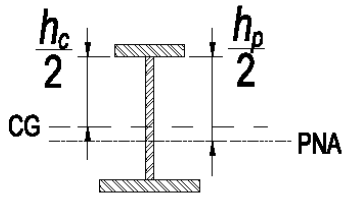
**Revision and Errata List—February 2012**
**AISC Steel Construction Manual, 14th Edition**

The following list represents corrections to the First Printing of the AISC *Steel Construction Manual*, 14th Edition. These corrections are incorporated in the Second Printing.

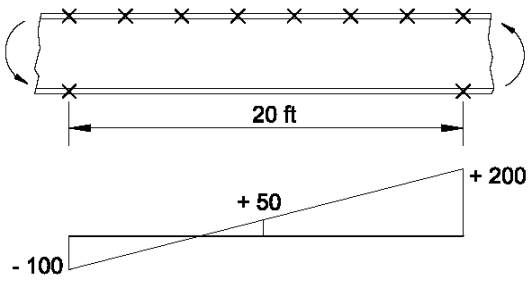
| Page(s) | Item |
|---|---|
| 1-34 | The HP12×53 should have footnote "c" following the shape designation. |
| 2-50 | Replace Table 2-6 with the attached revised Table 2-6. (Revisions are indicated with boxes and include: addition of F2280, added footnote d to A490 and F1852 and revised the shading and applicability for F1554 grades relative to anchor rods.) |
| 3-225 | In Case 35, replace the 5th line with the following: $$\Delta_{max}\,(\text{at } x = 0.423l)\ldots\ldots\ldots\ldots\ldots\ldots = 0.0642\frac{Ml^2}{EI}$$ |
| 3-225 | In the last line of Case 36, insert "(when $x > a$)" following "$\Delta_x$". |
| 4-25, 26, 27 | Replace Table 4-2 on these pages with the attached revised Table 4-2 (Insert P4-25, P4-26 and P4-27). See boxed areas for revisions. |
| 6-43 | Replace this table with the attached Insert P6-43. See boxed areas for revisions. |
| 6-49 | Replace this table with the attached Insert P6-49. See boxed areas for revisions. |
| 6-51 | Replace this table with the attached Insert P6-51. See boxed areas for revisions. |
| 10-17 | For Group A bolts, with N thread condition and STD holes, the ASD value for 5/16-in. angle thickness should be 165 kips. |
| 15-4 | In Equation 15-7, replace $V_a$ with $V_n$. |
| 16.1-16 | In Case 1, the double angle figure should show the *b* dimension to the heel of the angle. |
| 16.1-17 | In Case 16, under the heading "Examples", replace the lefthand figure with the following. |




16.1-31 In Section E1, 2nd line, replace $P_n\Omega_c$ with $P_n/\Omega_c$.

16.1-145 Insert "< *B*" following "$(5t_p+l_b)$" at the end of Equation K1-15.

16.1-306 Replace Figure C-F1.4 with the following:




16.1-366 In the 2nd full paragraph, 2nd to last line, replace "use of method 2" with "use of method 1".

16.1-387 In the 6th line, revise "1.5 times the thickness of the material…." to "1.0 times the thickness of the material…."

16.1-388 In Section J1.8, third line, replace "(Kulak and Grondin, 2001)" with "(Kulak and Grondin, 2003)."

16.1-390 The captions under Figure C-J2.1 should read as follows:

*(a) Incorrect for* t ≥ ¼ *in.* *(b) Correct for* t ≥ ¼ *in.*

16.1-403 In the middle paragraph, end of the last line should read, "…by 0.75/0.90 = 0.833."

16.1-542 Insert the following missing reference following the reference, Kulak and Grondin (2002):

Kulak, G.L. and Grondin, G.Y. (2003), “Strength of Joints that Combine Bolts and Welds,” *Engineering Journal*, AISC, Vol. 40, No. 2, 2nd Quarter, pp. 89–98.

