



08 FASTENERS AND THREAD REPAIR

FIGURE 8.3 Bolts and screws have many different heads, which determine what tool must be used.

ROUND HEAD SCREW FLATHEAD SCREW CAPSCREW HEX-HEAD BOLT

TORX® BOLT ALLEN BOLT CHEESE HEAD SCREW PAN HEAD SCREW

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FIGURE 8.4 The metric system specifies fasteners by diameter, length, and pitch.

METRIC HEXAGON HEAD CAP SCREWS
ALL MEASUREMENTS IN MILLIMETERS

M = NOMINAL THREAD DIAMETER
P = PITCH
D = HEAD SIZE ACROSS FLATS

M	P	D	M	P	D	M	P	D
1.6	0.35	3.2	10	1.25	17	20	1.50	30
1.7	0.35	3.8	10	1.25	17	20	2.50	30
2	0.40	4	10	1.50	17	22	1.50	32
2.3	0.40	4.5	12	1.25	18	22	2.50	32
2.5	0.45	5	12	1.50	18	24	2.00	36
3	0.50	5.5	12	1.75	19	24	3.00	36
3.5	0.60	6	14	1.50	22	27	3.00	41
4	0.70	7	14	2.00	22	30	3.50	46
5	0.80	8	16	1.50	24	33	3.50	50
6	1.00	10	18	2.00	24	36	4.00	55
7	1.00	11	18	1.50	27	39	4.00	60
8	1.00	13	18	2.50	27	42	4.50	65
8	1.25	13			27	45	4.50	70

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FIGURE 8.5 Stronger threads are created by cold-rolling a heat-treated bolt blank instead of cutting the threads using a die.

ROLLING THREADS

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FIGURE 8.6 Metric bolt (cap screw) grade markings and approximate tensile strength.

4.6	8.8	9.8	10.9	METRIC CLASS
60,000	120,000	130,000	150,000	APPROXIMATE MAXIMUM POUND FORCE PER SQUARE INCH

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FIGURE 8.7 Types of lock nuts. On the left, a nylon ring; in the center, a distorted shape; and on the right, a castle for use with a cotter key.

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FIGURE 8.8 A typical bottoming tap used to create threads in holes that are not open, but stop in a casting, such as an engine block.

TAP

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FIGURE 8.9 Many taps, especially larger ones, have the tap drill size printed on the top.

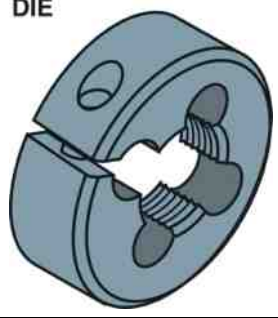


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FIGURE 8.10 A die is used to cut threads on a metal rod.

DIE

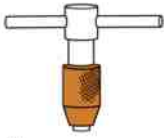


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FIGURE 8.11 (a) A T-handle is used to hold and rotate small taps. (b) A tap wrench is used to hold and drive larger taps.

T-HANDLE TAP WRENCH



(a)

HAND TAP WRENCH




(b)

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FIGURE 8.12 A die handle used to rotate a die while cutting threads on a metal rod.

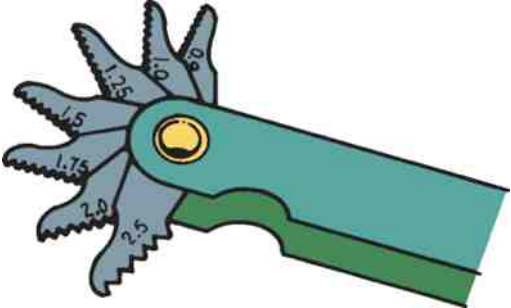


DIE HANDLE

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FIGURE 8.13 A typical metric thread pitch gauge.



