

Design Tables for Steel Grades

Part 1: 43, 50 & 55

Part 2: 43 Pre 89, 50 Pre 89 & 55 Pre 89

ColumnsBS449

**UB, UC, RSJ, UB Piles, RSc, CHS, SHS & RHS
Members in Axial Compression**

by

Dr Shaiq U.R. Khan

BEng (Civil), MEng, PhD, PE, CEng, FIStructE

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Techno Consultants Ltd

117 Portland Street, Manchester, England M1 6ED

<http://www.techno.uk.com>

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PREFACE TO COLUMNSBS449

ColumnsBS449 has been made available as a platform to pool, share and grow expertise in the building trade. Use of the Internet as a publishing media has made it possible without incurring undue costs in publishing.

In general, the software made available by Techno Consultants Ltd has been developed in the course of day to day design work. The objective has been to produce purpose friendly software, which saves time and helps the designer to devote more of his effort in creative aspects of the building design.

This template does not claim full compliance with the code. In author's opinion, this is not an achievable aim as codes change from time to time and they do not cover all aspects of real structural behaviour. However, this template does represent a substantial effort to achieve best possible compliance in practical terms.

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Section 1

INTRODUCTION

ColumnsBS449 is an Excel Spreadsheet template for finding Safe Loads on steel members in axial compression.

The Grades of steel can be 43, 50 and 55, employing post or pre 1989 stresses.

The sections can be UB, UC, RSJ, UB Piles, RSC, CHS, SHS and RHS.

The following three slenderness ranges has been considered:

Slenderness ratios of 0 to 180 (printed Normal) for all types of loads.

Slenderness ratio of 180 to 250 (printed in bold and green cell shade) for members subjected to compression due to wind loads.

Slenderness ratios of 250 to 350 (printed in Italics and red) for members designed to resist tension only. The safe loads for these members, which are not permitted by the code as compression members, have been produced for situations when such members are found to be resisting compression by the designer.

The template allows calculation of safe loads for both the y-y and the x-x axis. The x-x capacity assumes that the member length has been restrained adequately in the y-y (generally weaker) buckling axis.

For each safe load, the template also shows the corresponding slenderness ratio of the member. This gives guidance on slenderness level when selecting a section for given effective length.

UB, UC, RSJ and UP-Piles sections can be encased with 50 or 75 mm concrete. Next to the values of safe loads calculated by the template for these members, the printed slenderness is that of the uncased section. This is to help check requirement of the code on maximum slenderness limit which is based on uncased section (i.e. slenderness ratio of uncased section, measured over it full length centre-to-centre of the connections, cannot exceed 250). When calculating the safe load capacity, however, the cased slenderness properties are used as outlined in the code.

Section 2

USING COLUMNSBS449 IN WINDOWS 97/ 98

To ensure that your version of the template is up to date, please load the latest version from the URL:

www.techno.uk.com

Use of ColumnsBS449 requires Excel 97 running in Windows 97/98.

After opening the file in Excel, start using it in a normal way.

Section 3

USED STRESSES FOR CALCULATING SAFE LOADS

Table 1

| Used Yield Stresses in N/mm ² for Various Grades and Material Thicknesses in mm | | | | | | |
|--|----------|----------|----------|-----------------|-----------------|-----------------|
| Grade Thickness | Grade 43 | Grade 50 | Grade 55 | Grade 43 Pre 89 | Grade 50 Pre 89 | Grade 55 Pre 89 |
| 16 | 275 | 355 | 450 | 250 | 350 | 430 |
| 25 | 265 | 345 | 430 | 250 | 350 | 430 |
| 40 | 265 | 345 | 400 | 250 | 350 | 430 |
| 63 | 255 | 335 | 400* | 230* | 350 | 395* |
| 65 | 245 | 325 | 400* | 230* | 350 | 395* |
| 80 | 245 | 325 | 400* | 230* | 325 | 395* |
| 100 | 235 | 315 | 400* | 230* | 325 | 395* |
| 150 | 225 | 295 | 400* | 230* | 325 | 395* |
| 200 | 215 | 285 | 400* | 230* | 325 | 395* |
| 250 | 205 | 275 | 400* | 230* | 325 | 395* |
| 251 | 205* | 275* | 400* | 230* | 325 | 395* |

* Assumed values

Table 2

| Used Allowable Tension & Bending Stresses in N/mm ² (Reference Table 2 BS449) | | | | | | |
|---|----------|----------|----------|-----------------|-----------------|-----------------|
| Grade Thickness | Grade 43 | Grade 50 | Grade 55 | Grade 43 Pre 89 | Grade 50 Pre 89 | Grade 55 Pre 89 |
| 25 | 180 | 230 | 280 | 165 | 230 | 280 |
| 40 | 180 | 230 | 260 | 165 | 230 | 280 |
| 63 | 165 | 230 | 260 | 150 | 230 | 260 |
| 65 | 165 | 215 | 260 | 150 | 230 | 260 |
| 100 | 165 | 215 | 260 | 150 | 199 | 260 |

Table 3

| Used Allowable Stress pc in Compression for Slenderness Ratios of 0 (Reference Appendix B of BS449) | | | | | | |
|---|----------|----------|----------|-----------------|-----------------|-----------------|
| Grade Slenderness | Grade 43 | Grade 50 | Grade 55 | Grade 43 Pre 89 | Grade 50 Pre 89 | Grade 55 Pre 89 |
| $l/r = 0$ | 170 | 215 | 265 | 155 | 215 | 265 |

Table 4.1

Grade 43

Material Thickness: >0 mm <=16 mm

Yield Stress: 275 N/mm²

| Used Allowable Compressive Stresses pc N/mm ² (Ref Table 17a BS449) | | | | | | | | | | |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| l/r | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 170.0 | 169.6 | 169.1 | 168.7 | 168.3 | 167.8 | 167.4 | 167.0 | 166.5 | 166.1 |
| 10 | 165.7 | 165.2 | 164.8 | 164.4 | 163.9 | 163.5 | 163.1 | 162.6 | 162.2 | 161.7 |
| 20 | 161.3 | 160.9 | 160.4 | 160.0 | 159.6 | 159.1 | 158.7 | 158.3 | 157.8 | 157.4 |
| 30 | 157.0 | 156.6 | 156.2 | 155.8 | 155.4 | 155.0 | 154.6 | 154.1 | 153.6 | 153.1 |
| 40 | 152.6 | 152.1 | 151.5 | 150.9 | 150.3 | 149.7 | 149.0 | 148.3 | 147.6 | 146.9 |
| 50 | 146.1 | 145.3 | 144.5 | 143.7 | 142.8 | 141.9 | 141.0 | 140.0 | 139.0 | 138.0 |
| 60 | 136.9 | 135.9 | 134.7 | 133.6 | 132.4 | 131.2 | 130.0 | 128.8 | 127.5 | 126.2 |
| 70 | 124.9 | 123.6 | 122.2 | 120.8 | 119.4 | 118.0 | 116.6 | 115.2 | 113.7 | 112.3 |
| 80 | 110.9 | 109.4 | 107.9 | 106.5 | 105.0 | 103.6 | 102.2 | 100.7 | 99.3 | 97.9 |
| 90 | 96.5 | 95.1 | 93.7 | 92.3 | 91.0 | 89.6 | 88.3 | 87.0 | 85.7 | 84.4 |
| 100 | 83.2 | 82.0 | 80.7 | 79.5 | 78.4 | 77.2 | 76.1 | 74.9 | 73.8 | 72.7 |
| 110 | 71.7 | 70.6 | 69.6 | 68.6 | 67.6 | 66.6 | 65.6 | 64.7 | 63.8 | 62.9 |
| 120 | 62.0 | 61.1 | 60.2 | 59.4 | 58.5 | 57.7 | 56.9 | 56.1 | 55.4 | 54.6 |
| 130 | 53.9 | 53.1 | 52.4 | 51.7 | 51.0 | 50.4 | 49.7 | 49.0 | 48.4 | 47.8 |
| 140 | 47.2 | 46.5 | 46.0 | 45.4 | 44.8 | 44.2 | 43.7 | 43.1 | 42.6 | 42.1 |
| 150 | 41.5 | 41.0 | 40.5 | 40.0 | 39.6 | 39.1 | 38.6 | 38.2 | 37.7 | 37.3 |
| 160 | 36.8 | 36.4 | 36.0 | 35.6 | 35.2 | 34.8 | 34.4 | 34.0 | 33.6 | 33.2 |
| 170 | 32.9 | 32.5 | 32.1 | 31.8 | 31.4 | 31.1 | 30.8 | 30.4 | 30.1 | 29.8 |
| 180 | 29.5 | 29.2 | 28.9 | 28.6 | 28.3 | 28.0 | 27.7 | 27.4 | 27.1 | 26.9 |
| 190 | 26.6 | 26.3 | 26.1 | 25.8 | 25.5 | 25.3 | 25.0 | 24.8 | 24.6 | 24.3 |
| 200 | 24.1 | 23.9 | 23.6 | 23.4 | 23.2 | 23.0 | 22.7 | 22.5 | 22.3 | 22.1 |
| 210 | 21.9 | 21.7 | 21.5 | 21.3 | 21.1 | 20.9 | 20.7 | 20.6 | 20.4 | 20.2 |
| 220 | 20.0 | 19.8 | 19.7 | 19.5 | 19.3 | 19.2 | 19.0 | 18.8 | 18.7 | 18.5 |
| 230 | 18.4 | 18.2 | 18.1 | 17.9 | 17.8 | 17.6 | 17.5 | 17.3 | 17.2 | 17.0 |
| 240 | 16.9 | 16.8 | 16.6 | 16.5 | 16.4 | 16.2 | 16.1 | 16.0 | 15.8 | 15.7 |
| 250 | 15.6 | 15.5 | 15.4 | 15.2 | 15.1 | 15.0 | 14.9 | 14.8 | 14.7 | 14.6 |
| 260 | 14.4 | 14.3 | 14.2 | 14.1 | 14.0 | 13.9 | 13.8 | 13.7 | 13.6 | 13.5 |
| 270 | 13.4 | 13.3 | 13.2 | 13.1 | 13.0 | 12.9 | 12.8 | 12.8 | 12.7 | 12.6 |
| 280 | 12.5 | 12.4 | 12.3 | 12.2 | 12.1 | 12.1 | 12.0 | 11.9 | 11.8 | 11.7 |
| 290 | 11.7 | 11.6 | 11.5 | 11.4 | 11.3 | 11.3 | 11.2 | 11.1 | 11.0 | 11.0 |
| 300 | 10.9 | 10.8 | 10.8 | 10.7 | 10.6 | 10.6 | 10.5 | 10.4 | 10.4 | 10.3 |
| 310 | 10.2 | 10.2 | 10.1 | 10.0 | 10.0 | 9.9 | 9.8 | 9.8 | 9.7 | 9.7 |
| 320 | 9.6 | 9.5 | 9.5 | 9.4 | 9.4 | 9.3 | 9.3 | 9.2 | 9.1 | 9.1 |
| 330 | 9.0 | 9.0 | 8.9 | 8.9 | 8.8 | 8.8 | 8.7 | 8.7 | 8.6 | 8.6 |
| 340 | 8.5 | 8.5 | 8.4 | 8.4 | 8.3 | 8.3 | 8.2 | 8.2 | 8.1 | 8.1 |
| 350 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 | 8.0 |

