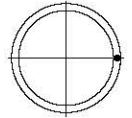




HSS / Round Structural Steel Tubing

Allowable Concentric Loads in Kips

F_y=50



ERW

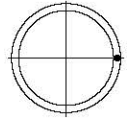
| Nominal Outside Diameter | | 20.000 | | 18.000 | | 16.000 | | | | 14.000 | | |
|-------------------------------|-------|--------|-------|--------|-------|--------|-------|-------|-------|--------|-------|-------|
| Wall Thickness | | 0.500 | 0.375 | 0.500 | 0.375 | 0.500 | 0.438 | 0.375 | 0.312 | 0.500 | 0.375 | 0.312 |
| Weight Per Foot | | 104.13 | 78.60 | 93.45 | 70.59 | 82.77 | 72.80 | 62.58 | 52.28 | 72.09 | 54.57 | 45.61 |
| Design Wall Thickness | | 0.465 | 0.349 | 0.465 | 0.349 | 0.465 | 0.407 | 0.349 | 0.291 | 0.465 | 0.349 | 0.291 |
| F_y = 50 ksi | | | | | | | | | | | | |
| Effective length KL in feet | 0 | 855 | 645 | 768 | 582 | 681 | 597 | 516 | 432 | 594 | 450 | 375 |
| | 2 | 848 | 640 | 761 | 577 | 674 | 591 | 511 | 428 | 587 | 445 | 371 |
| | 3 | 845 | 637 | 758 | 574 | 670 | 588 | 508 | 425 | 583 | 442 | 368 |
| | 4 | 841 | 634 | 754 | 571 | 666 | 584 | 505 | 423 | 579 | 439 | 366 |
| | 5 | 837 | 631 | 750 | 568 | 662 | 581 | 502 | 420 | 575 | 436 | 363 |
| | 6 | 833 | 628 | 745 | 565 | 658 | 577 | 499 | 417 | 570 | 432 | 360 |
| | 7 | 828 | 625 | 741 | 562 | 653 | 573 | 495 | 415 | 565 | 429 | 357 |
| | 8 | 824 | 622 | 736 | 558 | 648 | 568 | 491 | 412 | 560 | 425 | 354 |
| | 9 | 819 | 618 | 731 | 554 | 643 | 564 | 488 | 408 | 555 | 421 | 351 |
| | 10 | 814 | 614 | 726 | 551 | 638 | 559 | 484 | 405 | 549 | 417 | 347 |
| | 11 | 809 | 611 | 721 | 547 | 632 | 555 | 479 | 402 | 544 | 412 | 344 |
| | 12 | 804 | 607 | 716 | 543 | 627 | 550 | 475 | 398 | 537 | 408 | 340 |
| | 13 | 799 | 603 | 710 | 538 | 621 | 544 | 471 | 394 | 531 | 403 | 336 |
| | 14 | 793 | 599 | 704 | 534 | 615 | 539 | 466 | 391 | 525 | 398 | 332 |
| | 15 | 787 | 594 | 698 | 530 | 608 | 534 | 462 | 387 | 518 | 393 | 328 |
| | 16 | 782 | 590 | 692 | 525 | 602 | 528 | 457 | 383 | 511 | 388 | 324 |
| | 17 | 776 | 585 | 686 | 520 | 595 | 522 | 452 | 378 | 504 | 383 | 319 |
| | 18 | 769 | 581 | 679 | 515 | 588 | 516 | 447 | 374 | 497 | 377 | 315 |
| | 19 | 763 | 576 | 673 | 510 | 581 | 510 | 441 | 370 | 489 | 372 | 310 |
| | 20 | 757 | 571 | 666 | 505 | 574 | 504 | 436 | 365 | 482 | 366 | 305 |
| | 21 | 750 | 566 | 659 | 500 | 567 | 498 | 430 | 361 | 474 | 360 | 301 |
| | 22 | 743 | 561 | 652 | 495 | 559 | 491 | 425 | 356 | 466 | 354 | 296 |
| | 23 | 736 | 556 | 645 | 489 | 552 | 484 | 419 | 351 | 458 | 348 | 290 |
| | 24 | 729 | 551 | 637 | 484 | 544 | 477 | 413 | 346 | 449 | 342 | 285 |
| | 25 | 722 | 546 | 630 | 478 | 536 | 470 | 407 | 341 | 441 | 335 | 280 |
| | 26 | 715 | 540 | 622 | 472 | 528 | 463 | 401 | 336 | 432 | 329 | 275 |
| | 27 | 708 | 535 | 614 | 467 | 519 | 456 | 395 | 331 | 423 | 322 | 269 |
| | 28 | 700 | 529 | 606 | 461 | 511 | 449 | 389 | 326 | 414 | 315 | 263 |
| | 29 | 692 | 523 | 598 | 454 | 502 | 441 | 382 | 320 | 405 | 308 | 258 |
| | 30 | 685 | 517 | 590 | 448 | 494 | 434 | 375 | 315 | 395 | 301 | 252 |
| | 31 | 677 | 512 | 582 | 442 | 485 | 426 | 369 | 309 | 386 | 294 | 246 |
| | 32 | 669 | 505 | 573 | 436 | 476 | 418 | 362 | 304 | 376 | 287 | 240 |
| | 33 | 660 | 499 | 564 | 429 | 466 | 410 | 355 | 298 | 366 | 279 | 234 |
| | 34 | 652 | 493 | 556 | 422 | 457 | 402 | 348 | 292 | 356 | 272 | 227 |
| | 35 | 644 | 487 | 547 | 416 | 447 | 393 | 341 | 286 | 345 | 264 | 221 |
| | 36 | 635 | 480 | 538 | 409 | 438 | 385 | 333 | 280 | 335 | 256 | 214 |
| | 37 | 626 | 474 | 528 | 402 | 428 | 376 | 326 | 274 | 324 | 248 | 208 |
| | 38 | 618 | 467 | 519 | 395 | 418 | 367 | 318 | 268 | 313 | 240 | 201 |
| | 39 | 609 | 461 | 509 | 388 | 407 | 358 | 311 | 261 | 302 | 231 | 194 |
| | 40 | 600 | 454 | 500 | 381 | 397 | 349 | 303 | 255 | 290 | 223 | 187 |
| PROPERTIES | | | | | | | | | | | | |
| Area, In. ² | 28.5 | 21.5 | 25.6 | 19.4 | 22.7 | 19.9 | 17.2 | 14.4 | 19.8 | 15.0 | 12.5 | |
| I, In. ⁴ | 1360 | 1040 | 985 | 754 | 685 | 606 | 526 | 443 | 453 | 349 | 295 | |
| r, In. | 6.91 | 6.95 | 6.20 | 6.24 | 5.49 | 5.51 | 5.53 | 5.55 | 4.79 | 4.83 | 4.85 | |
| B, Bending Factor | 0.210 | 0.207 | 0.234 | 0.232 | 0.265 | 0.263 | 0.262 | 0.260 | 0.306 | 0.301 | 0.297 | |
| a ÷ 10 ⁶ | 203 | 155 | 147 | 113 | 102 | 90.5 | 78.5 | 66.2 | 67.6 | 52.1 | 44.1 | |



HSS / Round Structural Steel Tubing

Allowable Concentric Loads in Kips

F_y=50



ERW

| Nominal Outside Diameter | | 12.750 | | | 12.500 | | | | | |
|-------------------------------|-------|--------|-------|-------|--------|-------|-------|-------|-------|--------|
| Wall Thickness | | 0.500 | 0.375 | 0.250 | 0.625 | 0.500 | 0.375 | 0.312 | 0.250 | 0.188 |
| Weight Per Foot | | 65.42 | 49.56 | 33.38 | 79.27 | 64.08 | 48.56 | 40.61 | 32.71 | 24.72 |
| Design Wall Thickness | | 0.465 | 0.349 | 0.233 | 0.581 | 0.465 | 0.349 | 0.291 | 0.233 | 0.174* |
| F_y = 50 ksi | | | | | | | | | | |
| Effective length KL in feet | 0 | 537 | 408 | 275 | 654 | 528 | 399 | 336 | 269 | 197 |
| | 2 | 530 | 403 | 271 | 645 | 521 | 394 | 332 | 266 | 197 |
| | 3 | 526 | 400 | 269 | 640 | 517 | 391 | 329 | 264 | 197 |
| | 4 | 522 | 397 | 267 | 635 | 513 | 388 | 327 | 262 | 197 |
| | 5 | 518 | 393 | 265 | 630 | 508 | 384 | 324 | 260 | 195 |
| | 6 | 513 | 390 | 263 | 624 | 504 | 381 | 321 | 257 | 193 |
| | 7 | 508 | 386 | 260 | 617 | 499 | 377 | 318 | 255 | 191 |
| | 8 | 503 | 382 | 258 | 610 | 493 | 373 | 314 | 252 | 189 |
| | 9 | 497 | 378 | 255 | 603 | 488 | 369 | 311 | 249 | 187 |
| | 10 | 491 | 374 | 252 | 596 | 482 | 365 | 307 | 246 | 185 |
| | 11 | 485 | 369 | 249 | 588 | 476 | 360 | 303 | 243 | 183 |
| | 12 | 479 | 364 | 246 | 581 | 469 | 355 | 299 | 240 | 180 |
| | 13 | 473 | 360 | 243 | 572 | 463 | 350 | 295 | 237 | 178 |
| | 14 | 466 | 355 | 239 | 564 | 456 | 345 | 291 | 234 | 175 |
| | 15 | 459 | 349 | 236 | 555 | 449 | 340 | 287 | 230 | 173 |
| | 16 | 452 | 344 | 232 | 546 | 442 | 335 | 282 | 227 | 170 |
| | 17 | 444 | 339 | 229 | 536 | 434 | 329 | 278 | 223 | 167 |
| | 18 | 437 | 333 | 225 | 527 | 427 | 323 | 273 | 219 | 165 |
| | 19 | 429 | 327 | 221 | 517 | 419 | 318 | 268 | 215 | 162 |
| | 20 | 421 | 321 | 217 | 507 | 411 | 311 | 263 | 211 | 159 |
| | 21 | 413 | 315 | 213 | 496 | 402 | 305 | 258 | 207 | 156 |
| | 22 | 405 | 309 | 209 | 486 | 394 | 299 | 252 | 203 | 152 |
| | 23 | 396 | 302 | 204 | 475 | 385 | 292 | 247 | 198 | 149 |
| | 24 | 387 | 296 | 200 | 463 | 376 | 286 | 241 | 194 | 146 |
| | 25 | 378 | 289 | 196 | 452 | 367 | 279 | 236 | 189 | 143 |
| | 26 | 369 | 282 | 191 | 440 | 358 | 272 | 230 | 185 | 139 |
| | 27 | 360 | 275 | 186 | 428 | 348 | 265 | 224 | 180 | 136 |
| | 28 | 350 | 268 | 182 | 416 | 339 | 258 | 218 | 175 | 132 |
| | 29 | 340 | 261 | 177 | 404 | 329 | 250 | 212 | 170 | 128 |
| | 30 | 330 | 253 | 172 | 391 | 318 | 243 | 205 | 165 | 125 |
| | 31 | 320 | 245 | 167 | 378 | 308 | 235 | 199 | 160 | 121 |
| | 32 | 310 | 238 | 162 | 365 | 298 | 227 | 192 | 155 | 117 |
| | 33 | 299 | 230 | 156 | 351 | 287 | 219 | 186 | 150 | 113 |
| | 34 | 288 | 222 | 151 | 337 | 276 | 211 | 179 | 144 | 109 |
| | 35 | 277 | 213 | 146 | 323 | 265 | 203 | 172 | 139 | 105 |
| | 36 | 266 | 205 | 140 | 309 | 253 | 194 | 165 | 133 | 101 |
| | 37 | 255 | 196 | 134 | 294 | 241 | 185 | 157 | 127 | 96 |
| | 38 | 243 | 188 | 128 | 279 | 229 | 177 | 150 | 121 | 92 |
| | 39 | 231 | 179 | 122 | 265 | 218 | 168 | 143 | 115 | 87 |
| | 40 | 220 | 170 | 117 | 252 | 207 | 159 | 135 | 110 | 83 |
| PROPERTIES | | | | | | | | | | |
| Area, in. ² | 17.9 | 13.6 | 9.16 | 21.8 | 17.6 | 13.3 | 11.2 | 8.98 | 6.74 | |
| I, in. ⁴ | 339 | 262 | 180 | 387 | 319 | 246 | 208 | 169 | 128 | |
| r, in. | 4.35 | 4.39 | 4.43 | 4.22 | 4.26 | 4.30 | 4.32 | 4.34 | 4.36 | |
| B, Bending Factor | 0.337 | 0.331 | 0.324 | 0.352 | 0.345 | 0.338 | 0.337 | 0.332 | 0.329 | |
| a ÷ 10 ⁶ | 50.6 | 39.1 | 26.9 | 57.8 | 47.6 | 36.7 | 31.1 | 25.2 | 19.1 | |

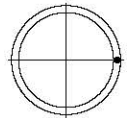
*Slender element section. Diameter-Thickness ratio exceeds AISC "Specification" Section B5.1 limiting value of 3300/F_y.



