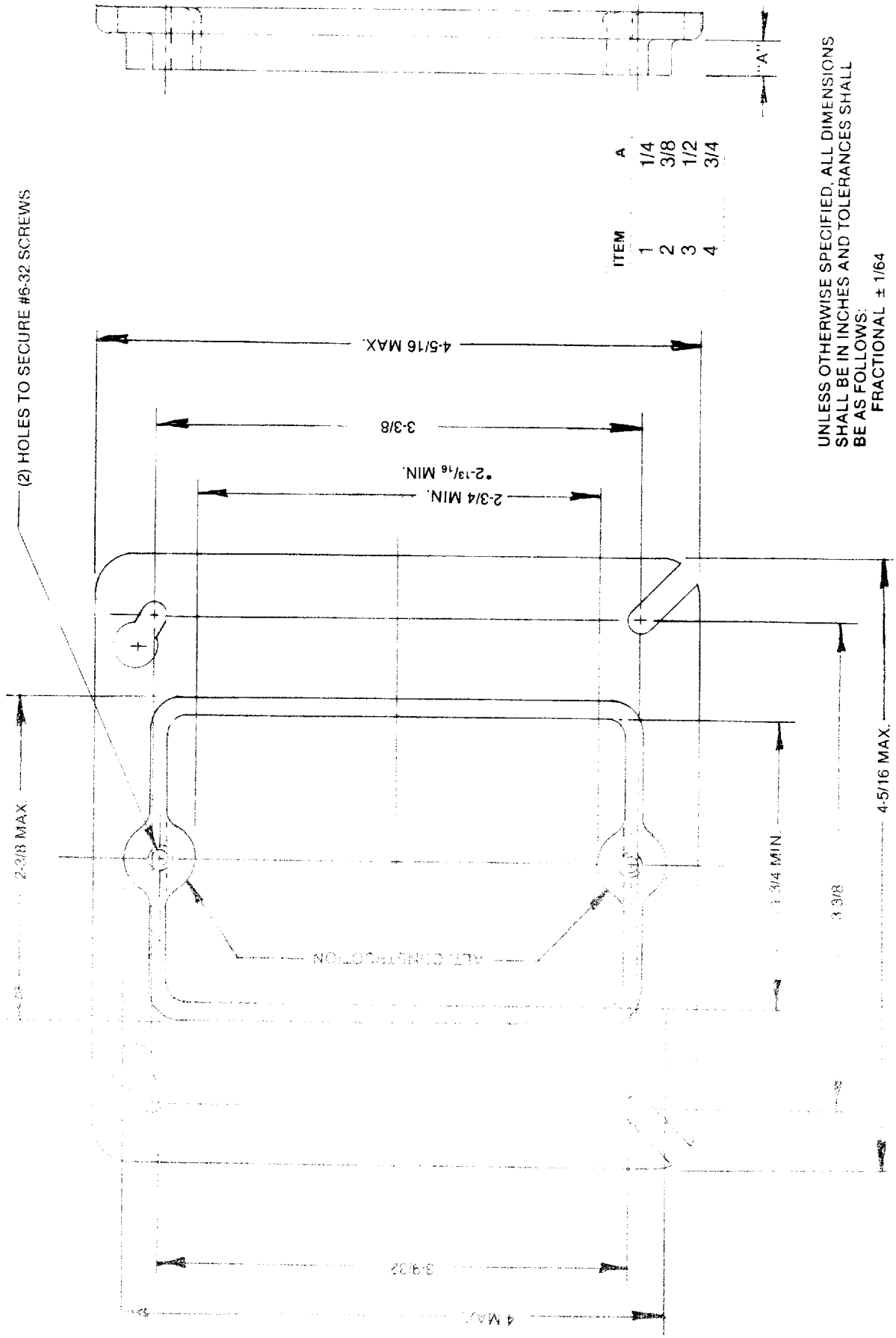
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FRACTIONAL ± 1/64

Figure 3-20
RAISED FIXTURE ATTACHMENT NONMETALLIC COVER FOR 4″ SQUARE OUTLET BOX

NEMA Standard 11-20-1980.

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ITEM	A
1	1/4
2	3/8
3	1/2
4	3/4

UNLESS OTHERWISE SPECIFIED, ALL DIMENSIONS SHALL BE IN INCHES AND TOLERANCES SHALL BE AS FOLLOWS:
FRACTIONAL ± 1/64

NEMA Standard 11-20-1980.
*Suggested Standard For Future Design 1-15-1986.