Table 4.2**Grade 43****Material Thickness: >16 mm <=40 mm****Yield Stress: 265 N/mm²**

| Used Allowable Compressive Stresses pc N/mm ² (Ref Table 17a BS449) | | | | | | | | | | |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| l/r | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 170.0 | 169.4 | 168.8 | 168.1 | 167.5 | 166.9 | 166.3 | 165.6 | 165.0 | 164.4 |
| 10 | 163.8 | 163.1 | 162.5 | 161.9 | 161.3 | 160.6 | 160.0 | 159.4 | 158.8 | 158.1 |
| 20 | 157.5 | 156.9 | 156.3 | 155.7 | 155.0 | 154.4 | 153.8 | 153.2 | 152.5 | 151.9 |
| 30 | 151.3 | 150.9 | 150.6 | 150.2 | 149.8 | 149.4 | 149.0 | 148.6 | 148.1 | 147.6 |
| 40 | 147.1 | 146.6 | 146.1 | 145.5 | 144.9 | 144.3 | 143.7 | 143.1 | 142.4 | 141.7 |
| 50 | 141.0 | 140.3 | 139.5 | 138.7 | 137.9 | 137.0 | 136.2 | 135.3 | 134.3 | 133.4 |
| 60 | 132.4 | 131.4 | 130.4 | 129.3 | 128.2 | 127.1 | 126.0 | 124.8 | 123.6 | 122.4 |
| 70 | 121.2 | 119.9 | 118.6 | 117.4 | 116.1 | 114.7 | 113.4 | 112.1 | 110.7 | 109.4 |
| 80 | 108.0 | 106.6 | 105.3 | 103.9 | 102.5 | 101.2 | 99.8 | 98.4 | 97.1 | 95.7 |
| 90 | 94.4 | 93.1 | 91.7 | 90.4 | 89.1 | 87.9 | 86.6 | 85.3 | 84.1 | 82.9 |
| 100 | 81.7 | 80.5 | 79.3 | 78.1 | 77.0 | 75.9 | 74.8 | 73.7 | 72.6 | 71.6 |
| 110 | 70.5 | 69.5 | 68.5 | 67.5 | 66.6 | 65.6 | 64.7 | 63.8 | 62.9 | 62.0 |
| 120 | 61.1 | 60.2 | 59.4 | 58.6 | 57.8 | 57.0 | 56.2 | 55.4 | 54.7 | 53.9 |
| 130 | 53.2 | 52.5 | 51.8 | 51.1 | 50.4 | 49.8 | 49.1 | 48.5 | 47.8 | 47.2 |
| 140 | 46.6 | 46.0 | 45.4 | 44.8 | 44.3 | 43.7 | 43.2 | 42.6 | 42.1 | 41.6 |
| 150 | 41.1 | 40.6 | 40.1 | 39.6 | 39.1 | 38.7 | 38.2 | 37.8 | 37.3 | 36.9 |
| 160 | 36.5 | 36.0 | 35.6 | 35.2 | 34.8 | 34.4 | 34.0 | 33.6 | 33.3 | 32.9 |
| 170 | 32.5 | 32.2 | 31.8 | 31.5 | 31.1 | 30.8 | 30.5 | 30.1 | 29.8 | 29.5 |
| 180 | 29.2 | 28.9 | 28.6 | 28.3 | 28.0 | 27.7 | 27.4 | 27.2 | 26.9 | 26.6 |
| 190 | 26.3 | 26.1 | 25.8 | 25.6 | 25.3 | 25.1 | 24.8 | 24.6 | 24.3 | 24.1 |
| 200 | 23.9 | 23.6 | 23.4 | 23.2 | 23.0 | 22.8 | 22.5 | 22.3 | 22.1 | 21.9 |
| 210 | 21.7 | 21.5 | 21.3 | 21.1 | 20.9 | 20.8 | 20.6 | 20.4 | 20.2 | 20.0 |
| 220 | 19.9 | 19.7 | 19.5 | 19.3 | 19.2 | 19.0 | 18.8 | 18.7 | 18.5 | 18.4 |
| 230 | 18.2 | 18.1 | 17.9 | 17.8 | 17.6 | 17.5 | 17.3 | 17.2 | 17.0 | 16.9 |
| 240 | 16.8 | 16.6 | 16.5 | 16.4 | 16.2 | 16.1 | 16.0 | 15.8 | 15.7 | 15.6 |
| 250 | 15.5 | 15.4 | 15.2 | 15.1 | 15.0 | 14.9 | 14.8 | 14.7 | 14.6 | 14.4 |
| 260 | 14.3 | 14.2 | 14.1 | 14.0 | 13.9 | 13.8 | 13.7 | 13.6 | 13.5 | 13.4 |
| 270 | 13.3 | 13.2 | 13.1 | 13.0 | 12.9 | 12.8 | 12.7 | 12.7 | 12.6 | 12.5 |
| 280 | 12.4 | 12.3 | 12.2 | 12.1 | 12.1 | 12.0 | 11.9 | 11.8 | 11.7 | 11.6 |
| 290 | 11.6 | 11.5 | 11.4 | 11.3 | 11.3 | 11.2 | 11.1 | 11.0 | 11.0 | 10.9 |
| 300 | 10.8 | 10.7 | 10.7 | 10.6 | 10.5 | 10.5 | 10.4 | 10.3 | 10.3 | 10.2 |
| 310 | 10.1 | 10.1 | 10.0 | 10.0 | 9.9 | 9.8 | 9.8 | 9.7 | 9.6 | 9.6 |
| 320 | 9.5 | 9.5 | 9.4 | 9.4 | 9.3 | 9.2 | 9.2 | 9.1 | 9.1 | 9.0 |
| 330 | 9.0 | 8.9 | 8.9 | 8.8 | 8.8 | 8.7 | 8.7 | 8.6 | 8.5 | 8.5 |
| 340 | 8.5 | 8.4 | 8.4 | 8.3 | 8.3 | 8.2 | 8.2 | 8.1 | 8.1 | 8.0 |
| 350 | 8.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

Table 4.3**Grade 43****Material Thickness: >40 mm <=63 mm****Yield Stress: 255 N/mm²**