HSS / Round Structural Steel Tubing

Allowable Concentric Loads in Kips

F_y=50



ERW

| Nominal Outside Diameter | | 12.313 | | | | | | 12.250 | | | | | |
|-------------------------------|-------|--------|-------|-------|-------|-------|--------|--------|-------|-------|-------|-------|--------|
| Wall Thickness | | 0.625 | 0.500 | 0.375 | 0.312 | 0.250 | 0.188 | 0.625 | 0.500 | 0.375 | 0.312 | 0.250 | 0.188 |
| Weight Per Foot | | 78.02 | 63.08 | 47.81 | 39.99 | 32.21 | 24.35 | 77.60 | 62.75 | 47.56 | 39.78 | 32.04 | 24.22 |
| Design Wall Thickness | | 0.581 | 0.465 | 0.349 | 0.291 | 0.233 | 0.174* | 0.581 | 0.465 | 0.349 | 0.291 | 0.233 | 0.174* |
| F_y = 50 ksi | | | | | | | | | | | | | |
| Effective length KL in feet | 0 | 642 | 519 | 393 | 330 | 265 | 195 | 639 | 516 | 390 | 327 | 264 | 194 |
| | 2 | 633 | 512 | 388 | 326 | 262 | 195 | 630 | 509 | 385 | 323 | 261 | 194 |
| | 3 | 628 | 508 | 385 | 323 | 260 | 195 | 625 | 505 | 382 | 320 | 259 | 194 |
| | 4 | 623 | 504 | 382 | 321 | 258 | 194 | 620 | 501 | 379 | 318 | 256 | 192 |
| | 5 | 617 | 499 | 378 | 318 | 255 | 192 | 614 | 496 | 375 | 315 | 254 | 191 |
| | 6 | 611 | 495 | 375 | 315 | 253 | 190 | 608 | 492 | 372 | 312 | 252 | 189 |
| | 7 | 605 | 489 | 371 | 312 | 250 | 188 | 602 | 486 | 368 | 309 | 249 | 187 |
| | 8 | 598 | 484 | 367 | 308 | 248 | 186 | 595 | 481 | 364 | 305 | 247 | 185 |
| | 9 | 591 | 479 | 363 | 305 | 245 | 184 | 588 | 475 | 360 | 302 | 244 | 183 |
| | 10 | 584 | 473 | 358 | 301 | 242 | 182 | 581 | 470 | 355 | 298 | 241 | 181 |
| | 11 | 576 | 466 | 354 | 297 | 239 | 180 | 573 | 463 | 351 | 294 | 238 | 178 |
| | 12 | 568 | 460 | 349 | 293 | 236 | 177 | 565 | 457 | 346 | 290 | 235 | 176 |
| | 13 | 560 | 454 | 344 | 289 | 233 | 175 | 557 | 450 | 341 | 286 | 231 | 174 |
| | 14 | 551 | 447 | 339 | 285 | 229 | 172 | 548 | 444 | 336 | 282 | 228 | 171 |
| | 15 | 542 | 440 | 334 | 280 | 226 | 170 | 539 | 437 | 331 | 278 | 224 | 168 |
| | 16 | 533 | 432 | 328 | 276 | 222 | 167 | 530 | 429 | 325 | 273 | 221 | 166 |
| | 17 | 524 | 425 | 323 | 271 | 218 | 164 | 521 | 422 | 320 | 268 | 217 | 163 |
| | 18 | 514 | 417 | 317 | 266 | 214 | 161 | 511 | 414 | 314 | 264 | 213 | 160 |
| | 19 | 504 | 409 | 311 | 261 | 211 | 158 | 501 | 406 | 308 | 259 | 209 | 157 |
| | 20 | 494 | 401 | 305 | 256 | 206 | 155 | 491 | 398 | 302 | 254 | 205 | 154 |
| | 21 | 484 | 393 | 299 | 251 | 202 | 152 | 480 | 389 | 296 | 248 | 201 | 151 |
| | 22 | 473 | 384 | 292 | 246 | 198 | 149 | 469 | 381 | 289 | 243 | 197 | 148 |
| | 23 | 462 | 375 | 286 | 240 | 194 | 146 | 458 | 372 | 283 | 238 | 192 | 145 |
| | 24 | 450 | 366 | 279 | 235 | 189 | 143 | 447 | 363 | 276 | 232 | 188 | 141 |
| | 25 | 439 | 357 | 272 | 229 | 185 | 139 | 435 | 354 | 269 | 226 | 183 | 138 |
| | 26 | 427 | 348 | 265 | 223 | 180 | 136 | 424 | 344 | 262 | 221 | 179 | 134 |
| | 27 | 415 | 338 | 258 | 217 | 175 | 132 | 412 | 335 | 255 | 215 | 174 | 131 |
| | 28 | 403 | 328 | 251 | 211 | 170 | 128 | 399 | 325 | 248 | 208 | 169 | 127 |
| | 29 | 390 | 318 | 243 | 205 | 165 | 125 | 387 | 315 | 240 | 202 | 164 | 123 |
| | 30 | 377 | 308 | 235 | 199 | 160 | 121 | 374 | 305 | 233 | 196 | 159 | 120 |
| | 31 | 364 | 298 | 228 | 192 | 155 | 117 | 360 | 294 | 225 | 189 | 154 | 116 |
| | 32 | 351 | 287 | 220 | 185 | 150 | 113 | 347 | 284 | 217 | 183 | 148 | 112 |
| | 33 | 337 | 276 | 212 | 179 | 144 | 109 | 333 | 273 | 209 | 176 | 143 | 108 |
| | 34 | 323 | 265 | 203 | 172 | 139 | 105 | 319 | 261 | 200 | 169 | 137 | 104 |
| | 35 | 309 | 253 | 195 | 165 | 133 | 101 | 305 | 250 | 192 | 162 | 132 | 100 |
| | 36 | 294 | 242 | 186 | 158 | 128 | 97 | 290 | 238 | 183 | 155 | 126 | 95 |
| | 37 | 279 | 230 | 177 | 150 | 122 | 92 | 275 | 227 | 174 | 148 | 120 | 91 |
| | 38 | 265 | 218 | 168 | 143 | 116 | 88 | 261 | 215 | 165 | 140 | 114 | 86 |
| | 39 | 251 | 207 | 160 | 135 | 110 | 83 | 248 | 204 | 157 | 133 | 108 | 82 |
| | 40 | 239 | 197 | 152 | 129 | 104 | 79 | 235 | 194 | 149 | 126 | 103 | 78 |
| PROPERTIES | | | | | | | | | | | | | |
| Area, In. ² | 21.4 | 17.3 | 13.1 | 11.0 | 8.84 | 6.64 | 21.3 | 17.2 | 13.0 | 10.9 | 8.80 | 6.60 | |
| I, In. ⁴ | 369 | 304 | 235 | 199 | 161 | 122 | 363 | 299 | 231 | 196 | 159 | 120 | |
| r, In. | 4.15 | 4.19 | 4.23 | 4.25 | 4.27 | 4.29 | 4.13 | 4.17 | 4.21 | 4.23 | 4.25 | 4.27 | |
| B, Bending Factor | 0.357 | 0.350 | 0.343 | 0.340 | 0.338 | 0.335 | 0.359 | 0.352 | 0.345 | 0.341 | 0.339 | 0.337 | |
| a ÷ 10 ⁶ | 55.1 | 45.4 | 35.1 | 29.7 | 24.0 | 18.2 | 54.2 | 44.7 | 34.5 | 29.3 | 23.7 | 17.9 | |

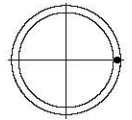
*Slender element section. Diameter-Thickness ratio exceeds AISC "Specification" Section B5.1 limiting value of 3300/F_y.



