STATION WIRE AND CABLE ATTACHING AND FASTENING

CONTENTS

1. GENERAL

1.01 This practice provides information on the proper type and size of attachments and fasteners to be used for various surfaces when attaching station wire and cable. For information on fastening drop wire, refer to CTSP 475-302-401 and CTSP 475-302-405.

2. SURFACES ENCOUNTERED

2.01 Use galvanized fasteners outdoors and enameled or nongalvanized fasteners indoors.

2.02 Masonry or Substantial Brick Veneer:

a. In general, the same fasteners apply in making attachments to masonry and substantial brick veneer. Veneering is considered substantial when:

(1) The veneer thickness is 3-3/4 inches (as observed at an outside corner).

(2) The bricks are joined firmly with mortar.

b. On masonry and substantial brick veneer, drill holes for all attachments as close to the center of bricks as practicable and use care to avoid damaging and loosening the bricks. In the case of face brick or ornamental types of brick, holes for intermediate and last attachments may be drilled in the seam to avoid breakage.

2.03 Thin-Wall Brick Veneer: Thin-wall brick veneer is considered as veneering having a thickness of less than 3-3/4 inches (as observed at an outside corner, some corners are mitered) or having bricks that loosen or crack easily when drilled. Make attachments to thin wall veneering as follows:

a. First Attachment: Attach to suitable woodwork with galvanized wood screws. When suitable woodwork is not available, attach to the brick veneer surface by drilling a clearance hole in the seam to permit a galvanized wood screw to be passed through the brick portion of the wall and screwed into the wood backing or studding. The screw should penetrate at least 1 inch into the wood backing or studding.

b. Intermediate and Last Attachments: Attach to brick veneer with suitable anchoring device. Drill holes in center of bricks; if bricks begin to crack or loosen, make the attachments to seams or to wood trim. On slab type veneering (approximately 1 inch thick), secure intermediate and last attachments to the wood backing in the manner specified for first attachments.

2.04 Wood:

a. Staples, galvanized wood or tapping screws, or nails are generally the standard fasteners on wood; however, hollow wall anchors, plastic anchors, or toggle bolts are recommended as fasteners on plywood and masonite when a more substantial fastener is needed for heavier apparatus.

NOTE: Do not use staples on exterior surfaces in damp climates.

b. On woodwork, drill lead holes for fasteners and screw type fixtures to avoid splitting the wood and to obtain maximum holding power. Locate fasteners in studding where practicable.

c. Studs in buildings of wood frame construction may usually be located by one of the following methods:

(1) **Buildings finished with clapboards:** By location of heads of nails used in fastening clapboards to studding, or where clapboards join.

(2) **Buildings finished with shingles or stucco:** By sounding; by locating studs in cellar or attic; by location of heads of nails used in fastening trim to studding.

2.05 Stucco on Wood: For stucco on wood buildings, attach to substantial wood trim with galvanized wood screws. Where required to install fixtures on stucco finished walls, drill a clearance hole for tapping screw or screw-type fixture, preferably by means of an installer drill in a ratchet brace or electric drill with masonry bit. If there is a wood backing, the spring of a hammered drill will knock the stucco loose. Use care to avoid cracking the stucco. Locate screws in studding where practicable.

2.06 Plaster on Lath, Rock Lath, Plaster Board: Plastic anchors, hollow wall anchors or toggle bolts are used to make attachments. However, when a substantial fastener is required for heavier apparatus, it will be necessary to locate the studding as in paragraph 2.04 c. and use tapping screws. The holding power of hollow wall fasteners is such that any movement or shifting of weight tends to loosen them. This must be considered at all times so that costly maintenance and hazards are not built into plant. If wood lath is used under plaster and can be entered by a slanting lead hole, a secure attachment can usually be made. Locate the lath before drilling the attachment hole.

2.07 Rigid Composition Shingles:

a. In general, galvanized wood screws are required in making attachments through composition shingles.

b. On buildings finished with rigid composition shingles, make attachments to substantial wood trim where practicable. If suitable wood trim is not available, locate the clearance holes for fasteners on the shingles as follows:

(1) Rectangular shaped shingles installed with the long dimension horizontal: Locate the hole midway between the vertical edges of the shingle and approximately 3/4 inch above the bottom edge.

