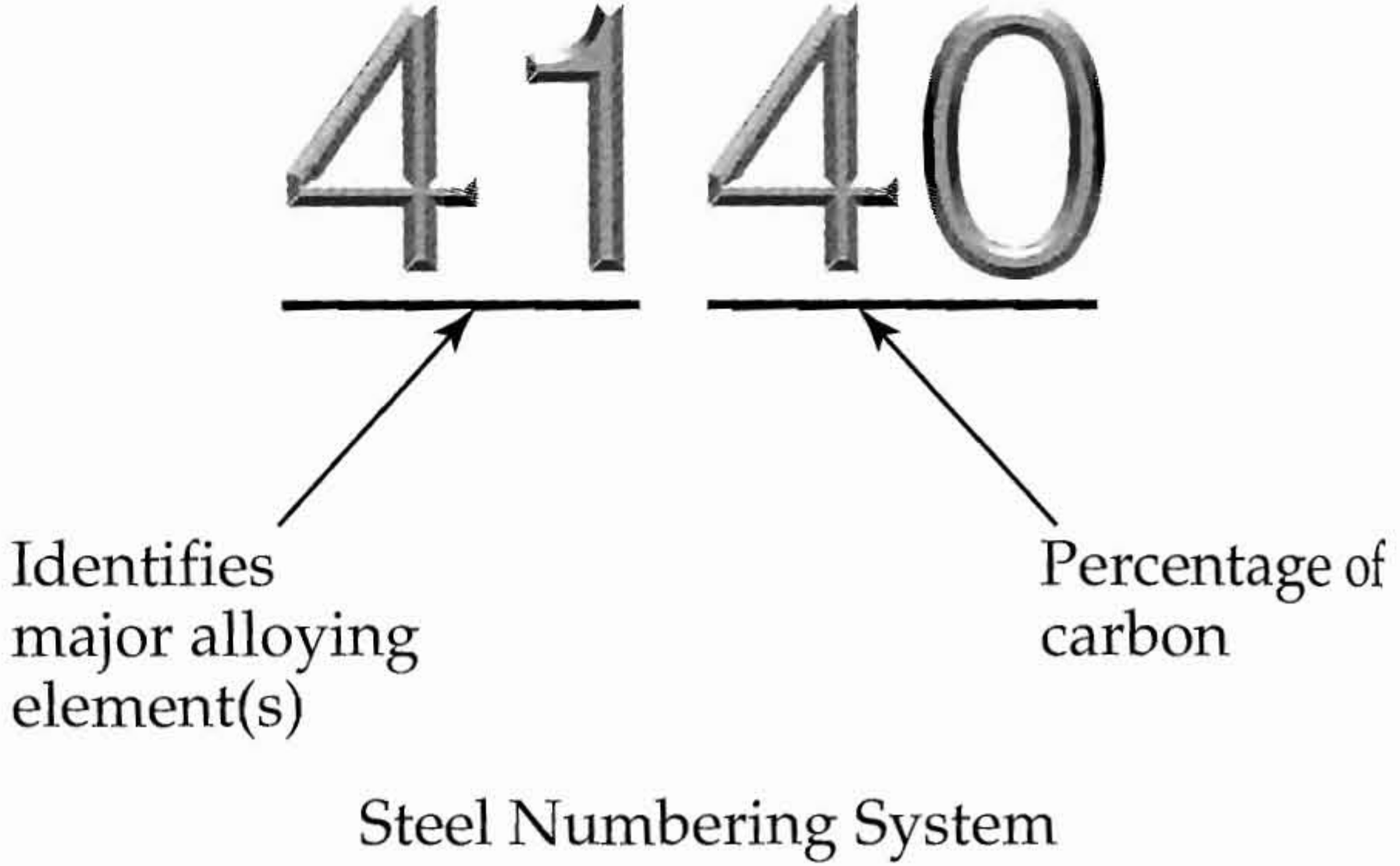

Figure 5-2. *A steel's name usually consists of four digits. It supplies information about the alloy content and percentage of carbon.*