| Used Allowable Compressive Stresses pc N/mm ² (Ref Table 17a BS449) | | | | | | | | | | |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| l/r | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 170.0 | 169.2 | 168.4 | 167.6 | 166.7 | 165.9 | 165.1 | 164.3 | 163.5 | 162.7 |
| 10 | 161.9 | 161.1 | 160.2 | 159.4 | 158.6 | 157.8 | 157.0 | 156.2 | 155.4 | 154.5 |
| 20 | 153.7 | 152.9 | 152.1 | 151.3 | 150.5 | 149.7 | 148.8 | 148.0 | 147.2 | 146.4 |
| 30 | 145.6 | 145.3 | 144.9 | 144.6 | 144.2 | 143.8 | 143.4 | 143.0 | 142.6 | 142.1 |
| 40 | 141.6 | 141.2 | 140.7 | 140.1 | 139.6 | 139.0 | 138.4 | 137.8 | 137.2 | 136.5 |
| 50 | 135.9 | 135.2 | 134.5 | 133.7 | 132.9 | 132.2 | 131.3 | 130.5 | 129.6 | 128.7 |
| 60 | 127.8 | 126.9 | 125.9 | 124.9 | 123.9 | 122.9 | 121.8 | 120.7 | 119.6 | 118.5 |
| 70 | 117.4 | 116.2 | 115.0 | 113.8 | 112.6 | 111.4 | 110.1 | 108.9 | 107.6 | 106.3 |
| 80 | 105.0 | 103.8 | 102.5 | 101.2 | 99.9 | 98.6 | 97.3 | 96.0 | 94.7 | 93.5 |
| 90 | 92.2 | 90.9 | 89.7 | 88.4 | 87.2 | 86.0 | 84.8 | 83.6 | 82.4 | 81.2 |
| 100 | 80.1 | 78.9 | 77.8 | 76.7 | 75.6 | 74.5 | 73.4 | 72.4 | 71.3 | 70.3 |
| 110 | 69.3 | 68.3 | 67.4 | 66.4 | 65.5 | 64.6 | 63.6 | 62.8 | 61.9 | 61.0 |
| 120 | 60.2 | 59.3 | 58.5 | 57.7 | 56.9 | 56.1 | 55.4 | 54.6 | 53.9 | 53.2 |
| 130 | 52.5 | 51.8 | 51.1 | 50.4 | 49.7 | 49.1 | 48.5 | 47.8 | 47.2 | 46.6 |
| 140 | 46.0 | 45.4 | 44.9 | 44.3 | 43.7 | 43.2 | 42.7 | 42.1 | 41.6 | 41.1 |
| 150 | 40.6 | 40.1 | 39.6 | 39.2 | 38.7 | 38.2 | 37.8 | 37.3 | 36.9 | 36.5 |
| 160 | 36.1 | 35.6 | 35.2 | 34.8 | 34.4 | 34.0 | 33.7 | 33.3 | 32.9 | 32.6 |
| 170 | 32.2 | 31.8 | 31.5 | 31.1 | 30.8 | 30.5 | 30.2 | 29.8 | 29.5 | 29.2 |
| 180 | 28.9 | 28.6 | 28.3 | 28.0 | 27.7 | 27.4 | 27.2 | 26.9 | 26.6 | 26.3 |
| 190 | 26.1 | 25.8 | 25.6 | 25.3 | 25.1 | 24.8 | 24.6 | 24.3 | 24.1 | 23.9 |
| 200 | 23.6 | 23.4 | 23.2 | 23.0 | 22.8 | 22.5 | 22.3 | 22.1 | 21.9 | 21.7 |
| 210 | 21.5 | 21.3 | 21.1 | 20.9 | 20.8 | 20.6 | 20.4 | 20.2 | 20.0 | 19.8 |
| 220 | 19.7 | 19.5 | 19.3 | 19.2 | 19.0 | 18.8 | 18.7 | 18.5 | 18.4 | 18.2 |
| 230 | 18.0 | 17.9 | 17.7 | 17.6 | 17.5 | 17.3 | 17.2 | 17.0 | 16.9 | 16.7 |
| 240 | 16.6 | 16.5 | 16.3 | 16.2 | 16.1 | 16.0 | 15.8 | 15.7 | 15.6 | 15.5 |
| 250 | 15.3 | 15.2 | 15.1 | 15.0 | 14.9 | 14.8 | 14.6 | 14.5 | 14.4 | 14.3 |
| 260 | 14.2 | 14.1 | 14.0 | 13.9 | 13.8 | 13.7 | 13.6 | 13.5 | 13.4 | 13.3 |
| 270 | 13.2 | 13.1 | 13.0 | 12.9 | 12.8 | 12.7 | 12.6 | 12.5 | 12.5 | 12.4 |
| 280 | 12.3 | 12.2 | 12.1 | 12.0 | 11.9 | 11.9 | 11.8 | 11.7 | 11.6 | 11.5 |
| 290 | 11.5 | 11.4 | 11.3 | 11.2 | 11.2 | 11.1 | 11.0 | 10.9 | 10.9 | 10.8 |
| 300 | 10.7 | 10.7 | 10.6 | 10.5 | 10.5 | 10.4 | 10.3 | 10.3 | 10.2 | 10.1 |
| 310 | 10.1 | 10.0 | 9.9 | 9.9 | 9.8 | 9.7 | 9.7 | 9.6 | 9.6 | 9.5 |
| 320 | 9.4 | 9.4 | 9.3 | 9.3 | 9.2 | 9.2 | 9.1 | 9.1 | 9.0 | 8.9 |
| 330 | 8.9 | 8.8 | 8.8 | 8.7 | 8.7 | 8.6 | 8.6 | 8.5 | 8.5 | 8.4 |
| 340 | 8.4 | 8.3 | 8.3 | 8.2 | 8.2 | 8.1 | 8.1 | 8.1 | 8.0 | 8.0 |
| 350 | 7.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

Table 4.4

Grade 43

Material Thickness: >63 mm <=80 mm

Yield Stress: 245 N/mm²

| Used Allowable Compressive Stresses pc N/mm ² (Ref Table 17a BS449) | | | | | | | | | | |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| l/r | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 170.0 | 169.0 | 168.0 | 167.0 | 166.0 | 165.0 | 164.0 | 163.0 | 162.0 | 161.0 |
| 10 | 160.0 | 159.0 | 158.0 | 157.0 | 156.0 | 155.0 | 153.9 | 152.9 | 151.9 | 150.9 |
| 20 | 149.9 | 148.9 | 147.9 | 146.9 | 145.9 | 144.9 | 143.9 | 142.9 | 141.9 | 140.9 |
| 30 | 139.9 | 139.6 | 139.3 | 138.9 | 138.6 | 138.2 | 137.8 | 137.4 | 137.0 | 136.6 |
| 40 | 136.2 | 135.7 | 135.2 | 134.7 | 134.2 | 133.7 | 133.1 | 132.6 | 132.0 | 131.4 |
| 50 | 130.7 | 130.1 | 129.4 | 128.7 | 128.0 | 127.2 | 126.5 | 125.7 | 124.9 | 124.1 |
| 60 | 123.2 | 122.3 | 121.4 | 120.5 | 119.6 | 118.6 | 117.6 | 116.6 | 115.6 | 114.5 |
| 70 | 113.5 | 112.4 | 111.3 | 110.2 | 109.0 | 107.9 | 106.7 | 105.5 | 104.4 | 103.2 |
| 80 | 102.0 | 100.8 | 99.6 | 98.4 | 97.1 | 95.9 | 94.7 | 93.5 | 92.3 | 91.1 |
| 90 | 89.9 | 88.7 | 87.5 | 86.3 | 85.2 | 84.0 | 82.8 | 81.7 | 80.6 | 79.5 |
| 100 | 78.3 | 77.3 | 76.2 | 75.1 | 74.1 | 73.0 | 72.0 | 71.0 | 70.0 | 69.0 |
| 110 | 68.0 | 67.1 | 66.2 | 65.2 | 64.3 | 63.4 | 62.6 | 61.7 | 60.8 | 60.0 |
| 120 | 59.2 | 58.4 | 57.6 | 56.8 | 56.0 | 55.3 | 54.5 | 53.8 | 53.1 | 52.4 |
| 130 | 51.7 | 51.0 | 50.3 | 49.7 | 49.0 | 48.4 | 47.8 | 47.2 | 46.6 | 46.0 |
| 140 | 45.4 | 44.8 | 44.3 | 43.7 | 43.2 | 42.6 | 42.1 | 41.6 | 41.1 | 40.6 |
| 150 | 40.1 | 39.6 | 39.1 | 38.7 | 38.2 | 37.8 | 37.3 | 36.9 | 36.5 | 36.0 |
| 160 | 35.6 | 35.2 | 34.8 | 34.4 | 34.0 | 33.6 | 33.3 | 32.9 | 32.5 | 32.2 |
| 170 | 31.8 | 31.5 | 31.1 | 30.8 | 30.5 | 30.1 | 29.8 | 29.5 | 29.2 | 28.9 |
| 180 | 28.6 | 28.3 | 28.0 | 27.7 | 27.4 | 27.1 | 26.9 | 26.6 | 26.3 | 26.1 |
| 190 | 25.8 | 25.5 | 25.3 | 25.0 | 24.8 | 24.6 | 24.3 | 24.1 | 23.8 | 23.6 |
| 200 | 23.4 | 23.2 | 23.0 | 22.7 | 22.5 | 22.3 | 22.1 | 21.9 | 21.7 | 21.5 |
| 210 | 21.3 | 21.1 | 20.9 | 20.7 | 20.5 | 20.4 | 20.2 | 20.0 | 19.8 | 19.6 |
| 220 | 19.5 | 19.3 | 19.1 | 19.0 | 18.8 | 18.6 | 18.5 | 18.3 | 18.2 | 18.0 |
| 230 | 17.9 | 17.7 | 17.6 | 17.4 | 17.3 | 17.1 | 17.0 | 16.9 | 16.7 | 16.6 |
| 240 | 16.5 | 16.3 | 16.2 | 16.1 | 15.9 | 15.8 | 15.7 | 15.6 | 15.4 | 15.3 |
| 250 | 15.2 | 15.1 | 15.0 | 14.8 | 14.7 | 14.6 | 14.5 | 14.4 | 14.3 | 14.2 |
| 260 | 14.1 | 14.0 | 13.9 | 13.8 | 13.7 | 13.6 | 13.5 | 13.4 | 13.3 | 13.2 |
| 270 | 13.1 | 13.0 | 12.9 | 12.8 | 12.7 | 12.6 | 12.5 | 12.4 | 12.3 | 12.3 |
| 280 | 12.2 | 12.1 | 12.0 | 11.9 | 11.8 | 11.8 | 11.7 | 11.6 | 11.5 | 11.4 |
| 290 | 11.4 | 11.3 | 11.2 | 11.1 | 11.1 | 11.0 | 10.9 | 10.8 | 10.8 | 10.7 |
| 300 | 10.6 | 10.6 | 10.5 | 10.4 | 10.4 | 10.3 | 10.2 | 10.2 | 10.1 | 10.0 |
| 310 | 10.0 | 9.9 | 9.8 | 9.8 | 9.7 | 9.7 | 9.6 | 9.5 | 9.5 | 9.4 |
| 320 | 9.4 | 9.3 | 9.3 | 9.2 | 9.1 | 9.1 | 9.0 | 9.0 | 8.9 | 8.9 |
| 330 | 8.8 | 8.8 | 8.7 | 8.7 | 8.6 | 8.6 | 8.5 | 8.5 | 8.4 | 8.4 |
| 340 | 8.3 | 8.3 | 8.2 | 8.2 | 8.1 | 8.1 | 8.0 | 8.0 | 7.9 | 7.9 |
| 350 | 7.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