HSS / Round Structural Steel Tubing

Allowable Concentric Loads in Kips

F_y=50



ERW

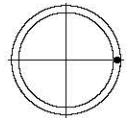
| Nominal Outside Diameter | | 11.250 | | | | | 10.750 | | | |
|-------------------------------|-------|--------|-------|-------|-------|-------|--------|-------|-------|-------|
| Wall Thickness | | 0.625 | 0.500 | 0.375 | 0.312 | 0.250 | 0.188 | 0.500 | 0.365 | 0.250 |
| Weight Per Foot | | 70.92 | 57.41 | 43.56 | 36.45 | 29.37 | 22.21 | 54.74 | 40.48 | 28.04 |
| Design Wall Thickness | | 0.581 | 0.465 | 0.349 | 0.291 | 0.233 | 0.174 | 0.465 | 0.340 | 0.233 |
| F_y = 50 ksi | | | | | | | | | | |
| Effective length KL in feet | 0 | 585 | 474 | 360 | 300 | 242 | 182 | 450 | 333 | 231 |
| | 2 | 576 | 467 | 355 | 296 | 238 | 179 | 443 | 328 | 227 |
| | 3 | 571 | 463 | 352 | 293 | 236 | 177 | 439 | 325 | 225 |
| | 4 | 566 | 459 | 348 | 290 | 234 | 176 | 435 | 322 | 223 |
| | 5 | 560 | 454 | 345 | 288 | 232 | 174 | 430 | 318 | 221 |
| | 6 | 554 | 449 | 341 | 284 | 229 | 172 | 425 | 315 | 218 |
| | 7 | 547 | 444 | 337 | 281 | 227 | 170 | 419 | 311 | 216 |
| | 8 | 540 | 438 | 333 | 278 | 224 | 168 | 414 | 307 | 213 |
| | 9 | 533 | 432 | 329 | 274 | 221 | 166 | 408 | 302 | 210 |
| | 10 | 525 | 426 | 324 | 270 | 218 | 164 | 402 | 298 | 207 |
| | 11 | 517 | 420 | 319 | 266 | 215 | 161 | 395 | 293 | 204 |
| | 12 | 509 | 413 | 314 | 262 | 212 | 159 | 388 | 288 | 200 |
| | 13 | 500 | 406 | 309 | 258 | 208 | 156 | 381 | 283 | 197 |
| | 14 | 491 | 399 | 304 | 254 | 205 | 154 | 374 | 278 | 193 |
| | 15 | 482 | 392 | 298 | 249 | 201 | 151 | 367 | 272 | 189 |
| | 16 | 472 | 384 | 293 | 244 | 197 | 148 | 359 | 266 | 186 |
| | 17 | 463 | 376 | 287 | 239 | 193 | 145 | 351 | 261 | 182 |
| | 18 | 452 | 368 | 281 | 234 | 189 | 142 | 342 | 255 | 177 |
| | 19 | 442 | 360 | 275 | 229 | 185 | 139 | 334 | 248 | 173 |
| | 20 | 431 | 351 | 268 | 224 | 181 | 136 | 325 | 242 | 169 |
| | 21 | 420 | 342 | 262 | 219 | 177 | 133 | 316 | 236 | 164 |
| | 22 | 409 | 333 | 255 | 213 | 172 | 130 | 307 | 229 | 160 |
| | 23 | 397 | 324 | 248 | 207 | 168 | 126 | 298 | 222 | 155 |
| | 24 | 385 | 315 | 241 | 201 | 163 | 123 | 288 | 215 | 150 |
| | 25 | 373 | 305 | 234 | 195 | 158 | 119 | 278 | 208 | 145 |
| | 26 | 361 | 295 | 226 | 189 | 153 | 116 | 268 | 200 | 140 |
| | 27 | 348 | 285 | 219 | 183 | 148 | 112 | 257 | 193 | 135 |
| | 28 | 335 | 275 | 211 | 177 | 143 | 108 | 247 | 185 | 130 |
| | 29 | 322 | 264 | 203 | 170 | 138 | 104 | 236 | 177 | 124 |
| | 30 | 308 | 253 | 195 | 163 | 132 | 100 | 224 | 169 | 119 |
| | 31 | 294 | 242 | 186 | 156 | 127 | 96 | 213 | 160 | 113 |
| | 32 | 280 | 230 | 178 | 149 | 121 | 92 | 201 | 152 | 107 |
| | 33 | 265 | 219 | 169 | 142 | 116 | 88 | 189 | 143 | 101 |
| | 34 | 250 | 207 | 160 | 135 | 110 | 83 | 178 | 135 | 96 |
| | 35 | 236 | 195 | 151 | 127 | 104 | 79 | 168 | 127 | 90 |
| | 36 | 223 | 184 | 143 | 120 | 98 | 74 | 159 | 120 | 85 |
| | 37 | 211 | 175 | 135 | 114 | 93 | 70 | 151 | 114 | 81 |
| | 38 | 200 | 166 | 128 | 108 | 88 | 67 | 143 | 108 | 77 |
| | 39 | 190 | 157 | 122 | 103 | 84 | 63 | 136 | 102 | 73 |
| | 40 | 181 | 149 | 116 | 98 | 79 | 60 | 129 | 97 | 69 |
| PROPERTIES | | | | | | | | | | |
| Area, In. ² | 19.5 | 15.8 | 12.0 | 10.0 | 8.06 | 6.05 | 15.0 | 11.1 | 7.70 | |
| I, In. ⁴ | 278 | 229 | 178 | 151 | 122 | 92.9 | 199 | 151 | 106 | |
| r, In. | 3.78 | 3.82 | 3.86 | 3.88 | 3.90 | 3.92 | 3.64 | 3.68 | 3.72 | |
| B, Bending Factor | 0.395 | 0.388 | 0.379 | 0.373 | 0.372 | 0.366 | 0.405 | 0.395 | 0.390 | |
| a ÷ 10 ⁶ | 41.5 | 34.2 | 26.6 | 22.5 | 18.2 | 13.9 | 29.7 | 22.5 | 15.8 | |



HSS / Round Structural Steel Tubing

Allowable Concentric Loads in Kips

Fy=50



ERW

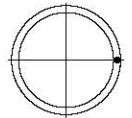
| Nominal Outside Diameter | | 10.000 | | | | | | 9.625 | | | | |
|-------------------------------|-------|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Wall Thickness | | 0.625 | 0.500 | 0.375 | 0.312 | 0.250 | 0.188 | 0.500 | 0.375 | 0.312 | 0.250 | 0.188 |
| Weight Per Foot | | 62.58 | 50.73 | 38.55 | 32.28 | 26.03 | 19.70 | 48.73 | 37.05 | 31.03 | 25.03 | 18.95 |
| Design Wall Thickness | | 0.581 | 0.465 | 0.349 | 0.291 | 0.233 | 0.174 | 0.465 | 0.349 | 0.291 | 0.233 | 0.174 |
| F_y = 50 ksi | | | | | | | | | | | | |
| Effective length KL in feet | 0 | 516 | 417 | 318 | 266 | 215 | 161 | 402 | 306 | 256 | 206 | 155 |
| | 2 | 507 | 410 | 313 | 262 | 211 | 158 | 395 | 301 | 251 | 203 | 152 |
| | 3 | 502 | 406 | 310 | 259 | 209 | 157 | 391 | 298 | 249 | 200 | 151 |
| | 4 | 496 | 401 | 306 | 257 | 207 | 155 | 386 | 294 | 246 | 198 | 149 |
| | 5 | 490 | 397 | 303 | 254 | 204 | 153 | 381 | 290 | 243 | 196 | 147 |
| | 6 | 484 | 391 | 299 | 250 | 202 | 152 | 376 | 287 | 240 | 193 | 145 |
| | 7 | 477 | 386 | 295 | 247 | 199 | 149 | 370 | 282 | 236 | 190 | 143 |
| | 8 | 470 | 380 | 290 | 243 | 196 | 147 | 364 | 278 | 233 | 187 | 141 |
| | 9 | 462 | 374 | 286 | 239 | 193 | 145 | 358 | 273 | 229 | 184 | 139 |
| | 10 | 454 | 368 | 281 | 235 | 190 | 143 | 352 | 268 | 225 | 181 | 136 |
| | 11 | 445 | 361 | 276 | 231 | 186 | 140 | 345 | 263 | 220 | 178 | 134 |
| | 12 | 437 | 354 | 270 | 227 | 183 | 138 | 338 | 258 | 216 | 174 | 131 |
| | 13 | 428 | 347 | 265 | 222 | 179 | 135 | 330 | 252 | 211 | 170 | 129 |
| | 14 | 418 | 339 | 259 | 218 | 176 | 132 | 322 | 246 | 206 | 167 | 126 |
| | 15 | 408 | 331 | 253 | 213 | 172 | 129 | 314 | 240 | 202 | 163 | 123 |
| | 16 | 398 | 323 | 247 | 208 | 168 | 126 | 306 | 234 | 196 | 159 | 120 |
| | 17 | 388 | 315 | 241 | 203 | 163 | 123 | 298 | 228 | 191 | 154 | 116 |
| | 18 | 377 | 306 | 235 | 197 | 159 | 120 | 289 | 221 | 186 | 150 | 113 |
| | 19 | 366 | 298 | 228 | 192 | 155 | 117 | 280 | 214 | 180 | 146 | 110 |
| | 20 | 354 | 288 | 221 | 186 | 150 | 113 | 270 | 207 | 174 | 141 | 106 |
| | 21 | 342 | 279 | 214 | 180 | 146 | 110 | 261 | 200 | 168 | 136 | 103 |
| | 22 | 330 | 269 | 207 | 174 | 141 | 106 | 251 | 193 | 162 | 131 | 99 |
| | 23 | 318 | 260 | 200 | 168 | 136 | 103 | 241 | 185 | 156 | 126 | 96 |
| | 24 | 305 | 250 | 192 | 162 | 131 | 99 | 230 | 178 | 149 | 121 | 92 |
| | 25 | 292 | 239 | 184 | 155 | 126 | 95 | 219 | 170 | 143 | 116 | 88 |
| | 26 | 279 | 228 | 176 | 149 | 120 | 91 | 208 | 161 | 136 | 110 | 84 |
| | 27 | 265 | 218 | 168 | 142 | 115 | 87 | 197 | 153 | 129 | 105 | 80 |
| | 28 | 251 | 206 | 159 | 135 | 109 | 83 | 185 | 144 | 122 | 99 | 75 |
| | 29 | 236 | 195 | 151 | 128 | 104 | 79 | 173 | 135 | 114 | 93 | 71 |
| | 30 | 221 | 183 | 142 | 120 | 98 | 74 | 162 | 126 | 107 | 87 | 66 |
| | 31 | 207 | 171 | 133 | 113 | 92 | 70 | 152 | 118 | 100 | 82 | 62 |
| | 32 | 194 | 161 | 125 | 106 | 86 | 65 | 142 | 111 | 94 | 77 | 58 |
| | 33 | 183 | 151 | 117 | 99 | 81 | 62 | 134 | 104 | 88 | 72 | 55 |
| | 34 | 172 | 142 | 111 | 94 | 76 | 58 | 126 | 98 | 83 | 68 | 52 |
| | 35 | 162 | 134 | 104 | 88 | 72 | 55 | 119 | 93 | 79 | 64 | 49 |
| | 36 | 154 | 127 | 99 | 84 | 68 | 52 | 113 | 88 | 74 | 61 | 46 |
| | 37 | 145 | 120 | 93 | 79 | 64 | 49 | 107 | 83 | 70 | 57 | 44 |
| | 38 | 138 | 114 | 89 | 75 | 61 | 46 | 101 | 79 | 67 | 54 | 41 |
| | 39 | 131 | 108 | 84 | 71 | 58 | 44 | 96 | 75 | 63 | 52 | 39 |
| | 40 | 124 | 103 | 80 | 68 | 55 | 42 | 91 | 71 | 60 | 49 | 37 |
| PROPERTIES | | | | | | | | | | | | |
| Area, In. ² | 17.2 | 13.9 | 10.6 | 8.88 | 7.15 | 5.37 | 13.4 | 10.2 | 8.53 | 6.87 | 5.17 | |
| I, In. ⁴ | 191 | 159 | 123 | 105 | 85.3 | 64.8 | 141 | 110 | 93.0 | 75.9 | 57.7 | |
| r, In. | 3.34 | 3.38 | 3.41 | 3.43 | 3.45 | 3.47 | 3.24 | 3.28 | 3.30 | 3.32 | 3.34 | |
| B, Bending Factor | 0.450 | 0.437 | 0.431 | 0.423 | 0.419 | 0.414 | 0.457 | 0.446 | 0.441 | 0.436 | 0.431 | |
| a ÷ 10 ⁶ | 28.5 | 23.7 | 18.4 | 15.7 | 12.7 | 9.68 | 21.1 | 16.4 | 13.9 | 11.3 | 8.62 | |