Figure 3-21
RAISED SINGLE-DEVICE NONMETALLIC COVER FOR 4" SQUARE OUTLET BOX

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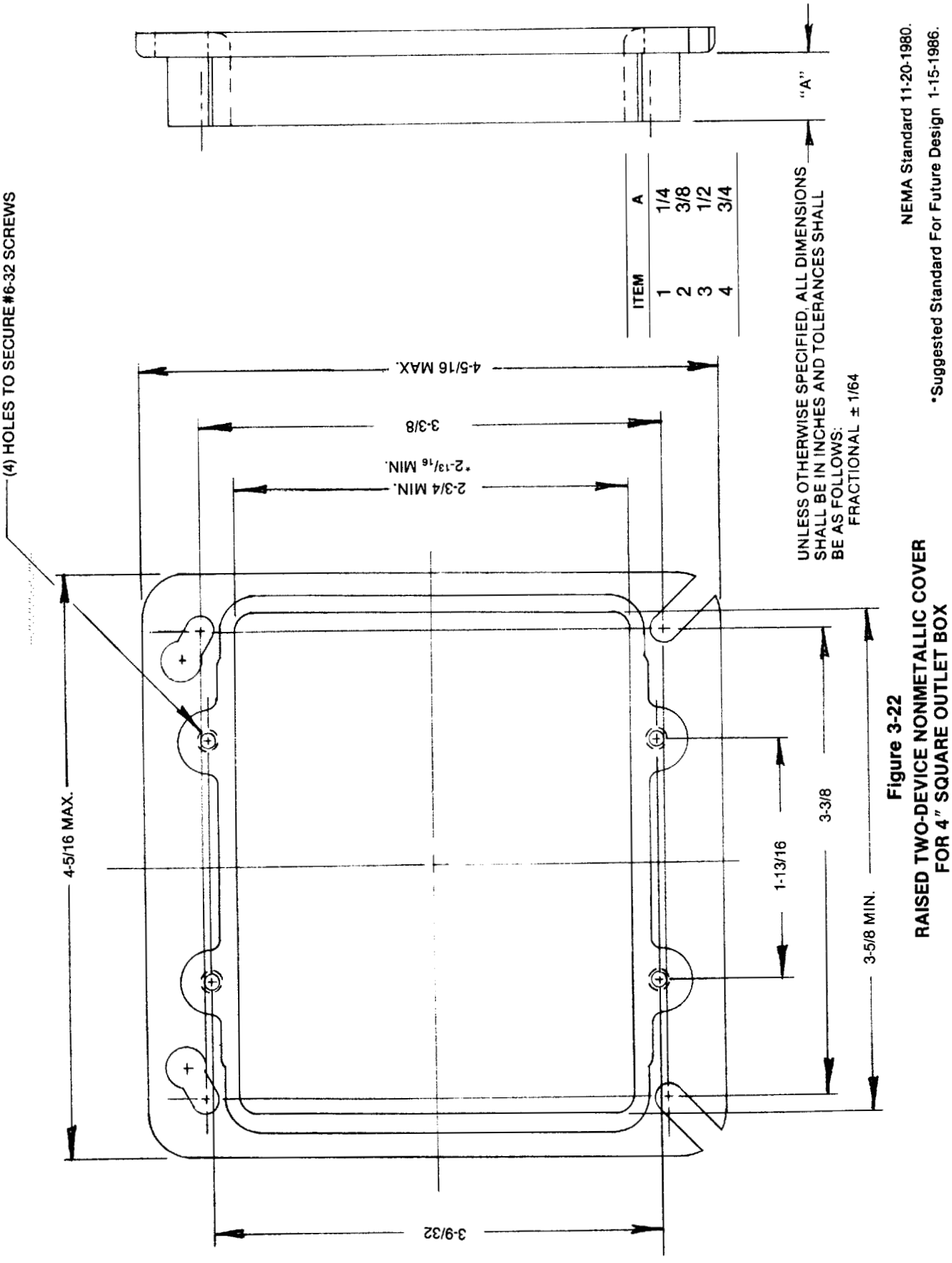


Figure 3-22
RAISED TWO-DEVICE NONMETALLIC COVER FOR 4″ SQUARE OUTLET BOX

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NEMA STANDARDIZATION

The purpose of NEMA Standards, their classification and status are set forth in certain clauses of the NEMA *Standardization Policies and Procedures* manual and are referenced below:

Purpose of Standards

National Electrical Manufacturers Association Standards are adopted in the public interest and are designed to eliminate misunderstandings between the manufacturer and the purchaser and to assist the purchaser in selecting and obtaining the proper product for their particular needs. Existence of a National Electrical Manufacturers Association Standard does not in any respect preclude any member or nonmember from manufacturing or selling products not conforming to the standard.

(Standardization Policies and Procedures, p. 1)

Definition of a Standard

A standard of the National Electrical Manufacturers Association defines a product, process or procedure with reference to one or more of the following: nomenclature, composition, construction, dimensions, tolerances, safety, operating characteristics, performance, rating, testing, and the service for which they are designed.

(Standardization Policies and Procedures, p. 2)

Dimensions

Where dimensions are given for interchangeability purposes, alternate dimensions satisfying the other provisions of the Standards Publication may be capable of otherwise equivalent performance.

(Standardization Policies and Procedures, p. 8)

Categories of Standards

National Electrical Manufacturers Association Standards are of three classes:

1. NEMA Standard, which relates to a product, process or procedure commercially standardized and subject to repetitive manufacture, which standard has been approved by at least 90 percent of the members of the Subdivision eligible to vote thereon;
2. Suggested Standard for Future Design, which may not have been regularly applied to a commercial product, but which suggests a sound engineering approach to future development, which standard has been approved by at least two-thirds of the members of the Subdivision eligible to vote thereon.
3. Adoptive Standard, which is adopted in whole or in part from the standards of another organization, either domestic, regional, or international.

(Standardization Policies and Procedures, pp 7 & 16)

Authorized Engineering Information

Authorized Engineering Information consists of explanatory data and other engineering information of an informative character not falling within the classification of NEMA Standard or Suggested Standard for Future Design, which standard has been approved by at least two-thirds of the members of the Subdivision eligible to vote on the standard.

(Standardization Policies and Procedures, pp. 7 & 16)

Official Standards Proposal

An Official Standards Proposal is an official draft of a proposed standard which is formally recommended to an outside organization(s) for consideration, comment and/or approval, and which has been approved by at least 90 percent of the members of the Subdivision eligible to vote thereon. *(Standardization Policies and Procedures, pp 7 & 16)*

Identification of Status

Standards in NEMA Standards Publications are identified in the foreword or following each standard as "NEMA Standard" or "Suggested Standard for Future Design." These indicate the status of the standard. These words are followed by a date which indicates when the standard was adopted in its present form by the Association.

The material identified as "Authorized Engineering Information" and "Official Standards Proposal" is designated similarly.

July 17, 1990

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