# Revised Table 2-6



## Table 2-6
## Applicable ASTM Specifications for Various Types of Structural Fasteners

| ASTM Designation | | $F_y$ Min. Yield Stress (ksi) | $F_u$ Tensile Stress[a] (ksi) | Diameter Range (in.) | High-Strength Bolts | | Common Bolts | Nuts | Washers | Direct-Tension-Indicator Washers | Threaded Rods | Steel Headed Stud Anchors | Anchor Rods | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Conventional | Twist-Off-Type Tension-Control | | | | | | | Hooked | Headed | Threaded & Nutted |
| A108 | | — | 65 | 0.375 to 0.75, incl. | | | | | | | | ■ | | | |
| A325[d] | | — | 105 | over 1 to 1.5, incl. | ■ | | | | | | | | | | |
| | | — | 120 | 0.5 to 1, incl. | ■ | | | | | | | | | | |
| A490[d] | | — | 150 | 0.5 to 1.5 | ■ | | | | | | | | | | |
| F1852[d] | | — | 105 | 1.125 | | ■ | | | | | | | | | |
| | | — | 120 | 0.5 to 1, incl. | | ■ | | | | | | | | | |
| F2280[d] | | — | 150 | 0.5 to 1.125, incl. | | ■ | | | | | | | | | |
| A194 Gr. 2H | | — | — | 0.25 to 4 | | | | ▒ | | | | | | | |
| A563 | | — | — | 0.25 to 4 | | | | ■ | | | | | | | |
| F436[b] | | — | — | 0.25 to 4 | | | | | ■ | | | | | | |
| F959 | | — | — | 0.5 to 1.5 | | | | | | ■ | | | | | |
| A36 | | 36 | 58-80 | to 10 | | | | | | | ■ | | ▒ | | ▒ |
| A193 Gr. B7[e] | | — | 100 | over 4 to 7 | | | | | | | ▒ | | ▒ | | ▒ |
| | | — | 115 | over 2.5 to 4 | | | | | | | ▒ | | ▒ | | ▒ |
| | | — | 125 | 2.5 and under | | | | | | | ▒ | | ▒ | | ▒ |
| A307 Gr. A | | — | 60 | 0.25 to 4 | | | ■ | | | | | | | | |
| A354 Gr. BD | | — | 140 | 2.5 to 4, incl. | | | | | | | ▒ | | ▒ | ▒ | ▒ |
| | | — | 150 | 0.25 to 2.5, incl. | | | | | | | ▒ | | ▒ | ▒ | ▒ |
| A449 | | — | 90 | 1.75 to 3, incl. | [c] | | | | | | ▒ | | ▒ | ▒ | ▒ |
| | | — | 105 | 1.125 to 1.5, incl. | [c] | | | | | | ▒ | | ▒ | ▒ | ▒ |
| | | — | 120 | 0.25 to 1, incl. | [c] | | | | | | ▒ | | ▒ | ▒ | ▒ |
| A572 | Gr. 42 | 42 | 60 | to 6 | | | | | | | ▒ | | ▒ | | ▒ |
| | Gr. 50 | 50 | 65 | to 4 | | | | | | | ▒ | | ▒ | | ▒ |
| | Gr. 55 | 55 | 70 | to 2 | | | | | | | ▒ | | ▒ | | ▒ |
| | Gr. 60 | 60 | 75 | to 1.25 | | | | | | | ▒ | | ▒ | | ▒ |
| | Gr. 65 | 65 | 80 | to 1.25 | | | | | | | ▒ | | ▒ | | ▒ |
| A588 | | 42 | 63 | Over 5 to 8, incl. | | | | | | | ▒ | | ▒ | | ▒ |
| | | 46 | 67 | Over 4 to 5, incl. | | | | | | | ▒ | | ▒ | | ▒ |
| | | 50 | 70 | 4 and under | | | | | | | ▒ | | ▒ | | ▒ |
| A687 | | 105 | 150 max. | 0.625 to 3 | | | | | | | ▒ | | | | |
| F1554 | Gr. 36 | 36 | 58-80 | 0.25 to 4 | | | | | | | | | ■ | ■ | ■ |
| | Gr. 55 | 55 | 75-95 | 0.25 to 4 | | | | | | | | | ■ | ■ | ■ |
| | Gr. 105 | 105 | 125-150 | 0.25 to 3 | | | | | | | | | ▒ | ▒ | ▒ |

■ = Preferred material specification
▒ = Other applicable material specification, the availability of which should be confirmed prior to specification
□ = Material specification does not apply

— Indicates that a value is not specified in the material specification.
[a] Minimum unless a range is shown or maximum (max.) is indicated.
[b] Special washer requirements may apply per RCSC *Specification* Table 6.1 for some steel-to-steel bolting applications and per Part 14 for anchor-rod applications.
[c] See AISC *Specification* Section J3.1 for limitations on use of ASTM A449 bolts.
[d] When atmospheric corrosion resistance is desired, Type 3 can be specified.
[e] For anchor rods with temperature and corrosion resistance characteristics.