Table 4.5

Grade 43

Material Thickness: >80 mm <=100 mm

Yield Stress: 235 N/mm²

| Used Allowable Compressive Stresses pc N/mm² (Ref Table 17a BS449) | | | | | | | | | | |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| l/r | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 170.0 | 168.8 | 167.6 | 166.4 | 165.2 | 164.0 | 162.8 | 161.6 | 160.5 | 159.3 |
| 10 | 158.1 | 156.9 | 155.7 | 154.5 | 153.3 | 152.1 | 150.9 | 149.7 | 148.5 | 147.3 |
| 20 | 146.1 | 144.9 | 143.8 | 142.6 | 141.4 | 140.2 | 139.0 | 137.8 | 136.6 | 135.4 |
| 30 | 134.2 | 133.9 | 133.6 | 133.3 | 133.0 | 132.6 | 132.3 | 131.9 | 131.5 | 131.1 |
| 40 | 130.7 | 130.2 | 129.8 | 129.3 | 128.8 | 128.3 | 127.8 | 127.3 | 126.7 | 126.1 |
| 50 | 125.6 | 124.9 | 124.3 | 123.7 | 123.0 | 122.3 | 121.6 | 120.9 | 120.1 | 119.3 |
| 60 | 118.5 | 117.7 | 116.9 | 116.0 | 115.2 | 114.3 | 113.3 | 112.4 | 111.5 | 110.5 |
| 70 | 109.5 | 108.5 | 107.5 | 106.4 | 105.4 | 104.3 | 103.2 | 102.1 | 101.0 | 99.9 |
| 80 | 98.8 | 97.7 | 96.6 | 95.4 | 94.3 | 93.2 | 92.0 | 90.9 | 89.7 | 88.6 |
| 90 | 87.5 | 86.4 | 85.2 | 84.1 | 83.0 | 81.9 | 80.8 | 79.7 | 78.7 | 77.6 |
| 100 | 76.5 | 75.5 | 74.5 | 73.5 | 72.4 | 71.5 | 70.5 | 69.5 | 68.5 | 67.6 |
| 110 | 66.7 | 65.8 | 64.9 | 64.0 | 63.1 | 62.2 | 61.4 | 60.6 | 59.7 | 58.9 |
| 120 | 58.1 | 57.3 | 56.6 | 55.8 | 55.1 | 54.3 | 53.6 | 52.9 | 52.2 | 51.5 |
| 130 | 50.9 | 50.2 | 49.5 | 48.9 | 48.3 | 47.7 | 47.0 | 46.4 | 45.9 | 45.3 |
| 140 | 44.7 | 44.2 | 43.6 | 43.1 | 42.5 | 42.0 | 41.5 | 41.0 | 40.5 | 40.0 |
| 150 | 39.5 | 39.1 | 38.6 | 38.1 | 37.7 | 37.3 | 36.8 | 36.4 | 36.0 | 35.6 |
| 160 | 35.2 | 34.8 | 34.4 | 34.0 | 33.6 | 33.2 | 32.8 | 32.5 | 32.1 | 31.8 |
| 170 | 31.4 | 31.1 | 30.7 | 30.4 | 30.1 | 29.8 | 29.5 | 29.1 | 28.8 | 28.5 |
| 180 | 28.2 | 27.9 | 27.7 | 27.4 | 27.1 | 26.8 | 26.5 | 26.3 | 26.0 | 25.8 |
| 190 | 25.5 | 25.2 | 25.0 | 24.8 | 24.5 | 24.3 | 24.0 | 23.8 | 23.6 | 23.4 |
| 200 | 23.1 | 22.9 | 22.7 | 22.5 | 22.3 | 22.1 | 21.9 | 21.7 | 21.5 | 21.3 |
| 210 | 21.1 | 20.9 | 20.7 | 20.5 | 20.3 | 20.1 | 20.0 | 19.8 | 19.6 | 19.4 |
| 220 | 19.3 | 19.1 | 18.9 | 18.8 | 18.6 | 18.4 | 18.3 | 18.1 | 18.0 | 17.8 |
| 230 | 17.7 | 17.5 | 17.4 | 17.2 | 17.1 | 17.0 | 16.8 | 16.7 | 16.5 | 16.4 |
| 240 | 16.3 | 16.2 | 16.0 | 15.9 | 15.8 | 15.6 | 15.5 | 15.4 | 15.3 | 15.2 |
| 250 | 15.0 | 14.9 | 14.8 | 14.7 | 14.6 | 14.5 | 14.4 | 14.3 | 14.1 | 14.0 |
| 260 | 13.9 | 13.8 | 13.7 | 13.6 | 13.5 | 13.4 | 13.3 | 13.2 | 13.1 | 13.0 |
| 270 | 12.9 | 12.9 | 12.8 | 12.7 | 12.6 | 12.5 | 12.4 | 12.3 | 12.2 | 12.1 |
| 280 | 12.1 | 12.0 | 11.9 | 11.8 | 11.7 | 11.6 | 11.6 | 11.5 | 11.4 | 11.3 |
| 290 | 11.3 | 11.2 | 11.1 | 11.0 | 11.0 | 10.9 | 10.8 | 10.7 | 10.7 | 10.6 |
| 300 | 10.5 | 10.5 | 10.4 | 10.3 | 10.3 | 10.2 | 10.1 | 10.1 | 10.0 | 9.9 |
| 310 | 9.9 | 9.8 | 9.7 | 9.7 | 9.6 | 9.6 | 9.5 | 9.4 | 9.4 | 9.3 |
| 320 | 9.3 | 9.2 | 9.2 | 9.1 | 9.1 | 9.0 | 8.9 | 8.9 | 8.8 | 8.8 |
| 330 | 8.7 | 8.7 | 8.6 | 8.6 | 8.5 | 8.5 | 8.4 | 8.4 | 8.3 | 8.3 |
| 340 | 8.2 | 8.2 | 8.1 | 8.1 | 8.0 | 8.0 | 8.0 | 7.9 | 7.9 | 7.8 |
| 350 | 7.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

Table 4.6**Grade 43****Material Thickness: >100 mm <=150 mm****Yield Stress: 225 N/mm²**

| Used Allowable Compressive Stresses pc N/mm ² (Ref Table 17a BS449) | | | | | | | | | | |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| l/r | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 170.0 | 168.6 | 167.2 | 165.9 | 164.5 | 163.1 | 161.7 | 160.3 | 158.9 | 157.6 |
| 10 | 156.2 | 154.8 | 153.4 | 152.0 | 150.6 | 149.3 | 147.9 | 146.5 | 145.1 | 143.7 |
| 20 | 142.3 | 141.0 | 139.6 | 138.2 | 136.8 | 135.4 | 134.0 | 132.7 | 131.3 | 129.9 |
| 30 | 128.5 | 128.2 | 127.9 | 127.6 | 127.3 | 127.0 | 126.7 | 126.3 | 125.9 | 125.6 |
| 40 | 125.2 | 124.8 | 124.3 | 123.9 | 123.4 | 123.0 | 122.5 | 122.0 | 121.5 | 120.9 |
| 50 | 120.4 | 119.8 | 119.2 | 118.6 | 118.0 | 117.3 | 116.7 | 116.0 | 115.3 | 114.6 |
| 60 | 113.8 | 113.1 | 112.3 | 111.5 | 110.7 | 109.9 | 109.0 | 108.2 | 107.3 | 106.4 |
| 70 | 105.5 | 104.5 | 103.6 | 102.6 | 101.6 | 100.6 | 99.6 | 98.6 | 97.6 | 96.6 |
| 80 | 95.5 | 94.5 | 93.5 | 92.4 | 91.3 | 90.3 | 89.2 | 88.1 | 87.1 | 86.0 |
| 90 | 85.0 | 83.9 | 82.8 | 81.8 | 80.7 | 79.7 | 78.7 | 77.7 | 76.6 | 75.6 |
| 100 | 74.6 | 73.6 | 72.7 | 71.7 | 70.7 | 69.8 | 68.9 | 67.9 | 67.0 | 66.1 |
| 110 | 65.2 | 64.3 | 63.5 | 62.6 | 61.8 | 61.0 | 60.1 | 59.3 | 58.5 | 57.8 |
| 120 | 57.0 | 56.2 | 55.5 | 54.8 | 54.0 | 53.3 | 52.6 | 52.0 | 51.3 | 50.6 |
| 130 | 50.0 | 49.3 | 48.7 | 48.1 | 47.5 | 46.9 | 46.3 | 45.7 | 45.1 | 44.5 |
| 140 | 44.0 | 43.4 | 42.9 | 42.4 | 41.9 | 41.4 | 40.9 | 40.4 | 39.9 | 39.4 |
| 150 | 38.9 | 38.5 | 38.0 | 37.6 | 37.1 | 36.7 | 36.3 | 35.9 | 35.5 | 35.1 |
| 160 | 34.7 | 34.3 | 33.9 | 33.5 | 33.1 | 32.8 | 32.4 | 32.0 | 31.7 | 31.3 |
| 170 | 31.0 | 30.7 | 30.3 | 30.0 | 29.7 | 29.4 | 29.1 | 28.8 | 28.5 | 28.2 |
| 180 | 27.9 | 27.6 | 27.3 | 27.0 | 26.7 | 26.5 | 26.2 | 25.9 | 25.7 | 25.4 |
| 190 | 25.2 | 24.9 | 24.7 | 24.4 | 24.2 | 24.0 | 23.7 | 23.5 | 23.3 | 23.1 |
| 200 | 22.8 | 22.6 | 22.4 | 22.2 | 22.0 | 21.8 | 21.6 | 21.4 | 21.2 | 21.0 |
| 210 | 20.8 | 20.6 | 20.4 | 20.3 | 20.1 | 19.9 | 19.7 | 19.6 | 19.4 | 19.2 |
| 220 | 19.0 | 18.9 | 18.7 | 18.6 | 18.4 | 18.2 | 18.1 | 17.9 | 17.8 | 17.6 |
| 230 | 17.5 | 17.3 | 17.2 | 17.0 | 16.9 | 16.8 | 16.6 | 16.5 | 16.4 | 16.2 |
| 240 | 16.1 | 16.0 | 15.8 | 15.7 | 15.6 | 15.5 | 15.3 | 15.2 | 15.1 | 15.0 |
| 250 | 14.9 | 14.8 | 14.6 | 14.5 | 14.4 | 14.3 | 14.2 | 14.1 | 14.0 | 13.9 |
| 260 | 13.8 | 13.7 | 13.6 | 13.5 | 13.4 | 13.3 | 13.2 | 13.1 | 13.0 | 12.9 |
| 270 | 12.8 | 12.7 | 12.6 | 12.5 | 12.4 | 12.4 | 12.3 | 12.2 | 12.1 | 12.0 |
| 280 | 11.9 | 11.8 | 11.8 | 11.7 | 11.6 | 11.5 | 11.4 | 11.4 | 11.3 | 11.2 |
| 290 | 11.1 | 11.1 | 11.0 | 10.9 | 10.8 | 10.8 | 10.7 | 10.6 | 10.6 | 10.5 |
| 300 | 10.4 | 10.4 | 10.3 | 10.2 | 10.2 | 10.1 | 10.0 | 10.0 | 9.9 | 9.8 |
| 310 | 9.8 | 9.7 | 9.6 | 9.6 | 9.5 | 9.5 | 9.4 | 9.4 | 9.3 | 9.2 |
| 320 | 9.2 | 9.1 | 9.1 | 9.0 | 9.0 | 8.9 | 8.9 | 8.8 | 8.7 | 8.7 |
| 330 | 8.6 | 8.6 | 8.5 | 8.5 | 8.4 | 8.4 | 8.3 | 8.3 | 8.2 | 8.2 |
| 340 | 8.1 | 8.1 | 8.1 | 8.0 | 8.0 | 7.9 | 7.9 | 7.8 | 7.8 | 7.7 |
| 350 | 7.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