HSS / Round Structural Steel Tubing

Allowable Concentric Loads in Kips

F_y=50



ERW

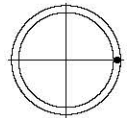
| Nominal Outside Diameter | | 8.750 | | | | | 8.625 | | | | | 7.625 | | |
|-------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Wall Thickness | | 0.500 | 0.375 | 0.312 | 0.250 | 0.188 | 0.500 | 0.375 | 0.322 | 0.250 | 0.188 | 0.375 | 0.328 | 0.125 |
| Weight Per Foot | | 44.06 | 33.54 | 28.12 | 22.70 | 17.19 | 43.39 | 33.04 | 28.55 | 22.36 | 16.94 | 29.04 | 25.56 | 10.01 |
| Design Wall Thickness | | 0.465 | 0.349 | 0.291 | 0.233 | 0.174 | 0.465 | 0.349 | 0.300 | 0.233 | 0.174 | 0.349 | 0.305 | 0.166 |
| F_y = 50 ksi | | | | | | | | | | | | | | |
| Effective length KL in feet | 0 | 363 | 276 | 232 | 187 | 141 | 357 | 272 | 236 | 184 | 139 | 239 | 210 | 82 |
| | 2 | 356 | 271 | 227 | 183 | 138 | 350 | 267 | 231 | 181 | 136 | 234 | 206 | 80 |
| | 3 | 352 | 268 | 225 | 181 | 136 | 346 | 264 | 228 | 178 | 134 | 231 | 203 | 79 |
| | 4 | 347 | 264 | 222 | 179 | 135 | 341 | 260 | 225 | 176 | 133 | 227 | 199 | 78 |
| | 5 | 342 | 260 | 219 | 176 | 133 | 336 | 256 | 222 | 174 | 131 | 223 | 196 | 77 |
| | 6 | 336 | 256 | 215 | 174 | 131 | 330 | 252 | 218 | 171 | 129 | 219 | 192 | 75 |
| | 7 | 331 | 252 | 212 | 171 | 129 | 324 | 248 | 215 | 168 | 127 | 214 | 188 | 74 |
| | 8 | 324 | 247 | 208 | 168 | 126 | 318 | 243 | 211 | 165 | 124 | 209 | 184 | 72 |
| | 9 | 318 | 243 | 204 | 164 | 124 | 312 | 238 | 206 | 162 | 122 | 204 | 179 | 71 |
| | 10 | 311 | 237 | 200 | 161 | 121 | 305 | 233 | 202 | 158 | 119 | 199 | 175 | 69 |
| | 11 | 304 | 232 | 195 | 157 | 119 | 298 | 228 | 197 | 155 | 117 | 193 | 170 | 67 |
| | 12 | 296 | 226 | 190 | 154 | 116 | 290 | 222 | 193 | 151 | 114 | 187 | 164 | 65 |
| | 13 | 288 | 221 | 186 | 150 | 113 | 282 | 216 | 188 | 147 | 111 | 181 | 159 | 63 |
| | 14 | 280 | 215 | 181 | 146 | 110 | 274 | 210 | 182 | 143 | 108 | 174 | 153 | 61 |
| | 15 | 272 | 208 | 175 | 142 | 107 | 266 | 204 | 177 | 139 | 105 | 167 | 147 | 59 |
| | 16 | 263 | 202 | 170 | 137 | 104 | 257 | 197 | 171 | 135 | 102 | 160 | 141 | 56 |
| | 17 | 254 | 195 | 164 | 133 | 100 | 248 | 191 | 166 | 130 | 98 | 153 | 135 | 54 |
| | 18 | 245 | 188 | 159 | 128 | 97 | 239 | 184 | 160 | 125 | 95 | 146 | 128 | 51 |
| | 19 | 235 | 181 | 153 | 124 | 94 | 229 | 176 | 153 | 121 | 91 | 138 | 122 | 49 |
| | 20 | 225 | 174 | 147 | 119 | 90 | 219 | 169 | 147 | 116 | 88 | 130 | 115 | 46 |
| | 21 | 215 | 166 | 140 | 114 | 86 | 209 | 161 | 141 | 111 | 84 | 122 | 107 | 44 |
| | 22 | 205 | 158 | 134 | 109 | 82 | 198 | 153 | 134 | 105 | 80 | 113 | 100 | 41 |
| | 23 | 194 | 150 | 127 | 103 | 78 | 187 | 145 | 127 | 100 | 76 | 104 | 92 | 38 |
| | 24 | 183 | 142 | 120 | 98 | 74 | 176 | 137 | 120 | 95 | 72 | 96 | 85 | 35 |
| | 25 | 171 | 133 | 113 | 92 | 70 | 164 | 128 | 112 | 89 | 68 | 88 | 78 | 32 |
| | 26 | 159 | 124 | 106 | 86 | 66 | 152 | 119 | 105 | 83 | 63 | 81 | 72 | 30 |
| | 27 | 148 | 116 | 98 | 80 | 61 | 141 | 111 | 97 | 77 | 59 | 76 | 67 | 28 |
| | 28 | 137 | 107 | 91 | 75 | 57 | 131 | 103 | 90 | 72 | 55 | 70 | 62 | 26 |
| | 29 | 128 | 100 | 85 | 70 | 53 | 123 | 96 | 84 | 67 | 51 | 65 | 58 | 24 |
| | 30 | 120 | 94 | 80 | 65 | 50 | 115 | 90 | 79 | 62 | 48 | 61 | 54 | 22 |
| | 31 | 112 | 88 | 75 | 61 | 46 | 107 | 84 | 74 | 58 | 45 | 57 | 51 | 21 |
| | 32 | 105 | 82 | 70 | 57 | 44 | 101 | 79 | 69 | 55 | 42 | 54 | 48 | 20 |
| | 33 | 99 | 77 | 66 | 54 | 41 | 95 | 74 | 65 | 52 | 39 | 51 | 45 | 18 |
| | 34 | 93 | 73 | 62 | 51 | 39 | 89 | 70 | 61 | 49 | 37 | 48 | 42 | 17 |
| | 35 | 88 | 69 | 59 | 48 | 36 | 84 | 66 | 58 | 46 | 35 | 45 | 40 | 16 |
| | 36 | 83 | 65 | 55 | 45 | 34 | 80 | 62 | 55 | 43 | 33 | 43 | 38 | 16 |
| | 37 | 79 | 62 | 52 | 43 | 33 | 75 | 59 | 52 | 41 | 31 | 40 | 36 | 15 |
| | 38 | 75 | 58 | 50 | 41 | 31 | 71 | 56 | 49 | 39 | 30 | 38 | 34 | 14 |
| | 39 | 71 | 55 | 47 | 38 | 29 | 68 | 53 | 47 | 37 | 28 | 36 | 32 | 13 |
| | 40 | 67 | 53 | 45 | 37 | 28 | 64 | 50 | 44 | 35 | 27 | 34 | 30 | 13 |
| PROPERTIES | | | | | | | | | | | | | | |
| Area, In. ² | 12.1 | 9.21 | 7.73 | 6.23 | 4.69 | 11.9 | 9.07 | 7.85 | 6.14 | 4.62 | 7.98 | 7.01 | 2.74 | |
| I, In. ⁴ | 104 | 81.4 | 69.3 | 56.6 | 43.1 | 99.5 | 77.8 | 68.1 | 54.1 | 41.3 | 52.9 | 47.1 | 19.3 | |
| r, In. | 2.93 | 2.97 | 2.99 | 3.01 | 3.03 | 2.89 | 2.93 | 2.95 | 2.97 | 2.99 | 2.58 | 2.59 | 2.66 | |
| B, Bending Factor | 0.509 | 0.495 | 0.488 | 0.482 | 0.476 | 0.516 | 0.503 | 0.497 | 0.489 | 0.482 | 0.575 | 0.567 | 0.541 | |
| a ÷ 10 ⁶ | 15.5 | 12.2 | 10.3 | 8.45 | 6.44 | 14.9 | 11.6 | 10.2 | 8.08 | 6.17 | 7.90 | 7.03 | 2.88 | |



HSS / Round Structural Steel Tubing

Allowable Concentric Loads in Kips

Fy=50



ERW

| Nominal Outside Diameter | | 7.500 | | | | | 7.000 | | | | | |
|-------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Wall Thickness | | 0.500 | 0.375 | 0.312 | 0.250 | 0.188 | 0.500 | 0.375 | 0.312 | 0.250 | 0.188 | 0.125 |
| Weight Per Foot | | 37.38 | 28.54 | 23.95 | 19.36 | 14.68 | 34.71 | 26.53 | 22.29 | 18.02 | 13.68 | 9.18 |
| Design Wall Thickness | | 0.465 | 0.349 | 0.291 | 0.233 | 0.174 | 0.465 | 0.349 | 0.291 | 0.233 | 0.174 | 0.116 |
| F_y = 50 ksi | | | | | | | | | | | | |
| Effective length KL in feet | 0 | 309 | 235 | 198 | 160 | 120 | 287 | 219 | 184 | 149 | 112 | 75 |
| | 2 | 302 | 230 | 193 | 156 | 117 | 279 | 213 | 179 | 145 | 109 | 73 |
| | 3 | 297 | 226 | 190 | 154 | 116 | 275 | 210 | 176 | 143 | 107 | 72 |
| | 4 | 292 | 223 | 187 | 151 | 114 | 270 | 206 | 173 | 140 | 106 | 71 |
| | 5 | 287 | 219 | 184 | 149 | 112 | 264 | 202 | 170 | 137 | 104 | 70 |
| | 6 | 281 | 214 | 180 | 146 | 110 | 258 | 197 | 166 | 134 | 101 | 68 |
| | 7 | 275 | 210 | 176 | 143 | 107 | 252 | 193 | 162 | 131 | 99 | 67 |
| | 8 | 268 | 205 | 172 | 139 | 105 | 245 | 187 | 158 | 128 | 96 | 65 |
| | 9 | 261 | 200 | 168 | 136 | 102 | 238 | 182 | 153 | 124 | 94 | 63 |
| | 10 | 254 | 194 | 163 | 132 | 100 | 230 | 176 | 149 | 120 | 91 | 61 |
| | 11 | 246 | 188 | 159 | 128 | 97 | 222 | 170 | 144 | 116 | 88 | 59 |
| | 12 | 238 | 182 | 154 | 124 | 94 | 214 | 164 | 138 | 112 | 85 | 57 |
| | 13 | 229 | 176 | 148 | 120 | 91 | 205 | 157 | 133 | 108 | 82 | 55 |
| | 14 | 220 | 169 | 143 | 116 | 87 | 196 | 151 | 127 | 103 | 78 | 53 |
| | 15 | 211 | 162 | 137 | 111 | 84 | 186 | 143 | 121 | 99 | 75 | 51 |
| | 16 | 202 | 155 | 131 | 107 | 81 | 176 | 136 | 115 | 94 | 71 | 48 |
| | 17 | 192 | 148 | 125 | 102 | 77 | 166 | 128 | 109 | 89 | 67 | 46 |
| | 18 | 182 | 140 | 119 | 97 | 73 | 155 | 120 | 102 | 83 | 63 | 43 |
| | 19 | 171 | 133 | 112 | 92 | 69 | 144 | 112 | 95 | 78 | 59 | 40 |
| | 20 | 160 | 124 | 106 | 86 | 65 | 133 | 104 | 88 | 72 | 55 | 38 |
| | 21 | 149 | 116 | 99 | 81 | 61 | 121 | 95 | 81 | 66 | 51 | 35 |
| | 22 | 137 | 107 | 91 | 75 | 57 | 110 | 86 | 74 | 61 | 46 | 32 |
| | 23 | 125 | 98 | 84 | 69 | 53 | 101 | 79 | 67 | 55 | 42 | 29 |
| | 24 | 115 | 90 | 77 | 63 | 48 | 93 | 72 | 62 | 51 | 39 | 27 |
| | 25 | 106 | 83 | 71 | 58 | 45 | 85 | 67 | 57 | 47 | 36 | 25 |
| | 26 | 98 | 77 | 66 | 54 | 41 | 79 | 62 | 53 | 43 | 33 | 23 |
| | 27 | 91 | 71 | 61 | 50 | 38 | 73 | 57 | 49 | 40 | 31 | 21 |
| | 28 | 84 | 66 | 57 | 46 | 35 | 68 | 53 | 46 | 37 | 29 | 20 |
| | 29 | 79 | 62 | 53 | 43 | 33 | 63 | 50 | 42 | 35 | 27 | 18 |
| | 30 | 74 | 58 | 49 | 40 | 31 | 59 | 46 | 40 | 33 | 25 | 17 |
| | 31 | 69 | 54 | 46 | 38 | 29 | 55 | 43 | 37 | 31 | 23 | 16 |
| | 32 | 65 | 51 | 43 | 36 | 27 | 52 | 41 | 35 | 29 | 22 | 15 |
| | 33 | 61 | 48 | 41 | 33 | 26 | 49 | 38 | 33 | 27 | 21 | 14 |
| | 34 | 57 | 45 | 38 | 32 | 24 | 46 | 36 | 31 | 25 | 19 | 13 |
| | 35 | 54 | 42 | 36 | 30 | 23 | 44 | 34 | 29 | 24 | 18 | 13 |
| | 36 | 51 | 40 | 34 | 28 | 21 | 41 | 32 | 28 | 23 | 17 | 12 |
| | 37 | 48 | 38 | 32 | 27 | 20 | 39 | 30 | 26 | 21 | 16 | 11 |
| | 38 | 46 | 36 | 31 | 25 | 19 | 37 | 29 | 25 | 20 | 16 | 11 |
| | 39 | 44 | 34 | 29 | 24 | 18 | 37 | 27 | 23 | 19 | 15 | 10 |
| | 40 | 41 | 33 | 28 | 23 | 17 | 37 | 27 | 23 | 19 | 14 | 10 |
| PROPERTIES | | | | | | | | | | | | |
| Area, in. ² | 10.3 | 7.84 | 6.59 | 5.32 | 4.00 | 9.55 | 7.29 | 6.13 | 4.95 | 3.73 | 2.51 | |
| I, in. ⁴ | 63.9 | 50.2 | 42.9 | 35.2 | 26.9 | 51.2 | 40.4 | 34.6 | 28.4 | 21.7 | 14.9 | |
| r, in. | 2.49 | 2.53 | 2.55 | 2.57 | 2.59 | 2.32 | 2.35 | 2.37 | 2.39 | 2.41 | 2.43 | |
| B, Bending Factor | 0.604 | 0.586 | 0.593 | 0.567 | 0.558 | 0.653 | 0.632 | 0.620 | 0.610 | 0.602 | 0.590 | |
| a ÷ 10 ⁶ | 9.54 | 7.50 | 6.41 | 5.26 | 4.02 | 7.65 | 6.03 | 5.17 | 4.24 | 3.24 | 2.23 | |