**Insert P4-25**



## Table 4-2 (continued)
# Available Strength in Axial Compression, kips
## HP-Shapes

$F_y$ = 50 ksi

HP16

| Shape | | HP16× | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| lb/ft | | 183 | | 162 | | 141 | | 121 | | 101 | | 88[c] | |
| Design | | $P_n/\Omega_c$ | $\phi_c P_n$ | $P_n/\Omega_c$ | $\phi_c P_n$ | $P_n/\Omega_c$ | $\phi_c P_n$ | $P_n/\Omega_c$ | $\phi_c P_n$ | $P_n/\Omega_c$ | $\phi_c P_n$ | $P_n/\Omega_c$ | $\phi_c P_n$ |
| | | ASD | LRFD | ASD | LRFD | ASD | LRFD | ASD | LRFD | ASD | LRFD | ASD | LRFD |
| Effective length, $KL$ (ft), with respect to least radius of gyration, $r_y$ | 0 | 1610 | 2430 | 1430 | 2150 | 1250 | 1880 | 1070 | 1610 | 895 | 1350 | 749 | 1130 |
| | 6 | 1570 | 2360 | 1390 | 2090 | 1220 | 1830 | 1040 | 1570 | 871 | 1310 | 729 | 1100 |
| | 7 | 1560 | 2340 | 1380 | 2070 | 1200 | 1810 | 1030 | 1550 | 862 | 1300 | 722 | 1080 |
| | 8 | 1540 | 2320 | 1360 | 2050 | 1190 | 1790 | 1020 | 1540 | 852 | 1280 | 714 | 1070 |
| | 9 | 1520 | 2290 | 1350 | 2020 | 1180 | 1770 | 1010 | 1520 | 841 | 1260 | 705 | 1060 |
| | 10 | 1500 | 2260 | 1330 | 2000 | 1160 | 1740 | 995 | 1490 | 829 | 1250 | 694 | 1040 |
| | 11 | 1480 | 2230 | 1310 | 1970 | 1140 | 1720 | 979 | 1470 | 816 | 1230 | 684 | 1030 |
| | 12 | 1460 | 2190 | 1290 | 1930 | 1120 | 1690 | 962 | 1450 | 802 | 1210 | 672 | 1010 |
| | 13 | 1430 | 2150 | 1260 | 1900 | 1100 | 1660 | 944 | 1420 | 787 | 1180 | 659 | 991 |
| | 14 | 1410 | 2110 | 1240 | 1860 | 1080 | 1630 | 926 | 1390 | 771 | 1160 | 646 | 971 |
| | 15 | 1380 | 2070 | 1210 | 1820 | 1060 | 1590 | 906 | 1360 | 754 | 1130 | 632 | 950 |
| | 16 | 1350 | 2020 | 1190 | 1780 | 1030 | 1560 | 885 | 1330 | 736 | 1110 | 617 | 928 |
| | 17 | 1320 | 1980 | 1160 | 1740 | 1010 | 1520 | 863 | 1300 | 718 | 1080 | 602 | 905 |
| | 18 | 1280 | 1930 | 1130 | 1700 | 985 | 1480 | 841 | 1260 | 699 | 1050 | 587 | 882 |
| | 19 | 1250 | 1880 | 1100 | 1650 | 958 | 1440 | 818 | 1230 | 679 | 1020 | 570 | 857 |
| | 20 | 1220 | 1830 | 1070 | 1610 | 931 | 1400 | 794 | 1190 | 659 | 991 | 554 | 833 |
| | 22 | 1150 | 1720 | 1010 | 1510 | 876 | 1320 | 746 | 1120 | 618 | 929 | 520 | 782 |
| | 24 | 1070 | 1610 | 942 | 1420 | 819 | 1230 | 696 | 1050 | 576 | 866 | 485 | 729 |
| | 26 | 1000 | 1500 | 877 | 1320 | 761 | 1140 | 646 | 971 | 534 | 802 | 450 | 676 |
| | 28 | 927 | 1390 | 811 | 1220 | 703 | 1060 | 596 | 896 | 491 | 739 | 415 | 623 |
| | 30 | 854 | 1280 | 746 | 1120 | 645 | 970 | 546 | 821 | 450 | 676 | 380 | 571 |
| | 32 | 783 | 1180 | 682 | 1030 | 589 | 886 | 498 | 748 | 409 | 615 | 346 | 520 |
| | 34 | 713 | 1070 | 620 | 932 | 535 | 804 | 451 | 678 | 370 | 556 | 313 | 471 |
| | 36 | 646 | 971 | 561 | 843 | 482 | 725 | 405 | 609 | 331 | 498 | 281 | 423 |
| | 38 | 581 | 873 | 503 | 756 | 433 | 651 | 364 | 547 | 297 | 447 | 253 | 380 |
| | 40 | 524 | 787 | 454 | 682 | 391 | 587 | 328 | 494 | 268 | 404 | 228 | 343 |
| **Properties** | | | | | | | | | | | | | |
| $P_{wo}$, kips | | 435 | 653 | 363 | 545 | 300 | 451 | 241 | 362 | 189 | 283 | 155 | 232 |
| $P_{wi}$, kips/in. | | 37.7 | 56.5 | 33.3 | 50.0 | 29.2 | 43.8 | 25.0 | 37.5 | 20.8 | 31.3 | 18.0 | 27.0 |
| $P_{wb}$, kips | | 2100 | 3160 | 1450 | 2190 | 974 | 1460 | 612 | 920 | 356 | 535 | 229 | 345 |
| $P_{fb}$, kips | | 239 | 359 | 187 | 281 | 143 | 215 | 105 | 158 | 73.1 | 110 | 54.6 | 82.0 |
| $L_p$, ft | | 13.6 | | 13.5 | | 13.4 | | 16.7 | | 20.2 | | 22.9 | |
| $L_r$, ft | | 67.6 | | 60.2 | | 54.5 | | 48.6 | | 43.6 | | 40.6 | |
| $A_g$, in.$^2$ | | 53.9 | | 47.7 | | 41.7 | | 35.8 | | 29.9 | | 25.8 | |
| $I_x$, in.$^4$ | | 2490 | | 2190 | | 1870 | | 1590 | | 1300 | | 1110 | |
| $I_y$, in.$^4$ | | 803 | | 697 | | 599 | | 504 | | 412 | | 349 | |
| $r_y$, in. | | 3.86 | | 3.82 | | 3.79 | | 3.75 | | 3.71 | | 3.68 | |
| $r_x/r_y$ | | 1.76 | | 1.77 | | 1.77 | | 1.78 | | 1.78 | | 1.78 | |
| $P_{ex}(KL)^2/10^4$, k-in.$^2$ | | 71300 | | 62700 | | 53500 | | 45500 | | 37200 | | 31800 | |
| $P_{ey}(KL)^2/10^4$, k-in.$^2$ | | 23000 | | 19900 | | 17100 | | 14400 | | 11800 | | 9990 | |

| ASD | LRFD |
|---|---|
| $\Omega_c = 1.67$ | $\phi_c = 0.90$ |

[c] Shape is slender for compression with $F_y$ = 50 ksi.