(2) Rectangular shaped shingles installed with the long dimension vertical: Locate the hole at the midpoint of the visible shingle height and approximately 3/4 inch from either vertical edge.

(3) Shingles installed in diamond formation: Locate the hole near a nail hole and approximately 3/4 inch from either exposed edge of the shingle.

c. When more than one screw is required to attach a drop wire fixture, observe the following in locating the clearance hole for the screw:

(1) House bracket: The distance between the edge of the shingle and the nearest hole should be approximately 3/4 inch.

TABLE A. Spacing Requirements of Attachments

FASTENERS		SPACING				
		HORIZONTAL		VERTICAL RUN		FROM CORNER
		FEET	INCHES	FEET	INCHES	INCHES
Cable Clamps	More than 12-pair cable		16	4		2
	Less than 12-pair cable		16		16	2
Cable Clasps	More than 12-pair cable		14	3		2
	Less than 12-pair cable		14		14	2
Adhesive Clips			12		12	2
Station Wire Clamps			16		16	2
Ground Wire Nail			16		16	2
Staples	Station Wire		7-1/2		7-1/2	1
	25-pair inside wiring cable		12		12	2
Adhesive Cable Tie		4				2 thru 8-1/2*
Bridle Rings		4		8		2 thru 8-1/2*
Drive Rings		4		8		2 thru 8-1/2*
Wire Loops		4		8		2 thru 8-1/2*
Toggle Bridle Rings		4		8		2 thru 8-1/2*
Beam Clamp		4		8		2 thru 8-1/2*
Utility Clip	Used on Beams	4		8		2 thru 8-1/2*
	Used on Hanger Wires	As Required				

When changing direction of wire or cable runs where wire loops, bridle rings, drive rings, toggle bridle rings, and beam clamps are used, the fasteners should be spaced to hold the wire or cable at approximately a 45-degree angle.

TABLE B. Clearances and Lead Holes for Fasteners and Screw-Type Fixture

FASTENER OR FIXTURE	CLEARANCE HOLE			LEAD HOLE		
	SIZE AND TYPE OF DRILL					
	INSTALLER	POINT	CARBON STEEL TWIST	INSTALLER	POINT	CARBON STEEL TWIST
	IN.					
Toggle Bolt	Clearance Hole					
1/4	5/3 or 3/4					
5/16	5/8 or 7/8					
Toggle Bolt Ring 3/4 and 1-1/4	3/4					
S and L Insulated Screw Eyes	3/16 by 5-1/2		No. 12 or 3/16		3/32	No. 42 or 3/32
Bridle Rings 1-1/4—1-5/8					1/8	
Drive Rings 5/8 and 7/8					3/32	No. 42 or 3/32*
1-1/4					11/64	
Angle Screw 5/16	5/16 by 7-1/2		5/16		11/64	No. 18 or 11/64
3/8	3/8 by 8		3/8	1/4 by 6-1/2		1/4
Tapping Screw + No. 7		11/64	No. 20		5/64	
No. 8		No. 13	11/64		3/32 or No. 333	
No. 10	3/16 by 5-1/2		No. 12 or 3/16		3/32	No. 42 or 3/32
No. 14	1/4 by 6-1/2		1/4		1/8	No. 30 or 1/8
Wire Loop Fasteners, Drive Anchors, Plastic Anchors, Hollow Wall Anchors	*The maximum holding power of these anchoring devices in any given quality of masonry depends upon obtaining a drilled hole corresponding to the outside diameter of the unexpanded anchor and of sufficient depth to allow the nail to be driven its full length. The diameter and length are generally indicated on the anchor. The depth of hole required varies with the thickness of the fixture to be installed at the point of support. In all installations the minimum depth of hole required is equivalent to the length of the anchor plus the distance the nail or screw will extend beyond the anchor (approximately 3/16 inch).*					

NOTES:

1. *Installer drills are bit stock twist drills and are used in the ratchet brace.*
2. *Carbon steel twist drills are straight shank drills and are used in the hand drill.*
3. *Drill points are used in the automatic drill and will drill lead holes approximately 1-1/2 inches deep. Where deeper holes are required, use twist drills in the hand drill.*
4. *Use masonry drills for drilling the seam between bricks.*
5. *Use masonry drills or star-faced stone drills in drilling holes for toggle bolts. Two sizes of holes are listed to cover the different types of approved toggle bolts. Drill the smaller hole if it will accommodate the toggle bolt.*
6. *Apply paraffin wax or soap to the threads of wood screws or screw-type fixtures to facilitate turning them into wood.*

* *Do not drill lead hole in poles.*

\+ *Tapping screws have an AB thread suitable for sheet metal or wood and are available with pan head.*

(2) Corner bracket: The bracket should be located so as to bear evenly on the shingles with the hole nearer the porcelain knob located approximately 3/4 inch from the edge of the shingle.