Table 5.1

Grade 50

Material Thickness: >0 mm <=16 mm

Yield Stress: 355 N/mm²

| Used Allowable Compressive Stresses pc N/mm ² (Ref Table 17b BS449) | | | | | | | | | | |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| l/r | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 215.0 | 214.6 | 214.2 | 213.7 | 213.3 | 212.9 | 212.5 | 212.1 | 211.6 | 211.2 |
| 10 | 210.8 | 210.4 | 210.0 | 209.5 | 209.1 | 208.7 | 208.3 | 207.9 | 207.4 | 207.0 |
| 20 | 206.6 | 206.2 | 205.8 | 205.3 | 204.9 | 204.5 | 204.1 | 203.7 | 203.2 | 202.8 |
| 30 | 202.4 | 201.9 | 201.4 | 200.8 | 200.3 | 199.6 | 199.0 | 198.3 | 197.6 | 196.9 |
| 40 | 196.1 | 195.3 | 194.5 | 193.6 | 192.7 | 191.7 | 190.7 | 189.7 | 188.6 | 187.4 |
| 50 | 186.2 | 185.0 | 183.7 | 182.3 | 180.9 | 179.5 | 178.0 | 176.4 | 174.8 | 173.1 |
| 60 | 171.4 | 169.6 | 167.8 | 165.9 | 164.0 | 162.0 | 160.0 | 158.0 | 155.9 | 153.8 |
| 70 | 151.7 | 149.6 | 147.4 | 145.2 | 143.1 | 140.9 | 138.7 | 136.5 | 134.4 | 132.2 |
| 80 | 130.1 | 128.0 | 125.8 | 123.8 | 121.7 | 119.7 | 117.6 | 115.7 | 113.7 | 111.8 |
| 90 | 109.9 | 108.0 | 106.2 | 104.4 | 102.6 | 100.9 | 99.2 | 97.5 | 95.9 | 94.3 |
| 100 | 92.7 | 91.2 | 89.7 | 88.2 | 86.7 | 85.3 | 83.9 | 82.6 | 81.2 | 79.9 |
| 110 | 78.7 | 77.4 | 76.2 | 75.0 | 73.8 | 72.7 | 71.5 | 70.4 | 69.4 | 68.3 |
| 120 | 67.3 | 66.3 | 65.3 | 64.3 | 63.4 | 62.4 | 61.5 | 60.6 | 59.8 | 58.9 |
| 130 | 58.1 | 57.2 | 56.4 | 55.6 | 54.9 | 54.1 | 53.4 | 52.6 | 51.9 | 51.2 |
| 140 | 50.5 | 49.9 | 49.2 | 48.5 | 47.9 | 47.3 | 46.7 | 46.1 | 45.5 | 44.9 |
| 150 | 44.3 | 43.8 | 43.2 | 42.7 | 42.2 | 41.6 | 41.1 | 40.6 | 40.1 | 39.7 |
| 160 | 39.2 | 38.7 | 38.3 | 37.8 | 37.4 | 36.9 | 36.5 | 36.1 | 35.7 | 35.3 |
| 170 | 34.9 | 34.5 | 34.1 | 33.7 | 33.3 | 33.0 | 32.6 | 32.2 | 31.9 | 31.5 |
| 180 | 31.2 | 30.9 | 30.5 | 30.2 | 29.9 | 29.6 | 29.3 | 29.0 | 28.7 | 28.4 |
| 190 | 28.1 | 27.8 | 27.5 | 27.2 | 27.0 | 26.7 | 26.4 | 26.2 | 25.9 | 25.7 |
| 200 | 25.4 | 25.2 | 24.9 | 24.7 | 24.4 | 24.2 | 24.0 | 23.8 | 23.5 | 23.3 |
| 210 | 23.1 | 22.9 | 22.7 | 22.5 | 22.3 | 22.1 | 21.9 | 21.7 | 21.5 | 21.3 |
| 220 | 21.1 | 20.9 | 20.7 | 20.5 | 20.3 | 20.2 | 20.0 | 19.8 | 19.7 | 19.5 |
| 230 | 19.3 | 19.2 | 19.0 | 18.8 | 18.7 | 18.5 | 18.4 | 18.2 | 18.1 | 17.9 |
| 240 | 17.8 | 17.6 | 17.5 | 17.3 | 17.2 | 17.1 | 16.9 | 16.8 | 16.7 | 16.5 |
| 250 | 16.4 | 16.3 | 16.1 | 16.0 | 15.9 | 15.8 | 15.6 | 15.5 | 15.4 | 15.3 |
| 260 | 15.2 | 15.1 | 14.9 | 14.8 | 14.7 | 14.6 | 14.5 | 14.4 | 14.3 | 14.2 |
| 270 | 14.1 | 14.0 | 13.9 | 13.8 | 13.7 | 13.6 | 13.5 | 13.4 | 13.3 | 13.2 |
| 280 | 13.1 | 13.0 | 12.9 | 12.8 | 12.7 | 12.7 | 12.6 | 12.5 | 12.4 | 12.3 |
| 290 | 12.2 | 12.1 | 12.1 | 12.0 | 11.9 | 11.8 | 11.7 | 11.7 | 11.6 | 11.5 |
| 300 | 11.4 | 11.4 | 11.3 | 11.2 | 11.1 | 11.1 | 11.0 | 10.9 | 10.8 | 10.8 |
| 310 | 10.7 | 10.6 | 10.6 | 10.5 | 10.4 | 10.4 | 10.3 | 10.2 | 10.2 | 10.1 |
| 320 | 10.1 | 10.0 | 9.9 | 9.9 | 9.8 | 9.8 | 9.7 | 9.6 | 9.6 | 9.5 |
| 330 | 9.5 | 9.4 | 9.3 | 9.3 | 9.2 | 9.2 | 9.1 | 9.1 | 9.0 | 9.0 |
| 340 | 8.9 | 8.9 | 8.8 | 8.8 | 8.7 | 8.7 | 8.6 | 8.6 | 8.5 | 8.5 |
| 350 | 8.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