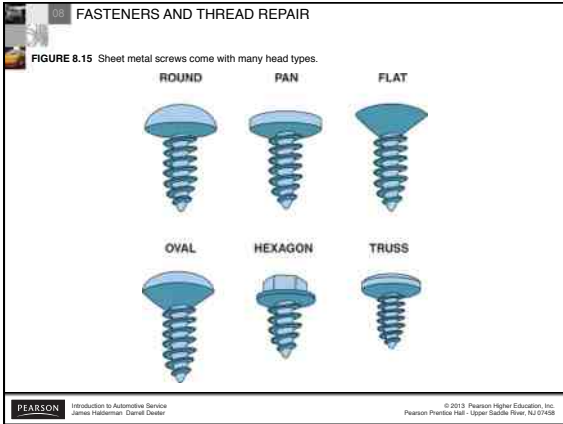
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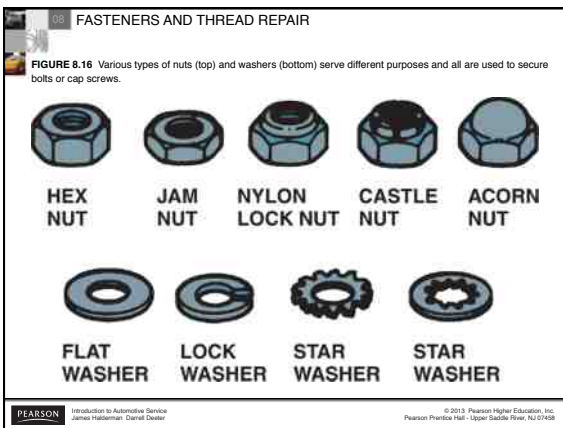
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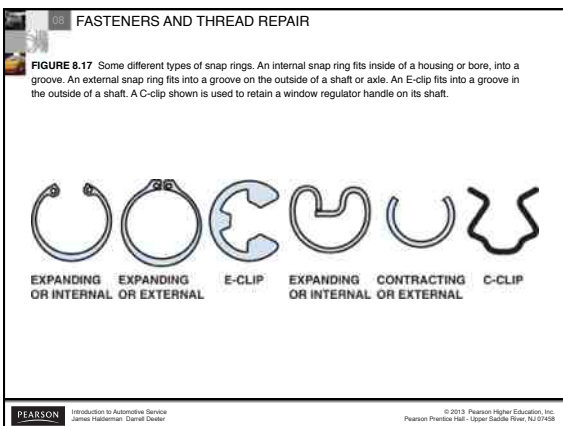
FIGURE 8.14 A thread chaser is shown at the top compared to a tap on the bottom. A thread chaser is used to clean threads without removing metal.

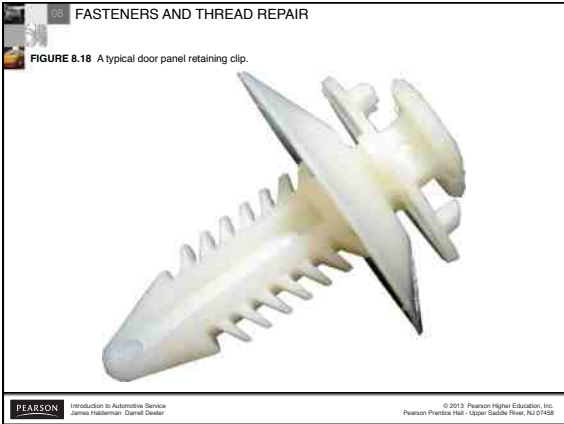


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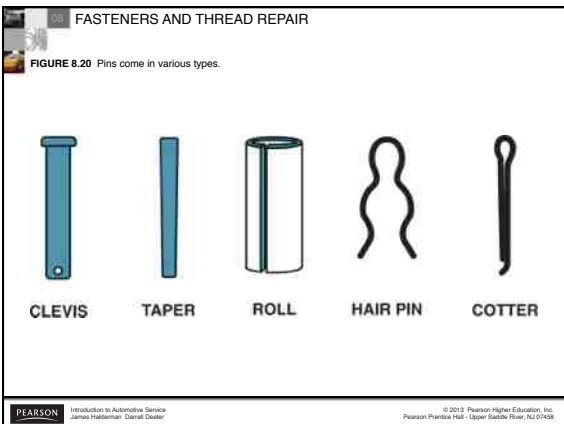