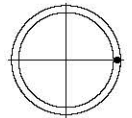
Note: Double Horizontal Line indicates k ℓ/r limit of 200.



HSS / Round Structural Steel Tubing

Allowable Concentric Loads in Kips

F_y=50



ERW

| Nominal Outside Diameter | | 6.875 | | | | | 6.625 | | | | | | | |
|-------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Wall Thickness | | 0.500 | 0.375 | 0.312 | 0.250 | 0.188 | 0.500 | 0.432 | 0.375 | 0.312 | 0.280 | 0.250 | 0.188 | 0.125 |
| Weight Per Foot | | 34.04 | 26.03 | 21.87 | 17.69 | 13.43 | 32.71 | 28.57 | 25.03 | 21.04 | 18.97 | 17.02 | 12.92 | 8.68 |
| Design Wall Thickness | | 0.465 | 0.349 | 0.291 | 0.233 | 0.174 | 0.465 | 0.403 | 0.349 | 0.291 | 0.261 | 0.233 | 0.174 | 0.116 |
| F_y = 50 ksi | | | | | | | | | | | | | | |
| Effective length KL in feet | 0 | 281 | 215 | 181 | 146 | 110 | 270 | 236 | 206 | 174 | 157 | 140 | 106 | 71 |
| | 2 | 273 | 209 | 176 | 142 | 107 | 263 | 230 | 201 | 169 | 152 | 137 | 103 | 69 |
| | 3 | 269 | 206 | 173 | 140 | 105 | 258 | 226 | 197 | 166 | 150 | 134 | 101 | 68 |
| | 4 | 264 | 202 | 170 | 137 | 103 | 253 | 221 | 194 | 163 | 147 | 132 | 100 | 67 |
| | 5 | 258 | 198 | 167 | 135 | 101 | 247 | 217 | 189 | 159 | 144 | 129 | 97 | 65 |
| | 6 | 252 | 193 | 163 | 132 | 99 | 241 | 211 | 185 | 156 | 140 | 126 | 95 | 64 |
| | 7 | 246 | 189 | 159 | 128 | 97 | 234 | 206 | 180 | 152 | 137 | 123 | 93 | 62 |
| | 8 | 239 | 183 | 154 | 125 | 94 | 227 | 199 | 175 | 147 | 133 | 119 | 90 | 61 |
| | 9 | 231 | 178 | 150 | 121 | 92 | 220 | 193 | 169 | 143 | 129 | 116 | 87 | 59 |
| | 10 | 224 | 172 | 145 | 118 | 89 | 212 | 186 | 163 | 138 | 124 | 112 | 84 | 57 |
| | 11 | 216 | 166 | 140 | 114 | 86 | 204 | 179 | 157 | 133 | 120 | 108 | 81 | 55 |
| | 12 | 207 | 160 | 135 | 109 | 83 | 195 | 172 | 150 | 127 | 115 | 103 | 78 | 53 |
| | 13 | 198 | 153 | 129 | 105 | 79 | 186 | 164 | 144 | 122 | 110 | 99 | 75 | 51 |
| | 14 | 189 | 146 | 124 | 100 | 76 | 176 | 155 | 137 | 116 | 105 | 94 | 71 | 48 |
| | 15 | 179 | 139 | 118 | 96 | 73 | 166 | 147 | 129 | 110 | 99 | 89 | 68 | 46 |
| | 16 | 169 | 132 | 112 | 91 | 69 | 156 | 138 | 122 | 103 | 94 | 84 | 64 | 43 |
| | 17 | 159 | 124 | 105 | 86 | 65 | 145 | 129 | 114 | 97 | 88 | 79 | 60 | 41 |
| | 18 | 148 | 116 | 98 | 80 | 61 | 134 | 119 | 105 | 90 | 82 | 74 | 56 | 38 |
| | 19 | 137 | 107 | 91 | 75 | 57 | 123 | 109 | 97 | 83 | 75 | 68 | 52 | 35 |
| | 20 | 125 | 99 | 84 | 69 | 53 | 111 | 99 | 88 | 75 | 69 | 62 | 48 | 32 |
| | 21 | 113 | 90 | 77 | 63 | 48 | 101 | 90 | 80 | 68 | 62 | 56 | 43 | 29 |
| | 22 | 103 | 82 | 70 | 58 | 44 | 92 | 82 | 73 | 62 | 57 | 51 | 39 | 27 |
| | 23 | 95 | 75 | 64 | 53 | 40 | 84 | 75 | 66 | 57 | 52 | 47 | 36 | 25 |
| | 24 | 87 | 69 | 59 | 48 | 37 | 77 | 69 | 61 | 52 | 48 | 43 | 33 | 23 |
| | 25 | 80 | 63 | 54 | 45 | 34 | 71 | 63 | 56 | 48 | 44 | 40 | 30 | 21 |
| | 26 | 74 | 59 | 50 | 41 | 32 | 66 | 59 | 52 | 45 | 41 | 37 | 28 | 19 |
| | 27 | 69 | 54 | 46 | 38 | 29 | 61 | 54 | 48 | 41 | 38 | 34 | 26 | 18 |
| | 28 | 64 | 51 | 43 | 36 | 27 | 57 | 50 | 45 | 38 | 35 | 32 | 24 | 17 |
| | 29 | 59 | 47 | 40 | 33 | 25 | 53 | 47 | 42 | 36 | 33 | 29 | 23 | 15 |
| | 30 | 56 | 44 | 38 | 31 | 24 | 49 | 44 | 39 | 33 | 30 | 28 | 21 | 14 |
| | 31 | 52 | 41 | 35 | 29 | 22 | 46 | 41 | 37 | 31 | 29 | 26 | 20 | 14 |
| | 32 | 49 | 39 | 33 | 27 | 21 | 43 | 39 | 34 | 29 | 27 | 24 | 19 | 13 |
| | 33 | 46 | 36 | 31 | 26 | 20 | 41 | 36 | 32 | 28 | 25 | 23 | 17 | 12 |
| | 34 | 43 | 34 | 29 | 24 | 18 | 38 | 34 | 30 | 26 | 24 | 21 | 16 | 11 |
| | 35 | 41 | 32 | 28 | 23 | 17 | 36 | 32 | 29 | 25 | 22 | 20 | 16 | 11 |
| | 36 | 39 | 31 | 26 | 21 | 16 | 34 | 31 | 27 | 23 | 21 | 19 | 15 | 10 |
| | 37 | 37 | 29 | 25 | 20 | 16 | == | == | 26 | 22 | 20 | 18 | 14 | 9 |
| | 38 | == | 27 | 23 | 19 | 15 | == | == | == | == | == | == | 13 | 9 |
| | 39 | == | == | == | 18 | 14 | == | == | == | == | == | == | == | == |
| | 40 | == | == | == | == | == | == | == | == | == | == | == | == | == |
| Area, In. ² | 9.36 | 7.16 | 6.02 | 4.86 | 3.66 | 9.00 | 7.88 | 6.88 | 5.79 | 5.22 | 4.68 | 3.53 | 2.37 | |
| I, In. ⁴ | 48.3 | 38.2 | 32.7 | 26.8 | 20.6 | 42.9 | 38.3 | 34.0 | 29.1 | 26.5 | 23.9 | 18.4 | 12.6 | |
| r, In. | 2.27 | 2.31 | 2.33 | 2.35 | 2.37 | 2.18 | 2.20 | 2.22 | 2.24 | 2.25 | 2.26 | 2.28 | 2.30 | |
| B, Bending Factor | 0.666 | 0.644 | 0.633 | 0.623 | 0.611 | 0.695 | 0.682 | 0.670 | 0.659 | 0.653 | 0.649 | 0.635 | 0.623 | |
| a ÷ 10 ⁶ | 7.21 | 5.70 | 4.88 | 4.00 | 3.08 | 6.41 | 5.72 | 5.08 | 4.35 | 3.96 | 3.57 | 2.75 | 1.88 | |

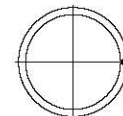
Note: Double Horizontal Line indicates k ℓ /r limit of 200.