NOTE: Because of the brittleness of rigid composition shingles, and where mounting of attachments cannot be avoided, the following precautions shall be observed.

(1) Place ladder carefully against the shingles.

(2) Use only well-sharpened drills.

(3) Never use drills which require the use of a hammer on composition shingles.

(4) Do not apply excessive pressure to the brace when drilling clearance holes through the shingles.

(5) Wood screws should not be tightened excessively as the pressure on the shingle might cause it to break.

2.08 Metal and Vinyl (Siding, Paneling, or Desk):

a. Be sure protrusion of fasteners will not cause damage or injury. Fasteners for siding, paneling, or desks can be of the following variety: tapping screw, plastic anchor, toggle bolts, or hollow wall anchors. There is also a possibility of using an adhesive clip for a wire. See CTSP 475-310-412 for information on attaching to aluminum, steel and vinyl siding.

b. Aluminum and vinyl siding presents other problems. The customer should be contacted to determine the type of siding and method used to install it. This will determine type of fastener or attachment to be used. Permission should be obtained at this time for proposed wire runs, etc. See CTSP 475-310-412.

c. When using an extension ladder against metal, vinyl or aluminum siding, use care to prevent damage.

CAUTION: It is possible for foreign voltage to be present on buildings covered with metal siding. Test siding with B voltage tester before starting any work.

3. ATTACHING AND FASTENING GROUND WIRE

3.01 Fasteners (Figure 1): Space ground wire fasteners as follows:

NOTE: If possible, locate nail or tapping screws that are used for fasteners so they will enter studding.

a. Space 24 inches apart on ordinary ground wire runs.

b. Space 16 inches apart when wire is subject to displacement.

c. Place on every beam when spanning beams. (Avoid spanning beams unless there is no alternative.) Stay as close to wall as possible.

d. Place within 3 inches of wall when run parallel to wall on beams (to discourage articles being hung on wire).

NOTE: Staples are not recommended for use in plaster.

4. ATTACHMENTS USED IN FINISHED ROOMS AND OFFICES

NOTE: Refer to Table A for spacing requirements.

4.01 Staples: Table C shows the staples recommended for wood surfaces with finishes available.

TABLE C. Selection of Staples

STAPLES				
FINISH	SIZE (INCHES)		SHAPE OF CROWN	USE
	LENGTH	WIDTH		
*Zinc or Ivory	3/8	5/32	Rounded	With station wire and small gauge ground wire in all type wood
†Vinyl				
*Zinc or Ivory	3/8	3/16		
†Vinyl				
*Zinc Coated	5/8	1/2	Flat	Inside wire cables up to 1/2-inch in diameter

* *For indoor use.*

† *For outdoor use or where appearance is unimportant.*

NOTE: Staples are not recommended for use in plaster or on exterior surfaces in damp climates.

4.02 Ground Wire Nail: This nail is used to fasten ground wire to plaster or wood surfaces. It can be used with station wire if care is taken to ensure that the wire is sufficiently secured by the arm of the nail.