**Insert P4-26**



## Table 4-2 (continued)
# Available Strength in Axial Compression, kips
## HP-Shapes

HP14-HP12

$F_y$ = 50 ksi

| Shape | | HP14× | | | | | | | | HP12× | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| lb/ft | | 117 | | 102 | | 89 | | 73[c] | | 84 | | 74 | |
| Design | | $P_n/\Omega_c$ | $\phi_c P_n$ | $P_n/\Omega_c$ | $\phi_c P_n$ | $P_n/\Omega_c$ | $\phi_c P_n$ | $P_n/\Omega_c$ | $\phi_c P_n$ | $P_n/\Omega_c$ | $\phi_c P_n$ | $P_n/\Omega_c$ | $\phi_c P_n$ |
| | | ASD | LRFD | ASD | LRFD | ASD | LRFD | ASD | LRFD | ASD | LRFD | ASD | LRFD |
| Effective length, $KL$ (ft), with respect to least radius of gyration, $r_y$ | 0 | 1030 | 1550 | 901 | 1350 | 781 | 1170 | 623 | 937 | 737 | 1110 | 653 | 981 |
| | 6 | 1000 | 1500 | 875 | 1310 | 758 | 1140 | 605 | 909 | 705 | 1060 | 624 | 938 |
| | 7 | 990 | 1490 | 865 | 1300 | 750 | 1130 | 598 | 899 | 694 | 1040 | 614 | 923 |
| | 8 | 977 | 1470 | 855 | 1280 | 740 | 1110 | 590 | 887 | 681 | 1020 | 603 | 906 |
| | 9 | 964 | 1450 | 843 | 1270 | 730 | 1100 | 582 | 875 | 667 | 1000 | 591 | 888 |
| | 10 | 949 | 1430 | 829 | 1250 | 718 | 1080 | 573 | 861 | 652 | 980 | 577 | 867 |
| | 11 | 933 | 1400 | 815 | 1220 | 705 | 1060 | 563 | 846 | 636 | 955 | 562 | 845 |
| | 12 | 916 | 1380 | 800 | 1200 | 692 | 1040 | 552 | 830 | 618 | 929 | 546 | 821 |
| | 13 | 897 | 1350 | 783 | 1180 | 677 | 1020 | 541 | 813 | 599 | 901 | 530 | 796 |
| | 14 | 878 | 1320 | 766 | 1150 | 662 | 995 | 528 | 794 | 580 | 872 | 512 | 770 |
| | 15 | 857 | 1290 | 748 | 1120 | 646 | 971 | 516 | 775 | 560 | 842 | 494 | 743 |
| | 16 | 836 | 1260 | 729 | 1100 | 629 | 946 | 502 | 755 | 539 | 810 | 476 | 715 |
| | 17 | 813 | 1220 | 709 | 1070 | 612 | 920 | 489 | 735 | 518 | 779 | 457 | 687 |
| | 18 | 790 | 1190 | 689 | 1030 | 594 | 893 | 475 | 713 | 496 | 746 | 437 | 658 |
| | 19 | 767 | 1150 | 668 | 1000 | 576 | 866 | 460 | 691 | 474 | 713 | 418 | 628 |
| | 20 | 743 | 1120 | 646 | 972 | 557 | 838 | 445 | 669 | 452 | 680 | 398 | 599 |
| | 22 | 694 | 1040 | 603 | 906 | 519 | 780 | 415 | 623 | 408 | 614 | 359 | 540 |
| | 24 | 643 | 967 | 558 | 839 | 480 | 722 | 384 | 577 | 365 | 549 | 320 | 482 |
| | 26 | 593 | 891 | 514 | 772 | 441 | 663 | 353 | 531 | 323 | 486 | 283 | 426 |
| | 28 | 543 | 816 | 470 | 706 | 403 | 606 | 322 | 484 | 283 | 425 | 247 | 372 |
| | 30 | 494 | 742 | 427 | 641 | 365 | 549 | 292 | 439 | 247 | 371 | 216 | 324 |
| | 32 | 446 | 671 | 385 | 579 | 329 | 494 | 263 | 396 | 217 | 326 | 189 | 285 |
| | 34 | 400 | 602 | 344 | 518 | 294 | 441 | 235 | 354 | 192 | 289 | 168 | 252 |
| | 36 | 357 | 537 | 307 | 462 | 262 | 394 | 210 | 316 | 171 | 257 | 150 | 225 |
| | 38 | 320 | 482 | 276 | 414 | 235 | 353 | 188 | 283 | 154 | 231 | 134 | 202 |
| | 40 | 289 | 435 | 249 | 374 | 212 | 319 | 170 | 256 | 139 | 208 | 121 | 182 |
| Properties | | | | | | | | | | | | | |
| $P_{wo}$, kips | | 201 | 302 | 162 | 243 | 134 | 201 | 100 | 150 | 158 | 236 | 132 | 198 |
| $P_{wi}$, kips/in. | | 26.8 | 40.3 | 23.5 | 35.3 | 20.5 | 30.8 | 16.8 | 25.3 | 22.8 | 34.3 | 20.2 | 30.3 |
| $P_{wb}$, kips | | 790 | 1190 | 531 | 798 | 354 | 532 | 195 | 294 | 572 | 859 | 393 | 591 |
| $P_{fb}$, kips | | 121 | 182 | 93.0 | 140 | 70.8 | 106 | 47.7 | 71.7 | 87.8 | 132 | 69.6 | 105 |
| $L_p$, ft | | 12.9 | | 15.6 | | 17.8 | | 21.2 | | 10.4 | | 11.9 | |
| $L_r$, ft | | 50.5 | | 45.7 | | 41.7 | | 37.6 | | 41.3 | | 37.9 | |
| $A_g$, in.$^2$ | | 34.4 | | 30.1 | | 26.1 | | 21.4 | | 24.6 | | 21.8 | |
| $I_x$, in.$^4$ | | 1220 | | 1050 | | 904 | | 729 | | 650 | | 569 | |
| $I_y$, in.$^4$ | | 443 | | 380 | | 326 | | 261 | | 213 | | 186 | |
| $r_y$, in. | | 3.59 | | 3.56 | | 3.53 | | 3.49 | | 2.94 | | 2.92 | |
| $r_x/r_y$ | | 1.66 | | 1.66 | | 1.67 | | 1.67 | | 1.75 | | 1.75 | |
| $P_{ex}(KL)^2/10^4$, k-in.$^2$ | | 34900 | | 30100 | | 25900 | | 20900 | | 18600 | | 16300 | |
| $P_{ey}(KL)^2/10^4$, k-in.$^2$ | | 12700 | | 10900 | | 9330 | | 7470 | | 6100 | | 5320 | |

| ASD | LRFD |
|---|---|
| $\Omega_c = 1.67$ | $\phi_c = 0.90$ |

[c] Shape is slender for compression with $F_y$ = 50 ksi.