HSS / Round Structural Steel Tubing

Allowable Concentric Loads in Kips

F_y=50



ERW

| Nominal Outside Diameter | | 6.125 | | | | | 6.000 | | | | | | |
|-------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Wall Thickness | | 0.500 | 0.375 | 0.312 | 0.250 | 0.188 | 0.500 | 0.375 | 0.312 | 0.280 | 0.250 | 0.188 | 0.125 |
| Weight Per Foot | | 30.04 | 23.03 | 19.37 | 15.69 | 11.92 | 29.37 | 22.53 | 18.95 | 17.11 | 15.35 | 11.67 | 7.84 |
| Design Wall Thickness | | 0.465 | 0.349 | 0.291 | 0.233 | 0.174 | 0.465 | 0.349 | 0.291 | 0.261 | 0.233 | 0.174 | 0.116 |
| F_y = 50 ksi | | | | | | | | | | | | | |
| Effective length KL in feet | 0 | 248 | 190 | 160 | 129 | 98 | 243 | 186 | 157 | 141 | 127 | 95 | 64 |
| | 2 | 241 | 184 | 155 | 126 | 95 | 235 | 180 | 152 | 137 | 123 | 93 | 62 |
| | 3 | 236 | 181 | 152 | 123 | 93 | 230 | 177 | 149 | 134 | 120 | 91 | 61 |
| | 4 | 231 | 177 | 149 | 121 | 91 | 225 | 173 | 146 | 131 | 118 | 89 | 60 |
| | 5 | 225 | 172 | 145 | 118 | 89 | 219 | 168 | 142 | 128 | 115 | 87 | 58 |
| | 6 | 218 | 168 | 141 | 114 | 86 | 213 | 164 | 138 | 125 | 112 | 84 | 57 |
| | 7 | 212 | 163 | 137 | 111 | 84 | 206 | 158 | 134 | 121 | 108 | 82 | 55 |
| | 8 | 204 | 157 | 133 | 107 | 81 | 198 | 153 | 129 | 117 | 105 | 79 | 53 |
| | 9 | 196 | 151 | 128 | 104 | 78 | 190 | 147 | 124 | 112 | 101 | 76 | 51 |
| | 10 | 188 | 145 | 123 | 100 | 75 | 182 | 141 | 119 | 108 | 97 | 73 | 49 |
| | 11 | 180 | 139 | 118 | 95 | 72 | 173 | 134 | 114 | 103 | 92 | 70 | 47 |
| | 12 | 171 | 132 | 112 | 91 | 69 | 164 | 127 | 108 | 98 | 88 | 67 | 45 |
| | 13 | 161 | 125 | 106 | 86 | 65 | 154 | 120 | 102 | 92 | 83 | 63 | 43 |
| | 14 | 151 | 118 | 100 | 81 | 62 | 144 | 113 | 96 | 87 | 78 | 59 | 40 |
| | 15 | 141 | 110 | 94 | 76 | 58 | 134 | 105 | 89 | 81 | 73 | 56 | 38 |
| | 16 | 130 | 102 | 87 | 71 | 54 | 123 | 97 | 83 | 75 | 68 | 52 | 35 |
| | 17 | 119 | 94 | 80 | 65 | 50 | 111 | 88 | 76 | 69 | 62 | 47 | 32 |
| | 18 | 107 | 85 | 73 | 59 | 46 | 99 | 79 | 68 | 62 | 56 | 43 | 30 |
| | 19 | 96 | 76 | 66 | 54 | 41 | 89 | 71 | 61 | 56 | 50 | 39 | 27 |
| | 20 | 87 | 69 | 59 | 48 | 37 | 81 | 64 | 55 | 50 | 46 | 35 | 24 |
| | 21 | 79 | 63 | 54 | 44 | 34 | 73 | 58 | 50 | 46 | 41 | 32 | 22 |
| | 22 | 72 | 57 | 49 | 40 | 31 | 67 | 53 | 46 | 42 | 38 | 29 | 20 |
| | 23 | 65 | 52 | 45 | 37 | 28 | 61 | 49 | 42 | 38 | 34 | 26 | 18 |
| | 24 | 60 | 48 | 41 | 34 | 26 | 56 | 45 | 38 | 35 | 32 | 24 | 17 |
| | 25 | 55 | 44 | 38 | 31 | 24 | 52 | 41 | 35 | 32 | 29 | 22 | 15 |
| | 26 | 51 | 41 | 35 | 29 | 22 | 48 | 38 | 33 | 30 | 27 | 21 | 14 |
| | 27 | 48 | 38 | 32 | 27 | 20 | 44 | 35 | 30 | 28 | 25 | 19 | 13 |
| | 28 | 44 | 35 | 30 | 25 | 19 | 41 | 33 | 28 | 26 | 23 | 18 | 12 |
| | 29 | 41 | 33 | 28 | 23 | 18 | 38 | 31 | 26 | 24 | 22 | 17 | 11 |
| | 30 | 38 | 31 | 26 | 21 | 17 | 36 | 29 | 25 | 22 | 20 | 16 | 11 |
| | 31 | 36 | 29 | 25 | 20 | 15 | 34 | 27 | 23 | 21 | 19 | 15 | 10 |
| | 32 | 34 | 27 | 23 | 19 | 15 | 31 | 25 | 22 | 20 | 18 | 14 | 9 |
| | 33 | 32 | 25 | 22 | 18 | 14 | 28 | 24 | 20 | 18 | 17 | 13 | 9 |
| | 34 | 30 | 24 | 20 | 17 | 13 | 26 | 22 | 18 | 16 | 16 | 12 | 8 |
| | 35 | 28 | 22 | 18 | 15 | 12 | 24 | 20 | 16 | 14 | 14 | 11 | 8 |
| | 36 | 26 | 20 | 16 | 13 | 10 | 22 | 18 | 14 | 12 | 12 | 10 | 7 |
| | 37 | 24 | 18 | 14 | 11 | 9 | 20 | 16 | 12 | 10 | 10 | 9 | 6 |
| | 38 | 22 | 16 | 12 | 10 | 8 | 18 | 14 | 10 | 8 | 8 | 8 | 5 |
| | 39 | 20 | 14 | 10 | 8 | 7 | 16 | 12 | 8 | 6 | 6 | 7 | 4 |
| | 40 | 18 | 12 | 9 | 7 | 6 | 14 | 10 | 7 | 5 | 5 | 6 | 3 |
| PROPERTIES | | | | | | | | | | | | | |
| Area, in. ² | 8.27 | 6.33 | 5.33 | 4.31 | 3.25 | 8.09 | 6.20 | 5.22 | 4.71 | 4.22 | 3.18 | 2.14 | |
| I, in. ⁴ | 33.3 | 26.5 | 22.7 | 18.7 | 14.4 | 31.2 | 24.8 | 21.3 | 19.4 | 17.6 | 13.5 | 9.28 | |
| r, in. | 2.01 | 2.05 | 2.07 | 2.08 | 2.10 | 1.96 | 2.00 | 2.02 | 2.03 | 2.04 | 2.06 | 2.08 | |
| B, Bending Factor | 0.761 | 0.732 | 0.719 | 0.706 | 0.691 | 0.778 | 0.750 | 0.735 | 0.728 | 0.719 | 0.707 | 0.692 | |
| a ÷ 10 ⁶ | 4.97 | 3.96 | 3.39 | 2.79 | 2.15 | 4.66 | 3.70 | 3.18 | 2.90 | 2.63 | 2.02 | 1.39 | |

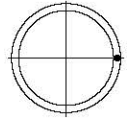
Note: Double Horizontal Line indicates k ℓ /r limit of 200.



HSS / Round Structural Steel Tubing

Allowable Concentric Loads in Kips

F_y=50



ERW

| Nominal Outside Diameter | | 5.563 | | | | 5.500 | | |
|-------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|
| Wall Thickness | | 0.375 | 0.258 | 0.188 | 0.134 | 0.500 | 0.375 | 0.258 |
| Weight Per Foot | | 20.78 | 14.62 | 10.79 | 7.77 | 26.70 | 20.53 | 14.44 |
| Design Wall Thickness | | 0.349 | 0.241 | 0.174 | 0.125 | 0.465 | 0.349 | 0.241 |
| F_y = 50 ksi | | | | | | | | |
| Effective length KL in feet | 0 | 172 | 121 | 89 | 64 | 221 | 170 | 119 |
| | 2 | 166 | 117 | 86 | 62 | 213 | 164 | 115 |
| | 3 | 162 | 114 | 84 | 61 | 208 | 160 | 113 |
| | 4 | 158 | 112 | 82 | 59 | 203 | 156 | 110 |
| | 5 | 154 | 108 | 80 | 58 | 197 | 151 | 107 |
| | 6 | 149 | 105 | 77 | 56 | 190 | 146 | 104 |
| | 7 | 143 | 101 | 75 | 54 | 183 | 141 | 100 |
| | 8 | 138 | 97 | 72 | 52 | 175 | 135 | 96 |
| | 9 | 132 | 93 | 69 | 50 | 167 | 129 | 92 |
| | 10 | 125 | 89 | 66 | 48 | 158 | 123 | 87 |
| | 11 | 118 | 84 | 62 | 45 | 149 | 116 | 83 |
| | 12 | 111 | 79 | 59 | 43 | 139 | 109 | 78 |
| | 13 | 104 | 74 | 55 | 40 | 129 | 101 | 73 |
| | 14 | 96 | 69 | 51 | 37 | 118 | 93 | 67 |
| | 15 | 88 | 63 | 47 | 34 | 107 | 85 | 61 |
| | 16 | 79 | 57 | 43 | 31 | 96 | 77 | 56 |
| | 17 | 70 | 51 | 39 | 28 | 85 | 68 | 49 |
| | 18 | 63 | 46 | 34 | 25 | 75 | 61 | 44 |
| | 19 | 56 | 41 | 31 | 23 | 68 | 54 | 40 |
| | 20 | 51 | 37 | 28 | 20 | 61 | 49 | 36 |
| | 21 | 46 | 33 | 25 | 19 | 55 | 44 | 32 |
| | 22 | 42 | 31 | 23 | 17 | 51 | 41 | 30 |
| | 23 | 38 | 28 | 21 | 15 | 46 | 37 | 27 |
| | 24 | 35 | 26 | 19 | 14 | 42 | 34 | 25 |
| | 25 | 32 | 24 | 18 | 13 | 39 | 31 | 23 |
| | 26 | 30 | 22 | 17 | 12 | 36 | 29 | 21 |
| | 27 | 28 | 20 | 15 | 11 | 34 | 27 | 20 |
| | 28 | 26 | 19 | 14 | 10 | 31 | 25 | 18 |
| | 29 | 24 | 18 | 13 | 10 | 29 | 23 | 17 |
| | 30 | 23 | 16 | 12 | 9 | 29 | 22 | 16 |
| | 31 | == | 15 | 12 | 9 | == | == | 15 |
| | 32 | | == | == | 8 | | | == |
| | 33 | | | | == | | | |
| | 34 | | | | | | | |
| | 35 | | | | | | | |
| | 36 | | | | | | | |
| | 37 | | | | | | | |
| | 38 | | | | | | | |
| | 39 | | | | | | | |
| | 40 | | | | | | | |
| PROPERTIES | | | | | | | | |
| Area, in. ² | 5.72 | 4.03 | 2.95 | 2.14 | 7.36 | 5.65 | 3.98 | |
| I, in. ⁴ | 19.5 | 14.3 | 10.7 | 7.90 | 23.5 | 18.8 | 13.8 | |
| r, in. | 1.85 | 1.88 | 1.91 | 1.92 | 1.79 | 1.83 | 1.86 | |
| B, Bending Factor | 0.816 | 0.784 | 0.767 | 0.753 | 0.861 | 0.826 | 0.793 | |
| a ÷ 10 ⁶ | 2.91 | 2.14 | 1.60 | 1.18 | 3.51 | 2.81 | 2.06 | |

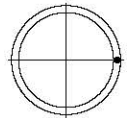
Note: Double Horizontal Line indicates k ℓ/r limit of 200.