4.03 Station Wire Clamp: This clamp is used to support station wire. Table D lists fasteners to be used with clamps.

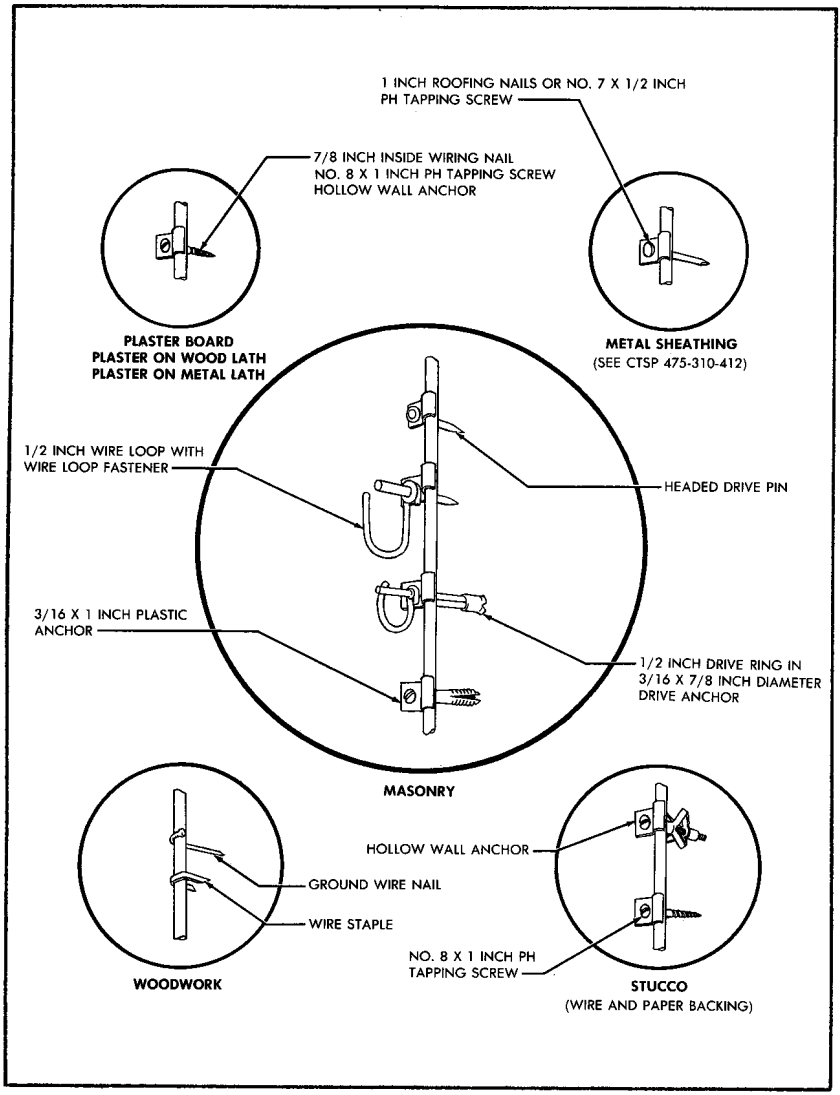

FIGURE 1. Fasteners for Ground Wire

TABLE D. Fasteners for Station Wire Clamp

SURFACE	FASTENER
Vinyl or Asbestos Siding See CTSP 475-310-412	No. 7 x 1/2 in. PH tapping screw
	No. 6 x 5/8-in. galvanized wood screw. Plastic Anchor, 3/16 x 1 in.
Wood, Indoors	No. 7 x 1/2 in. PH tapping screw
Wood, Outdoors	No. 6 x 5/8-in. RH galvanized wood screw
Stucco (Wire and Paper Backing)	No. 8 x 1-in. PH tapping screw or Hollow-Wall anchor (correct size)
Masonry	No. 2 Masonry Fastener

4.04 Cable Clamps and Cable Clasps: These attachments are used to support inside wiring cable or more than one station wire. Table E lists fasteners to be used with clamps and clasps.

4.05 Adhesive Cable Clips (Figure 2):

a. The adhesive cable clips are extruded vinyl, used as a fastening clamp for cable or wire on wooden and metal furniture. These clips have a pressure sensitive foamed, vinyl adhesive backing and are available in four sizes. See Table F.

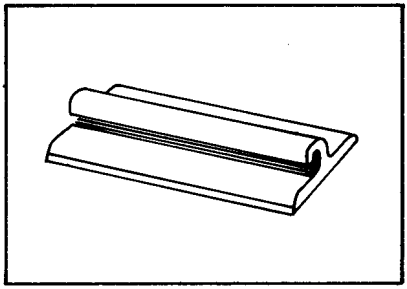

FIGURE 2. Adhesive Cable Clips

b. Use these clips to secure or store unsightly and hazardous slack in inside wire, cables, and telephone cords.

c. Space on 12-inch centers for horizontal and vertical runs. From corners they shall be placed on two-inch centers.

d. The adhesive clips can be mounted on most dry, clean, and smooth surfaces. To mount, pull off wax-covered paper from the back of the clip. Press the adhesive clip against the area chosen for mounting.

e. To remove the adhesive clip, pry up one corner until the edge can be grasped by the fingers and lift off clip. Do not scrape mounting surface with screwdriver or any other tool to remove remainder of adhesive. Remove surplus by saturating with hot water and peeling off by hand.