**Insert P4-27**



## Table 4-2 (continued)
# Available Strength in Axial Compression, kips
## HP-Shapes

$F_y$ = 50 ksi

HP12-HP8

| Shape | | HP12× | | | | HP10× | | | | HP8× | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| lb/ft | | 63 | | 53[c] | | 57 | | 42 | | 36 | |
| Design | | $P_n/\Omega_c$ | $\phi_c P_n$ | $P_n/\Omega_c$ | $\phi_c P_n$ | $P_n/\Omega_c$ | $\phi_c P_n$ | $P_n/\Omega_c$ | $\phi_c P_n$ | $P_n/\Omega_c$ | $\phi_c P_n$ |
| | | ASD | LRFD | ASD | LRFD | ASD | LRFD | ASD | LRFD | ASD | LRFD |
| Effective length, $KL$ (ft), with respect to least radius of gyration, $r_y$ | 0 | 551 | 828 | 460 | 691 | 500 | 751 | 371 | 558 | 317 | 477 |
| | 6 | 526 | 791 | 439 | 660 | 469 | 706 | 348 | 523 | 287 | 432 |
| | 7 | 518 | 778 | 432 | 649 | 459 | 690 | 340 | 511 | 277 | 416 |
| | 8 | 508 | 763 | 424 | 637 | 447 | 672 | 331 | 497 | 266 | 400 |
| | 9 | 497 | 747 | 415 | 623 | 434 | 652 | 321 | 482 | 254 | 381 |
| | 10 | 485 | 729 | 405 | 608 | 420 | 631 | 310 | 465 | 241 | 362 |
| | 11 | 472 | 710 | 394 | 592 | 404 | 608 | 298 | 448 | 227 | 341 |
| | 12 | 459 | 690 | 383 | 575 | 388 | 584 | 286 | 430 | 213 | 320 |
| | 13 | 445 | 668 | 371 | 557 | 372 | 559 | 273 | 411 | 199 | 299 |
| | 14 | 430 | 646 | 358 | 538 | 355 | 533 | 260 | 391 | 184 | 277 |
| | 15 | 414 | 622 | 345 | 519 | 337 | 506 | 247 | 371 | 170 | 256 |
| | 16 | 398 | 598 | 332 | 499 | 319 | 480 | 233 | 351 | 156 | 235 |
| | 17 | 382 | 574 | 318 | 478 | 301 | 453 | 220 | 330 | 143 | 214 |
| | 18 | 365 | 549 | 304 | 457 | 283 | 426 | 206 | 310 | 129 | 194 |
| | 19 | 348 | 524 | 290 | 436 | 265 | 399 | 193 | 290 | 117 | 175 |
| | 20 | 332 | 498 | 276 | 415 | 248 | 373 | 180 | 270 | 105 | 158 |
| | 22 | 298 | 448 | 248 | 373 | 214 | 322 | 154 | 232 | 86.9 | 131 |
| | 24 | 265 | 399 | 221 | 332 | 182 | 273 | 131 | 196 | 73.0 | 110 |
| | 26 | 234 | 351 | 194 | 292 | 155 | 233 | 111 | 167 | 62.2 | 93.5 |
| | 28 | 203 | 305 | 169 | 254 | 133 | 201 | 95.9 | 144 | 53.7 | 80.7 |
| | 30 | 177 | 266 | 147 | 221 | 116 | 175 | 83.5 | 126 | 46.7 | 70.3 |
| | 32 | 156 | 234 | 129 | 194 | 102 | 154 | 73.4 | 110 | 41.1 | 61.8 |
| | 34 | 138 | 207 | 114 | 172 | 90.5 | 136 | 65.0 | 97.7 | | |
| | 36 | 123 | 185 | 102 | 153 | 80.7 | 121 | 58.0 | 87.2 | | |
| | 38 | 110 | 166 | 91.6 | 138 | 72.5 | 109 | 52.1 | 78.2 | | |
| | 40 | 99.6 | 150 | 82.7 | 124 | 65.4 | 98.3 | 47.0 | 70.6 | | |
| **Properties** | | | | | | | | | | | |
| $P_{wo}$, kips | | 107 | 161 | 81.9 | 123 | 118 | 177 | 78.2 | 117 | 83.8 | 126 |
| $P_{wi}$, kips/in. | | 17.2 | 25.8 | 14.5 | 21.8 | 18.8 | 28.3 | 13.8 | 20.8 | 14.8 | 22.3 |
| $P_{wb}$, kips | | 243 | 365 | 147 | 221 | 397 | 597 | 158 | 237 | 241 | 363 |
| $P_{fb}$, kips | | 49.6 | 74.6 | 35.4 | 53.2 | 59.7 | 89.8 | 33.0 | 49.6 | 37.1 | 55.7 |
| $L_p$, ft | | 14.4 | | 16.6 | | 8.65 | | 12.3 | | 6.90 | |
| $L_r$, ft | | 34.0 | | 31.1 | | 34.8 | | 28.3 | | 27.3 | |
| $A_g$, in.$^2$ | | 18.4 | | 15.5 | | 16.7 | | 12.4 | | 10.6 | |
| $I_x$, in.$^4$ | | 472 | | 393 | | 294 | | 210 | | 119 | |
| $I_y$, in.$^4$ | | 153 | | 127 | | 101 | | 71.7 | | 40.3 | |
| $r_y$, in. | | 2.88 | | 2.86 | | 2.45 | | 2.41 | | 1.95 | |
| $r_x/r_y$ | | 1.76 | | 1.76 | | 1.71 | | 1.71 | | 1.72 | |
| $P_{ex}(KL)^2/10^4$, k-in.$^2$ | | 13500 | | 11200 | | 8410 | | 6010 | | 3410 | |
| $P_{ey}(KL)^2/10^4$, k-in.$^2$ | | 4380 | | 3630 | | 2890 | | 2050 | | 1150 | |

| ASD | LRFD |
|---|---|
| $\Omega_c = 1.67$ | $\phi_c = 0.90$ |

[c] Shape is slender for compression with $F_y$ = 50 ksi.
Note: Heavy line indicates $KL/r_y$ equal to or greater than 200.