HSS / Round Structural Steel Tubing

Allowable Concentric Loads in Kips

F_y=50



ERW

| Nominal Outside Diameter | | 5.000 | | | | | | 4.500 | | | | |
|-------------------------------|----|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Wall Thickness | | 0.500 | 0.375 | 0.312 | 0.258 | 0.250 | 0.188 | 0.125 | 0.337 | 0.237 | 0.188 | 0.125 |
| Weight Per Foot | | 24.03 | 18.52 | 15.62 | 13.07 | 12.68 | 9.66 | 6.51 | 14.98 | 10.79 | 8.66 | 5.84 |
| Design Wall Thickness | | 0.465 | 0.349 | 0.291 | 0.241 | 0.233 | 0.174 | 0.116 | 0.315 | 0.221 | 0.174 | 0.116 |
| F_y = 50 ksi | | | | | | | | | | | | |
| Effective length KL in feet | 0 | 199 | 153 | 129 | 108 | 105 | 79 | 53 | 124 | 89 | 71 | 48 |
| | 2 | 191 | 147 | 124 | 104 | 101 | 76 | 51 | 119 | 85 | 68 | 46 |
| | 3 | 186 | 143 | 121 | 101 | 98 | 74 | 50 | 115 | 83 | 66 | 45 |
| | 4 | 180 | 139 | 117 | 98 | 95 | 72 | 49 | 111 | 80 | 64 | 43 |
| | 5 | 174 | 134 | 113 | 95 | 92 | 70 | 47 | 107 | 77 | 61 | 42 |
| | 6 | 167 | 129 | 109 | 92 | 89 | 67 | 46 | 102 | 73 | 59 | 40 |
| | 7 | 159 | 123 | 105 | 88 | 85 | 65 | 44 | 96 | 70 | 56 | 38 |
| | 8 | 151 | 117 | 100 | 84 | 81 | 62 | 42 | 91 | 66 | 52 | 36 |
| | 9 | 142 | 111 | 94 | 79 | 77 | 59 | 40 | 84 | 61 | 49 | 34 |
| | 10 | 133 | 104 | 89 | 74 | 72 | 55 | 37 | 78 | 57 | 46 | 31 |
| | 11 | 123 | 97 | 83 | 69 | 68 | 52 | 35 | 71 | 52 | 42 | 29 |
| | 12 | 113 | 89 | 76 | 64 | 63 | 48 | 33 | 63 | 47 | 38 | 26 |
| | 13 | 102 | 81 | 70 | 59 | 57 | 44 | 30 | 56 | 41 | 34 | 23 |
| | 14 | 91 | 73 | 63 | 53 | 52 | 40 | 27 | 48 | 36 | 29 | 20 |
| | 15 | 79 | 64 | 55 | 47 | 46 | 36 | 24 | 42 | 31 | 25 | 18 |
| | 16 | 70 | 56 | 49 | 41 | 40 | 31 | 22 | 37 | 27 | 22 | 16 |
| | 17 | 62 | 50 | 43 | 36 | 36 | 28 | 19 | 33 | 24 | 20 | 14 |
| | 18 | 55 | 44 | 38 | 33 | 32 | 25 | 17 | 29 | 22 | 18 | 12 |
| | 19 | 49 | 40 | 34 | 29 | 29 | 22 | 15 | 26 | 19 | 16 | 11 |
| | 20 | 44 | 36 | 31 | 26 | 26 | 20 | 14 | 24 | 18 | 14 | 10 |
| | 21 | 40 | 33 | 28 | 24 | 23 | 18 | 13 | 21 | 16 | 13 | 9 |
| | 22 | 37 | 30 | 26 | 22 | 21 | 17 | 11 | 19 | 15 | 12 | 8 |
| | 23 | 34 | 27 | 24 | 20 | 20 | 15 | 10 | 18 | 13 | 11 | 8 |
| | 24 | 31 | 25 | 22 | 18 | 18 | 14 | 10 | 16 | 12 | 10 | 7 |
| | 25 | 28 | 23 | 20 | 17 | 17 | 13 | 9 | 15 | 11 | 9 | 6 |
| | 26 | 26 | 21 | 18 | 16 | 15 | 12 | 8 | 14 | 11 | 9 | 6 |
| | 27 | 24 | 20 | 17 | 14 | 14 | 11 | 8 | 13 | 10 | 8 | 6 |
| | 28 | 22 | 19 | 16 | 13 | 13 | 10 | 7 | 12 | 9 | 7 | 5 |
| | 29 | 20 | 17 | 14 | 12 | 12 | 9 | 6 | 11 | 8 | 6 | 5 |
| | 30 | 18 | 15 | 12 | 11 | 11 | 8 | 5 | 10 | 7 | 5 | 4 |
| | 31 | 16 | 13 | 10 | 9 | 9 | 7 | 4 | 9 | 6 | 4 | 3 |
| | 32 | 14 | 11 | 8 | 7 | 7 | 6 | 3 | 8 | 5 | 3 | 2 |
| | 33 | 12 | 9 | 6 | 5 | 5 | 4 | 2 | 7 | 4 | 2 | 1 |
| | 34 | 10 | 7 | 5 | 4 | 4 | 3 | 1 | 6 | 3 | 1 | 1 |
| | 35 | 8 | 5 | 3 | 2 | 2 | 2 | 1 | 5 | 2 | 1 | 1 |
| 36 | 6 | 3 | 2 | 1 | 1 | 1 | 0 | 4 | 1 | 0 | 0 | |
| 37 | 4 | 2 | 1 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 | |
| 38 | 2 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | |
| 39 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | |
| 40 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| PROPERTIES | | | | | | | | | | | | |
| Area, In. ² | | 6.62 | 5.10 | 4.30 | 3.60 | 3.49 | 2.64 | 1.78 | 4.14 | 2.97 | 2.36 | 1.60 |
| I, In. ⁴ | | 17.2 | 13.9 | 12.0 | 10.2 | 9.94 | 7.69 | 5.31 | 9.12 | 6.82 | 5.54 | 3.84 |
| r, In. | | 1.61 | 1.65 | 1.67 | 1.68 | 1.69 | 1.71 | 1.73 | 1.48 | 1.51 | 1.53 | 1.55 |
| B, Bending Factor | | 0.962 | 0.917 | 0.896 | 0.882 | 0.878 | 0.858 | 0.838 | 1.02 | 0.980 | 0.958 | 0.938 |
| a ÷ 10 ⁶ | | 2.57 | 2.08 | 1.79 | 1.52 | 1.48 | 1.15 | 0.793 | 1.36 | 1.02 | 0.827 | 0.573 |

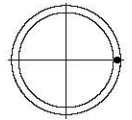
Note: Double Horizontal Line indicates k ℓ/r limit of 200.



HSS / Round Structural Steel Tubing

Allowable Concentric Loads in Kips

F_y=50



ERW

| Nominal Outside Diameter | | 4.000 | | | | | | | |
|-----------------------------|-------|-------------------------|-------|-------|-------|-------|-------|-------|----|
| Wall Thickness | 0.337 | 0.313 | 0.250 | 0.237 | 0.226 | 0.220 | 0.188 | 0.125 | |
| Weight Per Foot | 13.18 | 12.33 | 10.01 | 9.52 | 9.11 | 8.88 | 7.65 | 5.17 | |
| Design Wall Thickness | 0.315 | 0.291 | 0.233 | 0.221 | 0.211 | 0.205 | 0.174 | 0.116 | |
| | | F _y = 50 ksi | | | | | | | |
| Effective length KL in feet | 0 | 110 | 102 | 83 | 79 | 75 | 73 | 63 | 43 |
| | 2 | 104 | 97 | 79 | 75 | 72 | 70 | 60 | 41 |
| | 3 | 100 | 93 | 76 | 72 | 69 | 67 | 58 | 39 |
| | 4 | 96 | 89 | 73 | 69 | 66 | 64 | 55 | 38 |
| | 5 | 91 | 85 | 69 | 66 | 63 | 61 | 53 | 36 |
| | 6 | 86 | 80 | 65 | 62 | 60 | 58 | 50 | 34 |
| | 7 | 80 | 75 | 61 | 58 | 56 | 54 | 47 | 32 |
| | 8 | 74 | 69 | 57 | 54 | 52 | 50 | 43 | 30 |
| | 9 | 68 | 63 | 52 | 49 | 47 | 46 | 40 | 27 |
| | 10 | 61 | 57 | 47 | 45 | 43 | 42 | 36 | 25 |
| | 11 | 53 | 50 | 41 | 39 | 38 | 37 | 32 | 22 |
| | 12 | 45 | 43 | 35 | 34 | 32 | 32 | 27 | 19 |
| | 13 | 38 | 36 | 30 | 29 | 28 | 27 | 23 | 16 |
| | 14 | 33 | 31 | 26 | 25 | 24 | 23 | 20 | 14 |
| | 15 | 29 | 27 | 23 | 22 | 21 | 20 | 18 | 12 |
| | 16 | 25 | 24 | 20 | 19 | 18 | 18 | 15 | 11 |
| | 17 | 22 | 21 | 18 | 17 | 16 | 16 | 14 | 10 |
| | 18 | 20 | 19 | 16 | 15 | 14 | 14 | 12 | 9 |
| | 19 | 18 | 17 | 14 | 14 | 13 | 13 | 11 | 8 |
| | 20 | 16 | 15 | 13 | 12 | 12 | 11 | 10 | 7 |
| | 21 | 15 | 14 | 11 | 11 | 11 | 10 | 9 | 6 |
| | 22 | == | 13 | 10 | 10 | 10 | 9 | 8 | 6 |
| | 23 | | == | == | == | == | == | == | == |
| | 24 | | | | | | | | |
| | 25 | | | | | | | | |
| | 26 | | | | | | | | |
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| | 36 | | | | | | | | |
| | 37 | | | | | | | | |
| | 38 | | | | | | | | |
| | 39 | | | | | | | | |
| | 40 | | | | | | | | |
| PROPERTIES | | | | | | | | | |
| Area, in. ² | 3.65 | 3.39 | 2.76 | 2.62 | 2.51 | 2.44 | 2.09 | 1.42 | |
| I, in. ⁴ | 6.24 | 5.87 | 4.91 | 4.70 | 4.52 | 4.41 | 3.83 | 2.67 | |
| r, in. | 1.31 | 1.32 | 1.33 | 1.34 | 1.34 | 1.34 | 1.35 | 1.37 | |
| B, Bending Factor | 1.17 | 1.16 | 1.12 | 1.11 | 1.11 | 1.11 | 1.09 | 1.06 | |
| a ÷ 10 ⁶ | 0.932 | 0.877 | 0.733 | 0.702 | 0.675 | 0.659 | 0.572 | 0.399 | |

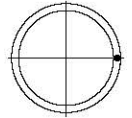
Note: Double Horizontal Line indicates k l/r limit of 200.