NOTE: Do not try to reuse adhesive clip.

5. ATTACHMENTS USED IN CELLARS, FACTORIES OR WHERE APPEARANCE IS UNIMPORTANT

NOTE: In general, the same types of attachments used in finished rooms apply for cellars, factories or where appearance is unimportant. However, they should be of an appropriate finish. In addition to these attachments, drive rings, wire loops, and toggle bridle rings are also available for use at these locations.

5.01 Drive Rings (Figure 1): Drive rings are formed steel loops having a pointed shaft suitable for hammer-driven attachment to wood or masonry surfaces. On wood surfaces, attach drive rings to beams or studding (to avoid injury below the 6-foot level use bridle rings). On masonry surfaces, use with drive anchors. Table G shows sizes of rings and anchors.

NOTE: For masonry surfaces, wire loops with wire loop fasteners are preferred.

5.02 Wire Loop (Figure 1): Wire loops are formed sections of wire used with wire loop fasteners as an intermediate support for station wires and inside wiring cables attached to masonry surfaces (to avoid injury below the 6-foot level use bridle rings). Table H shows sizes of wire loops.

NOTE: Wire loops with the wire loop fastener are preferred over drive rings in masonry surfaces because the fasteners are driven directly into the masonry surface without a predrilled hole.

TABLE E. Fasteners for Cable Clamps and Cable Clasps

SURFACE	CLAMP NO.	CLASP NO.	FASTENER	REMARKS
	COLOR			
	GALVANIZED OR BEIGE	BEIGE		
Woodwork	No. 3 and 5*	No. 17 CTS # 68-11-053-7	No. 7 x 1/2-in. PH tapping screw	
	No. 6, 8, 10	No. 17 CTS # 68-11-051-5 No. 14 CTS # 68-11-055-3	No. 7 x 1/2-in. PH tapping screw	
Plywood, Masonite	No. 3 and 5*	No. 17 CTS # 68-11-053-7	No. 7 x 1/2-in. PH tapping screw Hollow Wall Anchor 1/8 in. x 3 in. toggle bolt	Make tapping screw attachments at stud locations. Use No. 1 Hollow Wall Anchor on wall thickness 1/16 in. to 1/4 in. Use No. 2 Hollow Wall Anchor on wall thickness 1/4 in. to 3/8 in. Use No. 3 Hollow Wall Anchor on wall thickness 3/8 in. to 3/4 in.
	No. 6, 8, 10	No. 19 CTS # 68-11-051-5 No. 14 CTS # 68-11-055-3	No. 7 x 1/2-in. PH tapping screw 3/16 in. x 1 in. Plastic Anchor Hollow Wall Anchor 1/8 in. x 3 in. toggle bolt	
Plasterboard, Plaster on Wood Lath, and Plaster on Metal Lath	No. 3 and 5*	No. 17 CTS # 68-11-053-7	No. 7 x 1/2-in. PH tapping screw Hollow Wall Anchor	Make tapping screw attachments at stud locations. Use No. 1 Hollow Wall Anchor on wall thickness 1/16 in. to 1/4 in. Use No. 2 Hollow Wall Anchor on wall thickness 1/16 in. to 3/8 in. Use No. 3 Hollow Wall Anchor on wall thickness 3/8 in. to 3/4 in.
	No. 6, 8, 10	No. 19 CTS # 68-11-051-5 No. 14 CTS # 68-11-055-3	No. 8 x 1-in. PH tapping screw 3/16 x 1 in. Plastic Anchor Hollow-Wall Anchor	