**Insert P6-43**



$F_y$ = 50 ksi

## Table 6-1 (continued)
# Combined Flexure and Axial Force
## W-Shapes

W24

| Shape | | W24× | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 103[c] | | | | 94[c] | | | | 84[c] | | | |
| Design | | $p \times 10^3$ (kips)$^{-1}$ | | $b_x \times 10^3$ (kip-ft)$^{-1}$ | | $p \times 10^3$ (kips)$^{-1}$ | | $b_x \times 10^3$ (kip-ft)$^{-1}$ | | $p \times 10^3$ (kips)$^{-1}$ | | $b_x \times 10^3$ (kip-ft)$^{-1}$ | |
| | | ASD | LRFD | ASD | LRFD | ASD | LRFD | ASD | LRFD | ASD | LRFD | ASD | LRFD |
| Effective length, $KL$ (ft), with respect to least radius of gyration, $r_y$, or Unbraced Length, $L_b$ (ft), for X-X axis bending | 0 | 1.13 | 0.753 | 1.27 | 0.847 | 1.26 | 0.840 | 1.40 | 0.933 | 1.46 | 0.968 | 1.59 | 1.06 |
| | 11 | 1.52 | 1.01 | 1.42 | 0.944 | 1.67 | 1.11 | 1.57 | 1.05 | 1.92 | 1.28 | 1.80 | 1.20 |
| | 12 | 1.62 | 1.08 | 1.46 | 0.972 | 1.78 | 1.18 | 1.62 | 1.08 | 2.03 | 1.35 | 1.87 | 1.24 |
| | 13 | 1.73 | 1.15 | 1.51 | 1.00 | 1.90 | 1.26 | 1.68 | 1.12 | 2.17 | 1.44 | 1.93 | 1.28 |
| | 14 | 1.86 | 1.23 | 1.55 | 1.03 | 2.04 | 1.36 | 1.73 | 1.15 | 2.33 | 1.55 | 2.00 | 1.33 |
| | 15 | 2.00 | 1.33 | 1.61 | 1.07 | 2.21 | 1.47 | 1.79 | 1.19 | 2.52 | 1.68 | 2.08 | 1.38 |
| | 16 | 2.18 | 1.45 | 1.66 | 1.10 | 2.40 | 1.60 | 1.86 | 1.24 | 2.75 | 1.83 | 2.16 | 1.44 |
| | 17 | 2.38 | 1.58 | 1.72 | 1.14 | 2.62 | 1.74 | 1.93 | 1.28 | 3.01 | 2.00 | 2.25 | 1.49 |
| | 18 | 2.61 | 1.74 | 1.78 | 1.19 | 2.88 | 1.92 | 2.01 | 1.33 | 3.32 | 2.21 | 2.34 | 1.56 |
| | 19 | 2.88 | 1.92 | 1.85 | 1.23 | 3.18 | 2.12 | 2.09 | 1.39 | 3.68 | 2.45 | 2.45 | 1.63 |
| | 20 | 3.19 | 2.12 | 1.92 | 1.28 | 3.53 | 2.35 | 2.17 | 1.45 | 4.08 | 2.71 | 2.56 | 1.70 |
| | 22 | 3.86 | 2.57 | 2.09 | 1.39 | 4.27 | 2.84 | 2.43 | 1.61 | 4.94 | 3.28 | 2.95 | 1.96 |
| | 24 | 4.60 | 3.06 | 2.37 | 1.58 | 5.08 | 3.38 | 2.76 | 1.84 | 5.88 | 3.91 | 3.37 | 2.24 |
| | 26 | 5.40 | 3.59 | 2.65 | 1.77 | 5.96 | 3.97 | 3.10 | 2.06 | 6.90 | 4.59 | 3.80 | 2.53 |
| | 28 | 6.26 | 4.16 | 2.94 | 1.95 | 6.92 | 4.60 | 3.44 | 2.29 | 8.00 | 5.32 | 4.24 | 2.82 |
| | 30 | 7.19 | 4.78 | 3.22 | 2.14 | 7.94 | 5.28 | 3.79 | 2.52 | 9.18 | 6.11 | 4.67 | 3.11 |
| | 32 | 8.18 | 5.44 | 3.50 | 2.33 | 9.03 | 6.01 | 4.13 | 2.75 | 10.4 | 6.95 | 5.11 | 3.40 |
| **Other Constants and Properties** | | | | | | | | | | | | | |
| $b_y \times 10^3$, (kip-ft)$^{-1}$ | | 8.58 | | 5.71 | | 9.50 | | 6.32 | | 10.9 | | 7.27 | |
| $t_y \times 10^3$, (kips)$^{-1}$ | | 1.10 | | 0.733 | | 1.21 | | 0.802 | | 1.35 | | 0.900 | |
| $t_r \times 10^3$, (kips)$^{-1}$ | | 1.35 | | 0.903 | | 1.48 | | 0.987 | | 1.66 | | 1.11 | |
| $r_x/r_y$ | | 5.03 | | | | 4.98 | | | | 5.02 | | | |
| $r_y$, in. | | 1.99 | | | | 1.98 | | | | 1.95 | | | |

[c] Shape is slender for compression with $F_y$ = 50 ksi.

Note: Heavy line indicates $KL/r_y$ equal to or greater than 200.