Table 5.2

Grade 50

Material Thickness: >16 mm <=40 mm

Yield Stress: 345 N/mm²

| Used Allowable Compressive Stresses pc N/mm ² (Ref Table 17b BS449) | | | | | | | | | | |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| l/r | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 215.0 | 214.4 | 213.8 | 213.2 | 212.6 | 212.0 | 211.3 | 210.7 | 210.1 | 209.5 |
| 10 | 208.9 | 208.3 | 207.7 | 207.1 | 206.5 | 205.9 | 205.3 | 204.6 | 204.0 | 203.4 |
| 20 | 202.8 | 202.2 | 201.6 | 201.0 | 200.4 | 199.8 | 199.2 | 198.6 | 197.9 | 197.3 |
| 30 | 196.7 | 196.2 | 195.7 | 195.2 | 194.7 | 194.1 | 193.5 | 192.8 | 192.2 | 191.5 |
| 40 | 190.7 | 190.0 | 189.2 | 188.3 | 187.4 | 186.5 | 185.6 | 184.6 | 183.5 | 182.4 |
| 50 | 181.3 | 180.1 | 178.9 | 177.6 | 176.3 | 174.9 | 173.5 | 172.0 | 170.5 | 168.9 |
| 60 | 167.3 | 165.6 | 163.9 | 162.1 | 160.3 | 158.4 | 156.5 | 154.6 | 152.6 | 150.7 |
| 70 | 148.7 | 146.6 | 144.6 | 142.5 | 140.4 | 138.4 | 136.3 | 134.2 | 132.1 | 130.1 |
| 80 | 128.0 | 126.0 | 123.9 | 121.9 | 119.9 | 118.0 | 116.0 | 114.1 | 112.2 | 110.3 |
| 90 | 108.5 | 106.7 | 104.9 | 103.2 | 101.4 | 99.7 | 98.1 | 96.4 | 94.9 | 93.3 |
| 100 | 91.7 | 90.2 | 88.8 | 87.3 | 85.9 | 84.5 | 83.1 | 81.8 | 80.5 | 79.2 |
| 110 | 77.9 | 76.7 | 75.5 | 74.3 | 73.2 | 72.1 | 70.9 | 69.9 | 68.8 | 67.8 |
| 120 | 66.7 | 65.7 | 64.8 | 63.8 | 62.9 | 62.0 | 61.1 | 60.2 | 59.3 | 58.5 |
| 130 | 57.6 | 56.8 | 56.0 | 55.2 | 54.5 | 53.7 | 53.0 | 52.3 | 51.6 | 50.9 |
| 140 | 50.2 | 49.5 | 48.9 | 48.2 | 47.6 | 47.0 | 46.4 | 45.8 | 45.2 | 44.6 |
| 150 | 44.0 | 43.5 | 43.0 | 42.4 | 41.9 | 41.4 | 40.9 | 40.4 | 39.9 | 39.4 |
| 160 | 38.9 | 38.5 | 38.0 | 37.6 | 37.1 | 36.7 | 36.3 | 35.9 | 35.5 | 35.1 |
| 170 | 34.7 | 34.3 | 33.9 | 33.5 | 33.1 | 32.8 | 32.4 | 32.1 | 31.7 | 31.4 |
| 180 | 31.0 | 30.7 | 30.4 | 30.0 | 29.7 | 29.4 | 29.1 | 28.8 | 28.5 | 28.2 |
| 190 | 27.9 | 27.7 | 27.4 | 27.1 | 26.8 | 26.6 | 26.3 | 26.0 | 25.8 | 25.5 |
| 200 | 25.3 | 25.0 | 24.8 | 24.6 | 24.3 | 24.1 | 23.9 | 23.6 | 23.4 | 23.2 |
| 210 | 23.0 | 22.8 | 22.6 | 22.3 | 22.1 | 21.9 | 21.7 | 21.5 | 21.4 | 21.2 |
| 220 | 21.0 | 20.8 | 20.6 | 20.4 | 20.2 | 20.1 | 19.9 | 19.7 | 19.6 | 19.4 |
| 230 | 19.2 | 19.1 | 18.9 | 18.7 | 18.6 | 18.4 | 18.3 | 18.1 | 18.0 | 17.8 |
| 240 | 17.7 | 17.5 | 17.4 | 17.2 | 17.1 | 17.0 | 16.8 | 16.7 | 16.6 | 16.4 |
| 250 | 16.3 | 16.2 | 16.1 | 15.9 | 15.8 | 15.7 | 15.6 | 15.4 | 15.3 | 15.2 |
| 260 | 15.1 | 15.0 | 14.9 | 14.8 | 14.6 | 14.5 | 14.4 | 14.3 | 14.2 | 14.1 |
| 270 | 14.0 | 13.9 | 13.8 | 13.7 | 13.6 | 13.5 | 13.4 | 13.3 | 13.2 | 13.1 |
| 280 | 13.0 | 12.9 | 12.9 | 12.8 | 12.7 | 12.6 | 12.5 | 12.4 | 12.3 | 12.2 |
| 290 | 12.2 | 12.1 | 12.0 | 11.9 | 11.8 | 11.8 | 11.7 | 11.6 | 11.5 | 11.5 |
| 300 | 11.4 | 11.3 | 11.2 | 11.2 | 11.1 | 11.0 | 10.9 | 10.9 | 10.8 | 10.7 |
| 310 | 10.7 | 10.6 | 10.5 | 10.5 | 10.4 | 10.3 | 10.3 | 10.2 | 10.1 | 10.1 |
| 320 | 10.0 | 9.9 | 9.9 | 9.8 | 9.8 | 9.7 | 9.6 | 9.6 | 9.5 | 9.5 |
| 330 | 9.4 | 9.4 | 9.3 | 9.2 | 9.2 | 9.1 | 9.1 | 9.0 | 9.0 | 8.9 |
| 340 | 8.9 | 8.8 | 8.8 | 8.7 | 8.7 | 8.6 | 8.6 | 8.5 | 8.5 | 8.4 |
| 350 | 8.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

Table 5.3

Grade 50

Material Thickness: >40 mm <=63 mm

Yield Stress: 335 N/mm2

| Used Allowable Compressive Stresses pc N/mm2 (Ref Table 17b BS449) | | | | | | | | | | |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| l/r | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 215.0 | 214.2 | 213.4 | 212.6 | 211.8 | 211.0 | 210.2 | 209.4 | 208.6 | 207.8 |
| 10 | 207.0 | 206.2 | 205.4 | 204.6 | 203.8 | 203.0 | 202.2 | 201.4 | 200.6 | 199.8 |
| 20 | 199.0 | 198.2 | 197.4 | 196.6 | 195.8 | 195.0 | 194.2 | 193.4 | 192.6 | 191.9 |
| 30 | 191.1 | 190.6 | 190.1 | 189.6 | 189.1 | 188.5 | 187.9 | 187.3 | 186.7 | 186.0 |
| 40 | 185.3 | 184.6 | 183.8 | 183.0 | 182.2 | 181.3 | 180.4 | 179.4 | 178.4 | 177.4 |
| 50 | 176.3 | 175.2 | 174.1 | 172.9 | 171.6 | 170.3 | 168.9 | 167.6 | 166.1 | 164.6 |
| 60 | 163.1 | 161.5 | 159.9 | 158.2 | 156.5 | 154.8 | 153.0 | 151.2 | 149.3 | 147.4 |
| 70 | 145.5 | 143.6 | 141.7 | 139.7 | 137.7 | 135.8 | 133.8 | 131.8 | 129.8 | 127.8 |
| 80 | 125.9 | 123.9 | 121.9 | 120.0 | 118.1 | 116.2 | 114.3 | 112.5 | 110.6 | 108.8 |
| 90 | 107.0 | 105.3 | 103.5 | 101.8 | 100.2 | 98.5 | 96.9 | 95.3 | 93.8 | 92.2 |
| 100 | 90.7 | 89.2 | 87.8 | 86.4 | 85.0 | 83.6 | 82.3 | 81.0 | 79.7 | 78.4 |
| 110 | 77.2 | 76.0 | 74.8 | 73.7 | 72.5 | 71.4 | 70.3 | 69.2 | 68.2 | 67.2 |
| 120 | 66.2 | 65.2 | 64.2 | 63.3 | 62.4 | 61.5 | 60.6 | 59.7 | 58.8 | 58.0 |
| 130 | 57.2 | 56.4 | 55.6 | 54.8 | 54.1 | 53.3 | 52.6 | 51.9 | 51.2 | 50.5 |
| 140 | 49.8 | 49.2 | 48.5 | 47.9 | 47.3 | 46.6 | 46.0 | 45.5 | 44.9 | 44.3 |
| 150 | 43.7 | 43.2 | 42.7 | 42.1 | 41.6 | 41.1 | 40.6 | 40.1 | 39.6 | 39.2 |
| 160 | 38.7 | 38.2 | 37.8 | 37.3 | 36.9 | 36.5 | 36.1 | 35.6 | 35.2 | 34.8 |
| 170 | 34.4 | 34.1 | 33.7 | 33.3 | 32.9 | 32.6 | 32.2 | 31.9 | 31.5 | 31.2 |
| 180 | 30.8 | 30.5 | 30.2 | 29.9 | 29.6 | 29.2 | 28.9 | 28.6 | 28.3 | 28.1 |
| 190 | 27.8 | 27.5 | 27.2 | 26.9 | 26.7 | 26.4 | 26.1 | 25.9 | 25.6 | 25.4 |
| 200 | 25.1 | 24.9 | 24.6 | 24.4 | 24.2 | 24.0 | 23.7 | 23.5 | 23.3 | 23.1 |
| 210 | 22.8 | 22.6 | 22.4 | 22.2 | 22.0 | 21.8 | 21.6 | 21.4 | 21.2 | 21.0 |
| 220 | 20.9 | 20.7 | 20.5 | 20.3 | 20.1 | 20.0 | 19.8 | 19.6 | 19.4 | 19.3 |
| 230 | 19.1 | 19.0 | 18.8 | 18.6 | 18.5 | 18.3 | 18.2 | 18.0 | 17.9 | 17.7 |
| 240 | 17.6 | 17.4 | 17.3 | 17.2 | 17.0 | 16.9 | 16.7 | 16.6 | 16.5 | 16.4 |
| 250 | 16.2 | 16.1 | 16.0 | 15.8 | 15.7 | 15.6 | 15.5 | 15.4 | 15.2 | 15.1 |
| 260 | 15.0 | 14.9 | 14.8 | 14.7 | 14.6 | 14.5 | 14.4 | 14.3 | 14.1 | 14.0 |
| 270 | 13.9 | 13.8 | 13.7 | 13.6 | 13.5 | 13.4 | 13.3 | 13.3 | 13.2 | 13.1 |
| 280 | 13.0 | 12.9 | 12.8 | 12.7 | 12.6 | 12.5 | 12.4 | 12.4 | 12.3 | 12.2 |
| 290 | 12.1 | 12.0 | 11.9 | 11.9 | 11.8 | 11.7 | 11.6 | 11.5 | 11.5 | 11.4 |
| 300 | 11.3 | 11.2 | 11.2 | 11.1 | 11.0 | 11.0 | 10.9 | 10.8 | 10.7 | 10.7 |
| 310 | 10.6 | 10.5 | 10.5 | 10.4 | 10.3 | 10.3 | 10.2 | 10.1 | 10.1 | 10.0 |
| 320 | 10.0 | 9.9 | 9.8 | 9.8 | 9.7 | 9.7 | 9.6 | 9.5 | 9.5 | 9.4 |
| 330 | 9.4 | 9.3 | 9.3 | 9.2 | 9.1 | 9.1 | 9.0 | 9.0 | 8.9 | 8.9 |
| 340 | 8.8 | 8.8 | 8.7 | 8.7 | 8.6 | 8.6 | 8.5 | 8.5 | 8.4 | 8.4 |
| 350 | 8.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