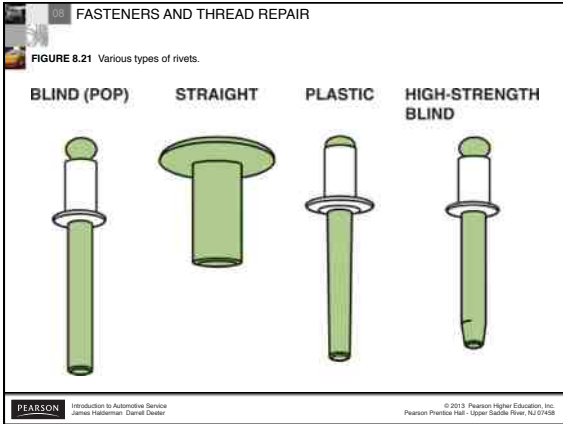


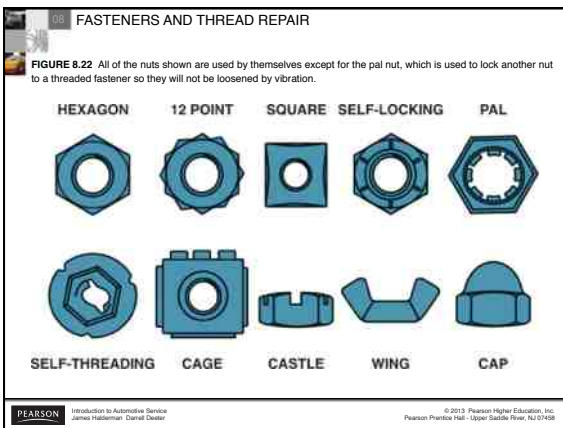


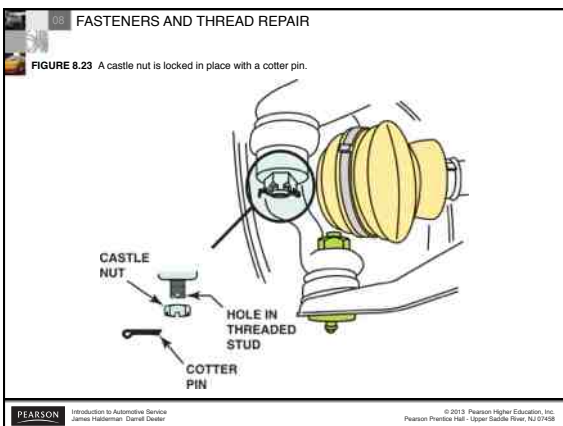













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FIGURE 8.24 Helical inserts look like small, coiled springs. The outside is a thread to hold the coil in the hole, and the inside is threaded to fit the desired fastener.



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FIGURE 8.25 The insert provides new, stock-size threads inside an oversize hole so that the original fastener can be used.



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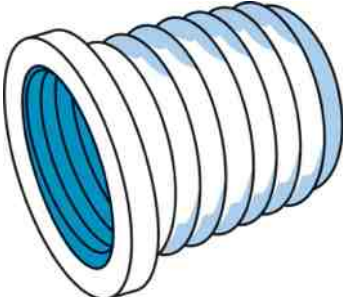
FIGURE 8.26 Heli-Coil® kits, available in a wide variety of sizes, contain everything needed to repair a damaged hole back to its original size.



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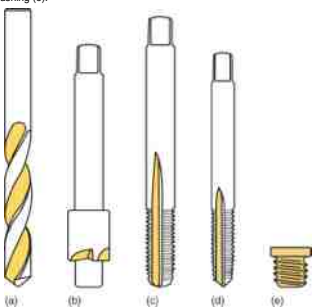
FIGURE 8.27 This solid-bushing insert is threaded on the outside, to grip the workpiece. The inner threads match the desired bolt size.



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FIGURE 8.28 A Timesert® kit includes the drill (a), the recess cutter (b), a special tap (c), the installer (d), and the Timesert® threaded bushing (e).



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FIGURE 8.29 Drill out the damaged threads with the correct bit.



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FIGURE 8.30 Use a special tap for the insert.



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FIGURE 8.31 Put some thread-locking compound on the insert.



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FIGURE 8.32 Use the driver to drive the keys down flush with the surface of the workpiece.



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FIGURE 8.33 The insert and insert locks should be below the surface of the workpiece.



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