**Insert P6-49**



$F_y$ = 50 ksi

## Table 6-1 (continued)
# Combined Flexure and Axial Force
## W-Shapes

W21

| Shape | | W21× | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 68[c] | | | | 62[c] | | | | 57[c] | | | |
| Design | | $p \times 10^3$ (kips)$^{-1}$ | | $b_x \times 10^3$ (kip-ft)$^{-1}$ | | $p \times 10^3$ (kips)$^{-1}$ | | $b_x \times 10^3$ (kip-ft)$^{-1}$ | | $p \times 10^3$ (kips)$^{-1}$ | | $b_x \times 10^3$ (kip-ft)$^{-1}$ | |
| | | ASD | LRFD | ASD | LRFD | ASD | LRFD | ASD | LRFD | ASD | LRFD | ASD | LRFD |
| Effective length, $KL$ (ft), with respect to least radius of gyration, $r_y$, or Unbraced Length, $L_b$ (ft), for X-X axis bending | 0 | 1.77 | 1.18 | 2.23 | 1.48 | 1.98 | 1.31 | 2.47 | 1.65 | 2.18 | 1.45 | 2.76 | 1.84 |
| | 6 | 1.95 | 1.30 | 2.23 | 1.48 | 2.18 | 1.45 | 2.47 | 1.65 | 2.56 | 1.71 | 2.91 | 1.94 |
| | 7 | 2.02 | 1.34 | 2.27 | 1.51 | 2.26 | 1.50 | 2.54 | 1.69 | 2.73 | 1.82 | 3.04 | 2.03 |
| | 8 | 2.10 | 1.40 | 2.35 | 1.56 | 2.35 | 1.56 | 2.62 | 1.74 | 2.94 | 1.96 | 3.19 | 2.12 |
| | 9 | 2.21 | 1.47 | 2.43 | 1.62 | 2.47 | 1.64 | 2.71 | 1.81 | 3.21 | 2.14 | 3.35 | 2.23 |
| | 10 | 2.33 | 1.55 | 2.51 | 1.67 | 2.61 | 1.74 | 2.81 | 1.87 | 3.56 | 2.37 | 3.53 | 2.35 |
| | 11 | 2.48 | 1.65 | 2.61 | 1.73 | 2.78 | 1.85 | 2.92 | 1.94 | 4.02 | 2.68 | 3.73 | 2.48 |
| | 12 | 2.67 | 1.77 | 2.70 | 1.80 | 2.98 | 1.98 | 3.04 | 2.02 | 4.60 | 3.06 | 3.95 | 2.63 |
| | 13 | 2.89 | 1.92 | 2.81 | 1.87 | 3.22 | 2.14 | 3.16 | 2.10 | 5.32 | 3.54 | 4.20 | 2.79 |
| | 14 | 3.16 | 2.10 | 2.93 | 1.95 | 3.53 | 2.35 | 3.30 | 2.19 | 6.17 | 4.10 | 4.48 | 2.98 |
| | 15 | 3.47 | 2.31 | 3.05 | 2.03 | 3.89 | 2.59 | 3.44 | 2.29 | 7.08 | 4.71 | 4.94 | 3.29 |
| | 16 | 3.84 | 2.55 | 3.19 | 2.12 | 4.31 | 2.87 | 3.61 | 2.40 | 8.06 | 5.36 | 5.47 | 3.64 |
| | 17 | 4.27 | 2.84 | 3.34 | 2.22 | 4.83 | 3.21 | 3.78 | 2.52 | 9.10 | 6.05 | 6.01 | 4.00 |
| | 18 | 4.79 | 3.19 | 3.50 | 2.33 | 5.41 | 3.60 | 3.98 | 2.65 | 10.2 | 6.79 | 6.55 | 4.36 |
| | 19 | 5.34 | 3.55 | 3.72 | 2.48 | 6.03 | 4.01 | 4.33 | 2.88 | 11.4 | 7.56 | 7.10 | 4.72 |
| | 20 | 5.91 | 3.93 | 4.03 | 2.68 | 6.68 | 4.45 | 4.70 | 3.13 | 12.6 | 8.38 | 7.65 | 5.09 |
| | 22 | 7.16 | 4.76 | 4.66 | 3.10 | 8.09 | 5.38 | 5.46 | 3.63 | 15.2 | 10.1 | 8.76 | 5.83 |
| | 24 | 8.52 | 5.67 | 5.31 | 3.53 | 9.63 | 6.40 | 6.24 | 4.15 | | | | |
| | 26 | 9.99 | 6.65 | 5.95 | 3.96 | 11.3 | 7.52 | 7.02 | 4.67 | | | | |
| | 28 | 11.6 | 7.71 | 6.60 | 4.39 | 13.1 | 8.72 | 7.81 | 5.20 | | | | |
| | 30 | 13.3 | 8.85 | 7.26 | 4.83 | | | | | | | | |
| **Other Constants and Properties** | | | | | | | | | | | | | |
| $b_y \times 10^3$, (kip-ft)$^{-1}$ | | 14.6 | | 9.71 | | 16.4 | | 10.9 | | 24.1 | | 16.0 | |
| $t_y \times 10^3$, (kips)$^{-1}$ | | 1.67 | | 1.11 | | 1.83 | | 1.21 | | 2.00 | | 1.33 | |
| $t_r \times 10^3$, (kips)$^{-1}$ | | 2.05 | | 1.37 | | 2.24 | | 1.49 | | 2.46 | | 1.64 | |
| $r_x/r_y$ | | 4.78 | | | | 4.82 | | | | 6.19 | | | |
| $r_y$, in. | | 1.80 | | | | 1.77 | | | | 1.35 | | | |

[c] Shape is slender for compression with $F_y$ = 50 ksi.

Note: Heavy line indicates $KL/r_y$ equal to or greater than 200.