Table 5.4

Grade 50

Material Thickness: >63 mm ≤80 mm

Yield Stress: 325 N/mm²

| Used Allowable Compressive Stresses pc N/mm ² (Ref Table 17b BS449) | | | | | | | | | | |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| l/r | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 215.0 | 214.0 | 213.0 | 212.0 | 211.1 | 210.1 | 209.1 | 208.1 | 207.1 | 206.1 |
| 10 | 205.1 | 204.1 | 203.2 | 202.2 | 201.2 | 200.2 | 199.2 | 198.2 | 197.2 | 196.2 |
| 20 | 195.3 | 194.3 | 193.3 | 192.3 | 191.3 | 190.3 | 189.3 | 188.3 | 187.4 | 186.4 |
| 30 | 185.4 | 184.9 | 184.5 | 184.0 | 183.5 | 182.9 | 182.4 | 181.8 | 181.2 | 180.5 |
| 40 | 179.9 | 179.2 | 178.4 | 177.7 | 176.9 | 176.1 | 175.2 | 174.3 | 173.4 | 172.4 |
| 50 | 171.4 | 170.3 | 169.2 | 168.1 | 166.9 | 165.7 | 164.4 | 163.1 | 161.7 | 160.3 |
| 60 | 158.9 | 157.4 | 155.8 | 154.3 | 152.7 | 151.0 | 149.3 | 147.6 | 145.9 | 144.1 |
| 70 | 142.3 | 140.5 | 138.6 | 136.8 | 134.9 | 133.0 | 131.2 | 129.3 | 127.4 | 125.5 |
| 80 | 123.6 | 121.7 | 119.9 | 118.0 | 116.2 | 114.3 | 112.5 | 110.7 | 109.0 | 107.2 |
| 90 | 105.5 | 103.8 | 102.1 | 100.5 | 98.8 | 97.2 | 95.7 | 94.1 | 92.6 | 91.1 |
| 100 | 89.6 | 88.2 | 86.8 | 85.4 | 84.0 | 82.7 | 81.4 | 80.1 | 78.9 | 77.6 |
| 110 | 76.4 | 75.2 | 74.1 | 72.9 | 71.8 | 70.7 | 69.6 | 68.6 | 67.6 | 66.6 |
| 120 | 65.6 | 64.6 | 63.7 | 62.7 | 61.8 | 60.9 | 60.0 | 59.2 | 58.3 | 57.5 |
| 130 | 56.7 | 55.9 | 55.1 | 54.4 | 53.6 | 52.9 | 52.2 | 51.5 | 50.8 | 50.1 |
| 140 | 49.4 | 48.8 | 48.2 | 47.5 | 46.9 | 46.3 | 45.7 | 45.1 | 44.5 | 44.0 |
| 150 | 43.4 | 42.9 | 42.4 | 41.8 | 41.3 | 40.8 | 40.3 | 39.8 | 39.4 | 38.9 |
| 160 | 38.4 | 38.0 | 37.5 | 37.1 | 36.7 | 36.2 | 35.8 | 35.4 | 35.0 | 34.6 |
| 170 | 34.2 | 33.8 | 33.5 | 33.1 | 32.7 | 32.4 | 32.0 | 31.7 | 31.3 | 31.0 |
| 180 | 30.6 | 30.3 | 30.0 | 29.7 | 29.4 | 29.1 | 28.8 | 28.5 | 28.2 | 27.9 |
| 190 | 27.6 | 27.3 | 27.0 | 26.8 | 26.5 | 26.2 | 26.0 | 25.7 | 25.5 | 25.2 |
| 200 | 25.0 | 24.7 | 24.5 | 24.3 | 24.0 | 23.8 | 23.6 | 23.4 | 23.1 | 22.9 |
| 210 | 22.7 | 22.5 | 22.3 | 22.1 | 21.9 | 21.7 | 21.5 | 21.3 | 21.1 | 20.9 |
| 220 | 20.7 | 20.6 | 20.4 | 20.2 | 20.0 | 19.8 | 19.7 | 19.5 | 19.3 | 19.2 |
| 230 | 19.0 | 18.8 | 18.7 | 18.5 | 18.4 | 18.2 | 18.1 | 17.9 | 17.8 | 17.6 |
| 240 | 17.5 | 17.3 | 17.2 | 17.1 | 16.9 | 16.8 | 16.7 | 16.5 | 16.4 | 16.3 |
| 250 | 16.1 | 16.0 | 15.9 | 15.8 | 15.6 | 15.5 | 15.4 | 15.3 | 15.2 | 15.0 |
| 260 | 14.9 | 14.8 | 14.7 | 14.6 | 14.5 | 14.4 | 14.3 | 14.2 | 14.1 | 14.0 |
| 270 | 13.9 | 13.8 | 13.7 | 13.6 | 13.5 | 13.4 | 13.3 | 13.2 | 13.1 | 13.0 |
| 280 | 12.9 | 12.8 | 12.7 | 12.6 | 12.5 | 12.5 | 12.4 | 12.3 | 12.2 | 12.1 |
| 290 | 12.0 | 12.0 | 11.9 | 11.8 | 11.7 | 11.6 | 11.6 | 11.5 | 11.4 | 11.3 |
| 300 | 11.3 | 11.2 | 11.1 | 11.0 | 11.0 | 10.9 | 10.8 | 10.8 | 10.7 | 10.6 |
| 310 | 10.6 | 10.5 | 10.4 | 10.4 | 10.3 | 10.2 | 10.2 | 10.1 | 10.0 | 10.0 |
| 320 | 9.9 | 9.8 | 9.8 | 9.7 | 9.7 | 9.6 | 9.5 | 9.5 | 9.4 | 9.4 |
| 330 | 9.3 | 9.3 | 9.2 | 9.2 | 9.1 | 9.0 | 9.0 | 8.9 | 8.9 | 8.8 |
| 340 | 8.8 | 8.7 | 8.7 | 8.6 | 8.6 | 8.5 | 8.5 | 8.4 | 8.4 | 8.3 |
| 350 | 8.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

Table 5.5

Grade 50

Material Thickness: >80 mm <=100 mm

Yield Stress: 315 N/mm2

| Used Allowable Compressive Stresses pc N/mm2 (Ref Table 17b BS449) | | | | | | | | | | |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| l/r | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 215.0 | 213.8 | 212.6 | 211.5 | 210.3 | 209.1 | 207.9 | 206.8 | 205.6 | 204.4 |
| 10 | 203.2 | 202.1 | 200.9 | 199.7 | 198.5 | 197.4 | 196.2 | 195.0 | 193.8 | 192.6 |
| 20 | 191.5 | 190.3 | 189.1 | 187.9 | 186.8 | 185.6 | 184.4 | 183.2 | 182.1 | 180.9 |
| 30 | 179.7 | 179.3 | 178.8 | 178.4 | 177.9 | 177.4 | 176.8 | 176.3 | 175.7 | 175.1 |
| 40 | 174.4 | 173.8 | 173.1 | 172.4 | 171.6 | 170.8 | 170.0 | 169.1 | 168.2 | 167.3 |
| 50 | 166.4 | 165.4 | 164.3 | 163.2 | 162.1 | 161.0 | 159.8 | 158.5 | 157.3 | 155.9 |
| 60 | 154.6 | 153.2 | 151.7 | 150.3 | 148.8 | 147.2 | 145.6 | 144.0 | 142.4 | 140.7 |
| 70 | 139.0 | 137.3 | 135.5 | 133.8 | 132.0 | 130.2 | 128.4 | 126.6 | 124.8 | 123.0 |
| 80 | 121.3 | 119.5 | 117.7 | 115.9 | 114.1 | 112.4 | 110.6 | 108.9 | 107.2 | 105.5 |
| 90 | 103.9 | 102.2 | 100.6 | 99.0 | 97.4 | 95.9 | 94.3 | 92.8 | 91.4 | 89.9 |
| 100 | 88.5 | 87.1 | 85.7 | 84.4 | 83.0 | 81.7 | 80.4 | 79.2 | 78.0 | 76.8 |
| 110 | 75.6 | 74.4 | 73.3 | 72.2 | 71.1 | 70.0 | 68.9 | 67.9 | 66.9 | 65.9 |
| 120 | 64.9 | 64.0 | 63.0 | 62.1 | 61.2 | 60.4 | 59.5 | 58.7 | 57.8 | 57.0 |
| 130 | 56.2 | 55.4 | 54.7 | 53.9 | 53.2 | 52.5 | 51.7 | 51.0 | 50.4 | 49.7 |
| 140 | 49.0 | 48.4 | 47.8 | 47.1 | 46.5 | 45.9 | 45.3 | 44.8 | 44.2 | 43.6 |
| 150 | 43.1 | 42.6 | 42.0 | 41.5 | 41.0 | 40.5 | 40.0 | 39.5 | 39.1 | 38.6 |
| 160 | 38.1 | 37.7 | 37.3 | 36.8 | 36.4 | 36.0 | 35.6 | 35.2 | 34.8 | 34.4 |
| 170 | 34.0 | 33.6 | 33.2 | 32.9 | 32.5 | 32.1 | 31.8 | 31.4 | 31.1 | 30.8 |
| 180 | 30.4 | 30.1 | 29.8 | 29.5 | 29.2 | 28.9 | 28.6 | 28.3 | 28.0 | 27.7 |
| 190 | 27.4 | 27.1 | 26.9 | 26.6 | 26.3 | 26.1 | 25.8 | 25.6 | 25.3 | 25.1 |
| 200 | 24.8 | 24.6 | 24.3 | 24.1 | 23.9 | 23.7 | 23.4 | 23.2 | 23.0 | 22.8 |
| 210 | 22.6 | 22.4 | 22.2 | 22.0 | 21.8 | 21.6 | 21.4 | 21.2 | 21.0 | 20.8 |
| 220 | 20.6 | 20.4 | 20.3 | 20.1 | 19.9 | 19.7 | 19.6 | 19.4 | 19.2 | 19.1 |
| 230 | 18.9 | 18.7 | 18.6 | 18.4 | 18.3 | 18.1 | 18.0 | 17.8 | 17.7 | 17.5 |
| 240 | 17.4 | 17.2 | 17.1 | 17.0 | 16.8 | 16.7 | 16.6 | 16.4 | 16.3 | 16.2 |
| 250 | 16.0 | 15.9 | 15.8 | 15.7 | 15.5 | 15.4 | 15.3 | 15.2 | 15.1 | 15.0 |
| 260 | 14.8 | 14.7 | 14.6 | 14.5 | 14.4 | 14.3 | 14.2 | 14.1 | 14.0 | 13.9 |
| 270 | 13.8 | 13.7 | 13.6 | 13.5 | 13.4 | 13.3 | 13.2 | 13.1 | 13.0 | 12.9 |
| 280 | 12.8 | 12.7 | 12.7 | 12.6 | 12.5 | 12.4 | 12.3 | 12.2 | 12.1 | 12.1 |
| 290 | 12.0 | 11.9 | 11.8 | 11.7 | 11.7 | 11.6 | 11.5 | 11.4 | 11.3 | 11.3 |
| 300 | 11.2 | 11.1 | 11.0 | 11.0 | 10.9 | 10.8 | 10.8 | 10.7 | 10.6 | 10.6 |
| 310 | 10.5 | 10.4 | 10.4 | 10.3 | 10.2 | 10.2 | 10.1 | 10.0 | 10.0 | 9.9 |
| 320 | 9.9 | 9.8 | 9.7 | 9.7 | 9.6 | 9.6 | 9.5 | 9.4 | 9.4 | 9.3 |
| 330 | 9.3 | 9.2 | 9.2 | 9.1 | 9.1 | 9.0 | 8.9 | 8.9 | 8.8 | 8.8 |
| 340 | 8.7 | 8.7 | 8.6 | 8.6 | 8.5 | 8.5 | 8.4 | 8.4 | 8.3 | 8.3 |
| 350 | 8.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