* *Inside wiring clamp only.*

TABLE F. Adhesive Cable Clips

CTS NO.	LENGTH (INCHES)	WIDTH (INCHES)	INTERIOR DIAMETER (NOMINAL)	ACCOMMODATES WIRE OR CABLE DIAMETER FROM
68-11-001-4	1-1/4	3/4	3/16	11/64 to 15/64
68-11-002-2	1-1/2	3/4	1/4	15/64 to 5/16
68-11-003-1	1-3/4	1	5/16	19/64 to 13/32
68-11-004-9	2	1	3/8	25/64 to 1/2

TABLE G. Drive Rings

DIMENSIONS IN INCHES				ANCHOR SIZE (IN.)	
SIZE	D	W	L	DIA.	L
1/2	1/2	1/2	2-1/16	3/16	7/8
5/8	5/8	3/4	2-1/4	1/4	1
5/8L	5/8	3/4	2-3/4		
7/8	7/8	1-1/2	2-9/16	1/4	1
7/8L	7/8	1-1/2	3-1/16		
1-1/4	1-1/4	2-3/8	2-15/16	5/16	1-1/4
1-1/4L	1-1/4	2-3/8	3-7/16		

L sizes have extra long shafts and cannot be used with Drive Anchors.

5.03 Toggle Bridle Ring (Figure 3): This attachment, available in two sizes, 3/4 inch and 1-1/4 inch, is used to attach station wire and cable to hollow surfaces. A predrilled 3/4-inch clearance hole is required.

NOTE: For best results and a secure installation, clearance holes should be restricted to 3/4-inch diameter.

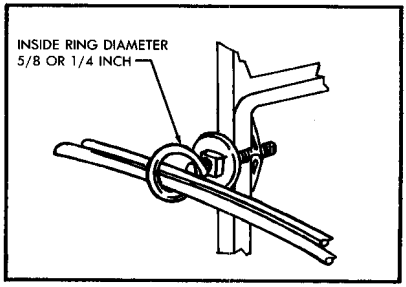

FIGURE 3. Toggle Bridle Ring

TABLE H. Wire Loop

WIRE LOOP SIZE NO.	WIDTH OF OPENING	LENGTH OF LOOP (INSIDE)	MASONRY FASTENER FOR		
			CONCRETE	MORTAR	BLOCK*
1/2	1/4-in.	3/4-in.	3	4	5
5/8	1/2-in.	1-1/8-in.			
7/8	5/8-in.	2-1/16-in.			
1-1/4	5/8-in.	2-3/4-in.			

** Cement or cinder blocks.*

6. ATTACHING TO STEEL STRUCTURES

6.01 Beam Clamp (Figure 4): The beam clamp, equipped with an A, K, or M bridle ring, is used to support wire runs on I beams, angle irons, etc., on beam thickness up to 3/4 inch.

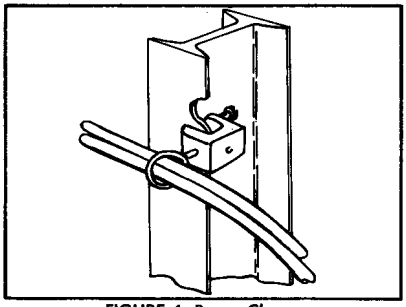

FIGURE 4. Beam Clamp

6.02 Utility Clip (Figures 5 and 6):

a. The utility clip provides a means of attaching drive rings or bridle rings to hanger wires and rods used in false-ceiling construction. It can also be used to grip the flanges of structural steel framework. See CTSP 405-705-402 for description and installation information.