## Table 6-1 (continued)
# Combined Flexure and Axial Force
## W-Shapes

$F_y$ = 50 ksi

W21-W18

| Shape | | W21× | | | | W18× | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 44[c] | | | | 311[h] | | | | 283[h] | | | |
| Design | | $p \times 10^3$ (kips)$^{-1}$ | | $b_x \times 10^3$ (kip-ft)$^{-1}$ | | $p \times 10^3$ (kips)$^{-1}$ | | $b_x \times 10^3$ (kip-ft)$^{-1}$ | | $p \times 10^3$ (kips)$^{-1}$ | | $b_x \times 10^3$ (kip-ft)$^{-1}$ | |
| | | ASD | LRFD | ASD | LRFD | ASD | LRFD | ASD | LRFD | ASD | LRFD | ASD | LRFD |
| Effective length, $KL$ (ft), with respect to least radius of gyration, $r_y$, or Unbraced Length, $L_b$ (ft), for X-X axis bending | 0 | 2.97 | 1.98 | 3.73 | 2.48 | 0.365 | 0.243 | 0.473 | 0.314 | 0.401 | 0.267 | 0.527 | 0.351 |
| | 6 | 3.53 | 2.35 | 4.03 | 2.68 | 0.381 | 0.253 | 0.473 | 0.314 | 0.419 | 0.279 | 0.527 | 0.351 |
| | 7 | 3.78 | 2.51 | 4.24 | 2.82 | 0.387 | 0.257 | 0.473 | 0.314 | 0.426 | 0.284 | 0.527 | 0.351 |
| | 8 | 4.09 | 2.72 | 4.48 | 2.98 | 0.394 | 0.262 | 0.473 | 0.314 | 0.434 | 0.289 | 0.527 | 0.351 |
| | 9 | 4.50 | 3.00 | 4.75 | 3.16 | 0.402 | 0.268 | 0.473 | 0.314 | 0.443 | 0.295 | 0.527 | 0.351 |
| | 10 | 5.03 | 3.35 | 5.05 | 3.36 | 0.412 | 0.274 | 0.473 | 0.314 | 0.454 | 0.302 | 0.527 | 0.351 |
| | 11 | 5.74 | 3.82 | 5.39 | 3.59 | 0.422 | 0.281 | 0.474 | 0.315 | 0.466 | 0.310 | 0.530 | 0.352 |
| | 12 | 6.68 | 4.45 | 5.79 | 3.85 | 0.434 | 0.289 | 0.477 | 0.317 | 0.480 | 0.319 | 0.533 | 0.355 |
| | 13 | 7.84 | 5.22 | 6.25 | 4.16 | 0.447 | 0.298 | 0.480 | 0.319 | 0.495 | 0.329 | 0.537 | 0.357 |
| | 14 | 9.10 | 6.05 | 7.11 | 4.73 | 0.462 | 0.308 | 0.483 | 0.321 | 0.512 | 0.340 | 0.540 | 0.359 |
| | 15 | 10.4 | 6.95 | 7.99 | 5.32 | 0.479 | 0.319 | 0.486 | 0.323 | 0.530 | 0.353 | 0.544 | 0.362 |
| | 16 | 11.9 | 7.91 | 8.90 | 5.92 | 0.497 | 0.331 | 0.489 | 0.325 | 0.551 | 0.367 | 0.548 | 0.364 |
| | 17 | 13.4 | 8.93 | 9.83 | 6.54 | 0.517 | 0.344 | 0.492 | 0.327 | 0.574 | 0.382 | 0.551 | 0.367 |
| | 18 | 15.0 | 10.0 | 10.8 | 7.18 | 0.540 | 0.359 | 0.495 | 0.329 | 0.600 | 0.399 | 0.555 | 0.369 |
| | 19 | 16.8 | 11.1 | 11.8 | 7.82 | 0.564 | 0.375 | 0.498 | 0.331 | 0.628 | 0.418 | 0.559 | 0.372 |
| | 20 | 18.6 | 12.4 | 12.7 | 8.47 | 0.592 | 0.394 | 0.501 | 0.333 | 0.659 | 0.439 | 0.563 | 0.374 |
| | 22 | | | | | 0.655 | 0.436 | 0.507 | 0.338 | 0.732 | 0.487 | 0.571 | 0.380 |
| | 24 | | | | | 0.732 | 0.487 | 0.514 | 0.342 | 0.821 | 0.546 | 0.579 | 0.385 |
| | 26 | | | | | 0.826 | 0.550 | 0.521 | 0.347 | 0.929 | 0.618 | 0.588 | 0.391 |
| | 28 | | | | | 0.942 | 0.627 | 0.528 | 0.351 | 1.06 | 0.708 | 0.596 | 0.397 |
| | 30 | | | | | 1.08 | 0.720 | 0.535 | 0.356 | 1.22 | 0.813 | 0.605 | 0.403 |
| | 32 | | | | | 1.23 | 0.819 | 0.542 | 0.361 | 1.39 | 0.925 | 0.614 | 0.409 |
| | 34 | | | | | 1.39 | 0.924 | 0.550 | 0.366 | 1.57 | 1.04 | 0.624 | 0.415 |
| | 36 | | | | | 1.56 | 1.04 | 0.557 | 0.371 | 1.76 | 1.17 | 0.634 | 0.422 |
| | 38 | | | | | 1.74 | 1.15 | 0.565 | 0.376 | 1.96 | 1.30 | 0.644 | 0.428 |
| | 40 | | | | | 1.92 | 1.28 | 0.573 | 0.382 | 2.17 | 1.45 | 0.654 | 0.435 |
| **Other Constants and Properties** | | | | | | | | | | | | | |
| $b_y \times 10^3$, (kip-ft)$^{-1}$ | | 35.0 | | 23.3 | | 1.72 | | 1.15 | | 1.93 | | 1.28 | |
| $t_y \times 10^3$, (kips)$^{-1}$ | | 2.57 | | 1.71 | | 0.365 | | 0.243 | | 0.401 | | 0.267 | |
| $t_r \times 10^3$, (kips)$^{-1}$ | | 3.16 | | 2.10 | | 0.448 | | 0.299 | | 0.493 | | 0.328 | |
| $r_x/r_y$ | | 6.40 | | | | 2.96 | | | | 2.96 | | | |
| $r_y$, in. | | 1.26 | | | | 2.95 | | | | 2.91 | | | |

[c] Shape is slender for compression with $F_y$ = 50 ksi.

[h] Flange thickness greater than 2 in. Special requirements may apply per AISC *Specification* Section A3.1c.

Note: Heavy line indicates $KL/r_y$ equal to or greater than 200.