Steel Numbering System	
Steel Numerical Name	**Key Alloys**
10XX	Carbon only
11XX	Carbon only (free cutting)
13XX	Manganese
23XX	Nickel
25XX	Nickel
31XX	Nickel-Chromium
33XX	Nickel-Chromium
303XX	Nickel-Chromium
40XX	Molybdenum
41XX	Chromium-Molybdenum
43XX	Nickel-Chromium-Molybdenum
44XX	Manganese-Molybdenum
46XX	Nickel-Molybdenum
47XX	Nickel-Chromium-Molybdenum
48XX	Nickel-Molybdenum
50XX	Chromium
51XX	Chromium
501XX	Chromium
511XX	Chromium
521XX	Chromium
514XX	Chromium
515XX	Chromium
61XX	Chromium-Vanadium
81XX	Nickel-Chromium-Molybdenum
86XX	Nickel-Chromium-Molybdenum
87XX	Nickel-Chromium-Molybdenum
88XX	Nickel-Chromium-Molybdenum
92XX	Silicon-Manganese
93XX	Nickel-Chromium-Molybdenum
94XX	Nickel-Chromium-Molybdenum-Manganese
98XX	Nickel-Chromium-Molybdenum
XXBXX	Boron
XXLXX	Lead

Figure 5-3. *This table relates the alloy content in steel to the first two digits in its name.*

Effects of Alloying Elements on Steel	
Alloying Element	**Effect on Steel**
Carbon	Hardness, strength, wear
Chromium	Corrosion resistance, hardenability
Lead	Machinability
Manganese	Strength, hardenability, more response to heat treatment
Aluminum	Deoxidization
Nickel	Toughness, strength
Silicon	Deoxidization, hardenability
Tungsten	High-temperature strength, wear
Molybdenum	High-temperature strength, hardenability
Sulfur	Machinability
Titanium	Elimination of carbide precipitation
Vanadium	Fine grain, toughness
Boron	Hardenability
Copper	Corrosion resistance, strength
Columbium	Elimination of carbide precipitation
Phosphorus	Strength
Tellurium	Machinability
Cobalt	Hardness, wear

Figure 5-6. *This table lists the effects of common alloying elements.*

Examples of Alloying Elements in Steel											
Steel	**Type of Steel**	**Tensile Strength (× 1000 psi)**	**C**	**Mn**	**P**	**S**	**Si**	**Ni**	**Cr**	**Mo**	**V**
1025	Plain Carbon	60–103	0.22–0.28	0.30–0.60	0.04 max	0.05 max					
1045	Plain Carbon	80–182	0.43–0.50	0.60–0.90	0.04 max	0.05 max					
1095	Plain Carbon	90–213	0.90–1.03	0.30–0.50	0.04 max	0.05 max					
1112	Free Cutting Carbon	60–100	0.13 max	0.70–1.00	0.07–0.12	0.16–0.23					
1330	Manganese	90–162	0.28–0.33	1.60–1.90	0.035	0.040	0.20–0.35				
2517	Nickel	88–190	0.15–0.20	0.45–0.60	0.025	0.025	0.20–0.35	4.75–5.25			
3310	Nickel-Chromium	104–172	0.08–0.13	0.45–0.60	0.025	0.025	0.20–0.35	3.25–3.75	1.40–1.75		
4023	Molybdenum	105–170	0.20–0.25	0.70–0.90	0.035	0.040	0.20–0.35			0.20–0.30	
52100	Chromium	100–240	0.98–1.10	0.25–0.45	0.035	0.040	0.20–0.35		1.30–1.60		
6150	Chromium-Vanadium	96–230	0.48–0.53	0.70–0.90	0.035	0.040	0.20–0.35		0.80–1.10		0.15 min
9840	Nickel-Chromium Molybdenum	120–280	0.38–0.43	0.70–0.90	0.040	0.040	0.20–0.35	0.85–1.15	0.70–0.90	0.20–0.30	
4140	Chromium-Molybdenum	95–125	0.38–0.43	0.75–1.00	0.035	0.040	0.20–0.35		0.80–1.10	0.15–0.25	

Figure 5-7. *This table shows the alloy content of common types of steel.*