HSS / Round Structural Steel Tubing

Allowable Concentric Loads in Kips

F_y=50



ERW

| Nominal Outside Diameter | | 3.500 | | | | | | |
|-----------------------------|-------|-------------------------------|-------|-------|-------|-------|-------|------|
| Wall Thickness | 0.313 | 0.300 | 0.250 | 0.216 | 0.203 | 0.188 | 0.125 | |
| Weight Per Foot | 10.65 | 10.25 | 8.68 | 7.58 | 7.15 | 6.65 | 4.51 | |
| Design Wall Thickness | 0.291 | 0.280 | 0.233 | 0.201 | 0.189 | 0.174 | 0.116 | |
| | | F_y = 50 ksi | | | | | | |
| Effective length KL in feet | 0 | 88 | 85 | 72 | 62 | 59 | 55 | 37 |
| | 2 | 83 | 80 | 67 | 59 | 56 | 51 | 35 |
| | 3 | 79 | 76 | 65 | 56 | 53 | 49 | 33 |
| | 4 | 75 | 72 | 61 | 53 | 51 | 47 | 32 |
| | 5 | 70 | 68 | 58 | 50 | 48 | 44 | 30 |
| | 6 | 65 | 63 | 53 | 47 | 44 | 41 | 28 |
| | 7 | 59 | 57 | 49 | 43 | 41 | 38 | 26 |
| | 8 | 53 | 51 | 44 | 39 | 37 | 34 | 23 |
| | 9 | 47 | 45 | 39 | 34 | 32 | 30 | 21 |
| | 10 | 39 | 38 | 33 | 29 | 28 | 26 | 18 |
| | 11 | 33 | 32 | 28 | 24 | 23 | 22 | 15 |
| | 12 | 27 | 26 | 23 | 21 | 19 | 18 | 13 |
| | 13 | 23 | 23 | 20 | 17 | 17 | 16 | 11 |
| | 14 | 20 | 19 | 17 | 15 | 14 | 13 | 9 |
| | 15 | 18 | 17 | 15 | 13 | 12 | 12 | 8 |
| | 16 | 15 | 15 | 13 | 12 | 11 | 10 | 7 |
| | 17 | 14 | 13 | 12 | 10 | 10 | 9 | 6 |
| | 18 | 12 | 12 | 10 | 9 | 9 | 8 | 6 |
| | 19 | 11 | 11 | 9 | 8 | 8 | 7 | 5 |
| | 20 | == | == | == | == | == | == | == |
| | 21 | | | | | | | == |
| | 22 | | | | | | | |
| | 23 | | | | | | | |
| | 24 | | | | | | | |
| | 25 | | | | | | | |
| | 26 | | | | | | | |
| | 27 | | | | | | | |
| | 28 | | | | | | | |
| | 29 | | | | | | | |
| | 30 | | | | | | | |
| | 31 | | | | | | | |
| | 32 | | | | | | | |
| | 33 | | | | | | | |
| | 34 | | | | | | | |
| | 35 | | | | | | | |
| | 36 | | | | | | | |
| | 37 | | | | | | | |
| | 38 | | | | | | | |
| | 39 | | | | | | | |
| | 40 | 2.93 | 2.83 | 2.39 | 2.08 | 1.97 | 1.82 | 1.23 |
| PROPERTIES | | | | | | | | |
| Area, In. ² | 3.81 | 3.70 | 3.21 | 2.84 | 2.70 | 2.52 | 1.77 | |
| I, In. ⁴ | 1.14 | 1.14 | 1.16 | 1.17 | 1.17 | 1.18 | 1.20 | |
| r, In. | 1.35 | 1.34 | 1.30 | 1.28 | 1.28 | 1.26 | 1.19 | |
| B, Bending Factor | 0.569 | 0.553 | 0.479 | 0.424 | 0.403 | 0.376 | 0.264 | |
| a ÷ 10 ⁶ | | | | | | | | |

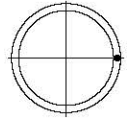
Note: Double Horizontal Line indicates k ℓ /r limit of 200.



HSS / Round Structural Steel Tubing

Allowable Concentric Loads in Kips

F_y=50



ERW

| Nominal Outside Diameter | | 3.000 | | | | | | | 2.875 | | | | | |
|-------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--|
| Wall Thickness | | 0.300 | 0.250 | 0.216 | 0.203 | 0.188 | 0.152 | 0.134 | 0.120 | 0.250 | 0.203 | 0.188 | 0.125 | |
| Weight Per Foot | | 8.65 | 7.34 | 6.42 | 6.06 | 5.65 | 4.62 | 4.10 | 3.69 | 7.01 | 5.79 | 5.40 | 3.67 | |
| Design Wall Thickness | | 0.280 | 0.233 | 0.201 | 0.189 | 0.174 | 0.142 | 0.125 | 0.112 | 0.233 | 0.189 | 0.174 | 0.116 | |
| F_y = 50 ksi | | | | | | | | | | | | | | |
| Effective length KL in feet | 0 | 72 | 61 | 53 | 50 | 46 | 38 | 34 | 31 | 58 | 48 | 44 | 30 | |
| | 2 | 66 | 56 | 49 | 47 | 43 | 35 | 32 | 28 | 53 | 44 | 41 | 28 | |
| | 3 | 63 | 53 | 47 | 44 | 41 | 34 | 30 | 27 | 50 | 42 | 39 | 27 | |
| | 4 | 58 | 50 | 44 | 41 | 38 | 31 | 28 | 25 | 47 | 39 | 36 | 25 | |
| | 5 | 53 | 46 | 40 | 38 | 35 | 29 | 26 | 23 | 43 | 35 | 33 | 23 | |
| | 6 | 48 | 41 | 36 | 34 | 32 | 26 | 24 | 21 | 38 | 32 | 30 | 20 | |
| | 7 | 42 | 36 | 32 | 30 | 28 | 23 | 21 | 19 | 33 | 28 | 26 | 18 | |
| | 8 | 36 | 31 | 27 | 26 | 24 | 20 | 18 | 16 | 27 | 23 | 22 | 15 | |
| | 9 | 29 | 25 | 22 | 21 | 20 | 17 | 15 | 14 | 22 | 18 | 17 | 12 | |
| | 10 | 23 | 20 | 18 | 17 | 16 | 13 | 12 | 11 | 18 | 15 | 14 | 10 | |
| | 11 | 19 | 17 | 15 | 14 | 13 | 11 | 10 | 9 | 15 | 12 | 12 | 8 | |
| | 12 | 16 | 14 | 13 | 12 | 11 | 9 | 8 | 8 | 12 | 10 | 10 | 7 | |
| | 13 | 14 | 12 | 11 | 10 | 9 | 8 | 7 | 7 | 10 | 9 | 8 | 6 | |
| | 14 | 12 | 10 | 9 | 9 | 8 | 7 | 6 | 6 | 9 | 8 | 7 | 5 | |
| | 15 | 10 | 9 | 8 | 8 | 7 | 6 | 5 | 5 | 8 | 7 | 6 | 4 | |
| | 16 | 9 | 8 | 7 | 7 | 6 | 5 | 5 | 4 | == | == | == | 4 | |
| | 17 | == | == | == | == | == | == | == | 4 | == | == | == | == | |
| | 18 | | | | | | | | | | | | | |
| | 19 | | | | | | | | | | | | | |
| | 20 | | | | | | | | | | | | | |
| | 21 | | | | | | | | | | | | | |
| | 22 | | | | | | | | | | | | | |
| | 23 | | | | | | | | | | | | | |
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| | 30 | | | | | | | | | | | | | |
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| | 32 | | | | | | | | | | | | | |
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| | 36 | | | | | | | | | | | | | |
| | 37 | | | | | | | | | | | | | |
| | 38 | | | | | | | | | | | | | |
| | 39 | | | | | | | | | | | | | |
| | 40 | | | | | | | | | | | | | |
| PROPERTIES | | | | | | | | | | | | | | |
| Area, in. ² | 2.39 | 2.03 | 1.77 | 1.67 | 1.54 | 1.27 | 1.13 | 1.02 | 1.93 | 1.59 | 1.48 | 1.01 | | |
| I, in. ⁴ | 2.24 | 1.95 | 1.74 | 1.66 | 1.55 | 1.30 | 1.17 | 1.06 | 1.70 | 1.45 | 1.35 | 0.958 | | |
| r, in. | 0.967 | 0.982 | 0.992 | 0.996 | 1.00 | 1.01 | 1.02 | 1.02 | 0.938 | 0.952 | 0.957 | 0.976 | | |
| B, Bending Factor | 1.60 | 1.56 | 1.53 | 1.51 | 1.49 | 1.47 | 1.45 | 1.44 | 1.63 | 1.58 | 1.58 | 1.52 | | |
| a ÷ 10 ⁶ | 0.335 | 0.291 | 0.260 | 0.248 | 0.231 | 0.194 | 0.175 | 0.158 | 0.254 | 0.217 | 0.202 | 0.143 | | |

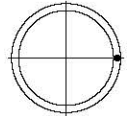
Note: Double Horizontal Line indicates k *l*/r limit of 200.



HSS / Round Structural Steel Tubing

Allowable Concentric Loads in Kips

Fy=50



ERW

| Nominal Outside Diameter | 2.500 | | | 2.375 | | | | | 1.900 | 1.660 | |
|-------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----|
| Wall Thickness | 0.250 | 0.188 | 0.125 | 0.250 | 0.218 | 0.188 | 0.154 | 0.125 | 0.145 | 0.140 | |
| Weight Per Foot | 6.01 | 4.64 | 3.17 | 5.67 | 5.02 | 4.39 | 3.65 | 3.00 | 2.72 | 2.27 | |
| Design Wall Thickness | 0.233 | 0.174 | 0.116 | 0.233 | 0.204 | 0.174 | 0.143 | 0.116 | 0.135 | 0.130 | |
| F_y = 50 ksi | | | | | | | | | | | |
| Effective length KL in feet | 0 | 50 | 38 | 26 | 47 | 42 | 36 | 30 | 25 | 23 | 19 |
| | 2 | 45 | 35 | 24 | 42 | 38 | 32 | 27 | 22 | 20 | 16 |
| | 3 | 42 | 32 | 22 | 39 | 35 | 30 | 25 | 21 | 17 | 13 |
| | 4 | 38 | 29 | 20 | 35 | 31 | 27 | 23 | 19 | 15 | 11 |
| | 5 | 33 | 26 | 18 | 30 | 27 | 24 | 20 | 16 | 12 | 8 |
| | 6 | 28 | 22 | 16 | 25 | 23 | 20 | 17 | 14 | 8 | 5 |
| | 7 | 23 | 18 | 13 | 19 | 17 | 15 | 13 | 11 | 6 | 4 |
| | 8 | 17 | 14 | 10 | 15 | 13 | 12 | 10 | 9 | 5 | 3 |
| | 9 | 14 | 11 | 8 | 12 | 11 | 9 | 8 | 7 | 4 | 2 |
| | 10 | 11 | 9 | 6 | 9 | 9 | 8 | 6 | 5 | 3 | == |
| | 11 | 9 | 7 | 5 | 8 | 7 | 6 | 5 | 4 | == | |
| | 12 | 8 | 6 | 4 | 7 | 6 | 5 | 5 | 4 | | |
| | 13 | 7 | 5 | 4 | == | == | 4 | 4 | 3 | | |
| | 14 | == | == | 3 | | | == | == | == | | |
| | 15 | | | == | | | | | | | |
| | 16 | | | | | | | | | | |
| | 17 | | | | | | | | | | |
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| PROPERTIES | | | | | | | | | | | |
| Area, In. ² | 1.66 | 1.27 | 0.87 | 1.57 | 1.39 | 1.20 | 1.00 | 0.82 | 0.75 | 0.62 | |
| I, In. ⁴ | 1.08 | 0.865 | 0.619 | 0.910 | 0.827 | 0.733 | 0.627 | 0.527 | 0.293 | 0.184 | |
| r, In. | 0.806 | 0.825 | 0.844 | 0.762 | 0.771 | 0.781 | 0.791 | 0.800 | 0.626 | 0.543 | |
| B, Bending Factor | 1.92 | 1.84 | 1.76 | 2.05 | 2.00 | 1.94 | 1.89 | 1.85 | 2.43 | 2.80 | |
| a ÷ 10 ⁶ | 0.161 | 0.129 | 0.092 | 0.136 | 0.123 | 0.109 | 0.094 | 0.079 | 0.044 | 0.027 | |

Note: Double Horizontal Line indicates k ℓ /r limit of 200.