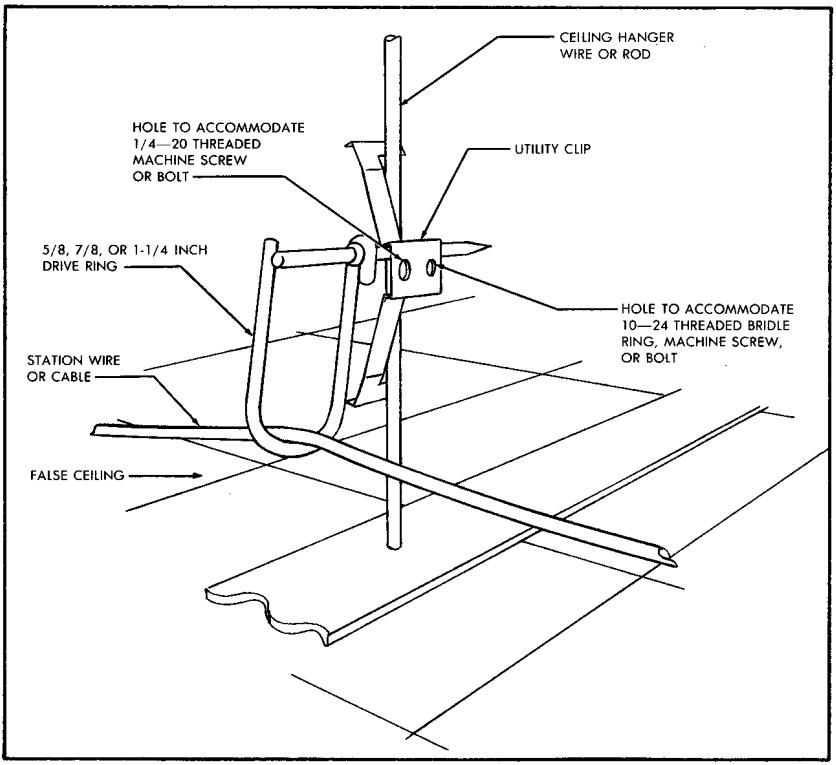

FIGURE 5. Utility Clip On Rod

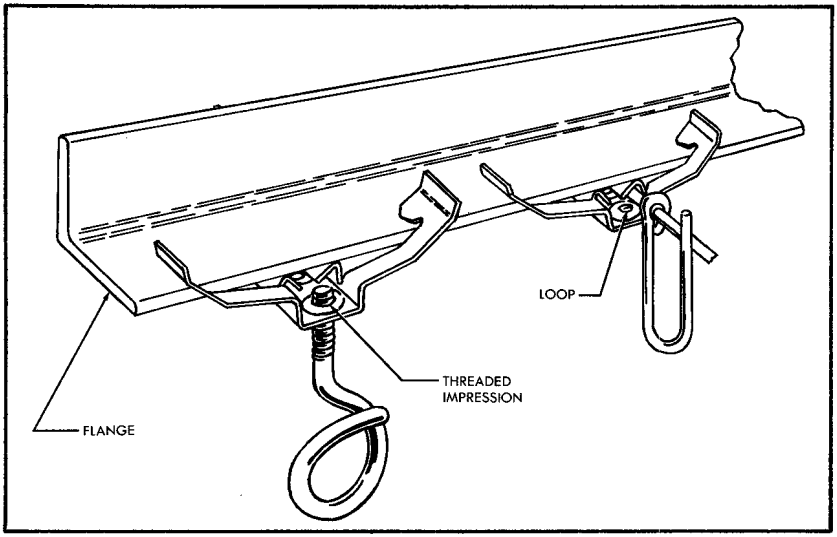

FIGURE 6. Utility Clip On Angle Iron

b. This notched spring-steel clip has two loops, each providing a fit for the drive rings. In addition, two holes are provided in the face of the clip which will accommodate either a No. 10-24 threaded bridle ring, machine screw, or bolt or a 1/4-20 threaded machine screw or bolt. The clip is intended for inside use only.

6.03 This clip may be attached to flanges from 1/8 inch to 3/8 inch, to wire from 12 through 8 gauges and to suspension rods 3/16-inch through 3/8-inch in diameter.

7. ADHESIVE CABLE TIE (FIGURE 7)

7.01 The adhesive cable tie is intended for use on various smooth flat surfaces in customer telephone installations to group wires, cords, and inside wiring cables in an orderly harness.

7.02 The tie consists of a C cable tie and a molded plastic base. It can be mounted using the self-adhesive backing, or knockouts are provided if more secure mounting is required.

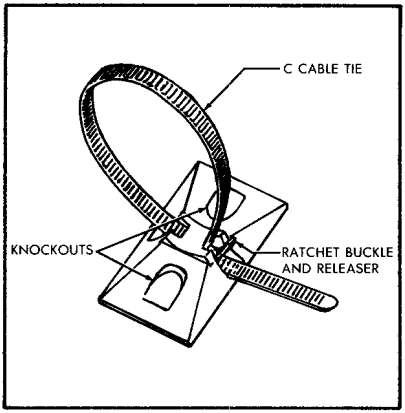

FIGURE 7. Adhesive Cable Tie