Table 5.6**Grade 50****Material Thickness: >100 mm <=150 mm****Yield Stress: 295 N/mm2**

| Used Allowable Compressive Stresses pc N/mm2 (Ref Table 17b BS449) | | | | | | | | | | |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| l/r | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 215.0 | 213.4 | 211.9 | 210.3 | 208.8 | 207.2 | 205.7 | 204.1 | 202.6 | 201.0 |
| 10 | 199.4 | 197.9 | 196.3 | 194.8 | 193.2 | 191.7 | 190.1 | 188.6 | 187.0 | 185.4 |
| 20 | 183.9 | 182.3 | 180.8 | 179.2 | 177.7 | 176.1 | 174.6 | 173.0 | 171.5 | 169.9 |
| 30 | 168.3 | 167.9 | 167.5 | 167.1 | 166.7 | 166.2 | 165.7 | 165.2 | 164.7 | 164.1 |
| 40 | 163.5 | 162.9 | 162.3 | 161.7 | 161.0 | 160.3 | 159.5 | 158.8 | 158.0 | 157.1 |
| 50 | 156.3 | 155.4 | 154.5 | 153.5 | 152.5 | 151.5 | 150.4 | 149.3 | 148.2 | 147.1 |
| 60 | 145.9 | 144.6 | 143.4 | 142.1 | 140.7 | 139.4 | 138.0 | 136.5 | 135.1 | 133.6 |
| 70 | 132.1 | 130.6 | 129.1 | 127.5 | 125.9 | 124.3 | 122.7 | 121.1 | 119.5 | 117.9 |
| 80 | 116.3 | 114.6 | 113.0 | 111.4 | 109.8 | 108.2 | 106.6 | 105.0 | 103.4 | 101.9 |
| 90 | 100.4 | 98.8 | 97.3 | 95.8 | 94.4 | 92.9 | 91.5 | 90.1 | 88.7 | 87.3 |
| 100 | 86.0 | 84.7 | 83.4 | 82.1 | 80.8 | 79.6 | 78.4 | 77.2 | 76.0 | 74.9 |
| 110 | 73.7 | 72.6 | 71.5 | 70.5 | 69.4 | 68.4 | 67.4 | 66.4 | 65.4 | 64.5 |
| 120 | 63.5 | 62.6 | 61.7 | 60.8 | 60.0 | 59.1 | 58.3 | 57.5 | 56.7 | 55.9 |
| 130 | 55.1 | 54.4 | 53.6 | 52.9 | 52.2 | 51.5 | 50.8 | 50.1 | 49.4 | 48.8 |
| 140 | 48.2 | 47.5 | 46.9 | 46.3 | 45.7 | 45.1 | 44.6 | 44.0 | 43.4 | 42.9 |
| 150 | 42.4 | 41.8 | 41.3 | 40.8 | 40.3 | 39.8 | 39.4 | 38.9 | 38.4 | 38.0 |
| 160 | 37.5 | 37.1 | 36.7 | 36.2 | 35.8 | 35.4 | 35.0 | 34.6 | 34.2 | 33.8 |
| 170 | 33.5 | 33.1 | 32.7 | 32.4 | 32.0 | 31.7 | 31.3 | 31.0 | 30.6 | 30.3 |
| 180 | 30.0 | 29.7 | 29.4 | 29.1 | 28.7 | 28.5 | 28.2 | 27.9 | 27.6 | 27.3 |
| 190 | 27.0 | 26.8 | 26.5 | 26.2 | 26.0 | 25.7 | 25.5 | 25.2 | 25.0 | 24.7 |
| 200 | 24.5 | 24.2 | 24.0 | 23.8 | 23.6 | 23.3 | 23.1 | 22.9 | 22.7 | 22.5 |
| 210 | 22.3 | 22.1 | 21.9 | 21.7 | 21.5 | 21.3 | 21.1 | 20.9 | 20.7 | 20.5 |
| 220 | 20.3 | 20.2 | 20.0 | 19.8 | 19.6 | 19.5 | 19.3 | 19.1 | 19.0 | 18.8 |
| 230 | 18.6 | 18.5 | 18.3 | 18.2 | 18.0 | 17.9 | 17.7 | 17.6 | 17.4 | 17.3 |
| 240 | 17.2 | 17.0 | 16.9 | 16.7 | 16.6 | 16.5 | 16.3 | 16.2 | 16.1 | 16.0 |
| 250 | 15.8 | 15.7 | 15.6 | 15.5 | 15.3 | 15.2 | 15.1 | 15.0 | 14.9 | 14.8 |
| 260 | 14.7 | 14.5 | 14.4 | 14.3 | 14.2 | 14.1 | 14.0 | 13.9 | 13.8 | 13.7 |
| 270 | 13.6 | 13.5 | 13.4 | 13.3 | 13.2 | 13.1 | 13.0 | 12.9 | 12.9 | 12.8 |
| 280 | 12.7 | 12.6 | 12.5 | 12.4 | 12.3 | 12.2 | 12.2 | 12.1 | 12.0 | 11.9 |
| 290 | 11.8 | 11.7 | 11.7 | 11.6 | 11.5 | 11.4 | 11.4 | 11.3 | 11.2 | 11.1 |
| 300 | 11.1 | 11.0 | 10.9 | 10.8 | 10.8 | 10.7 | 10.6 | 10.6 | 10.5 | 10.4 |
| 310 | 10.4 | 10.3 | 10.2 | 10.2 | 10.1 | 10.0 | 10.0 | 9.9 | 9.9 | 9.8 |
| 320 | 9.7 | 9.7 | 9.6 | 9.6 | 9.5 | 9.4 | 9.4 | 9.3 | 9.3 | 9.2 |
| 330 | 9.2 | 9.1 | 9.0 | 9.0 | 8.9 | 8.9 | 8.8 | 8.8 | 8.7 | 8.7 |
| 340 | 8.6 | 8.6 | 8.5 | 8.5 | 8.4 | 8.4 | 8.3 | 8.3 | 8.2 | 8.2 |
| 350 | 8.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

Table 6.1

Grade 55

Material Thickness: >0 mm <=16 mm

**Yield Stress: 450
N/mm2**

| Used Allowable Compressive Stresses pc N/mm2 (Ref Table 17c BS449) | | | | | | | | | | |
|---|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| <i>l/r</i> | <i>0</i> | <i>1</i> | <i>2</i> | <i>3</i> | <i>4</i> | <i>5</i> | <i>6</i> | <i>7</i> | <i>8</i> | <i>9</i> |
| <i>0</i> | 265.0 | 264.7 | 264.4 | 264.1 | 263.8 | 263.5 | 263.2 | 262.9 | 262.6 | 262.4 |
| <i>10</i> | 262.1 | 261.8 | 261.5 | 261.2 | 260.9 | 260.6 | 260.3 | 260.0 | 259.7 | 259.4 |
| <i>20</i> | 259.1 | 258.8 | 258.5 | 258.2 | 257.9 | 257.6 | 257.4 | 257.1 | 256.8 | 256.5 |
| <i>30</i> | 256.2 | 255.5 | 254.7 | 254.0 | 253.2 | 252.3 | 251.4 | 250.4 | 249.4 | 248.3 |
| <i>40</i> | 247.1 | 245.9 | 244.7 | 243.3 | 241.9 | 240.4 | 238.8 | 237.1 | 235.4 | 233.6 |
| <i>50</i> | 231.6 | 229.6 | 227.5 | 225.2 | 222.9 | 220.5 | 218.0 | 215.4 | 212.7 | 210.0 |
| <i>60</i> | 207.1 | 204.2 | 201.2 | 198.2 | 195.1 | 192.0 | 188.8 | 185.7 | 182.5 | 179.3 |
| <i>70</i> | 176.1 | 172.9 | 169.8 | 166.6 | 163.5 | 160.5 | 157.4 | 154.4 | 151.5 | 148.6 |
| <i>80</i> | 145.7 | 142.9 | 140.2 | 137.5 | 134.8 | 132.2 | 129.7 | 127.2 | 124.8 | 122.4 |
| <i>90</i> | 120.1 | 117.9 | 115.7 | 113.5 | 111.4 | 109.3 | 107.3 | 105.4 | 103.5 | 101.6 |
| <i>100</i> | 99.8 | 98.0 | 96.3 | 94.6 | 92.9 | 91.3 | 89.7 | 88.2 | 86.7 | 85.2 |
| <i>110</i> | 83.8 | 82.4 | 81.1 | 79.7 | 78.4 | 77.1 | 75.9 | 74.7 | 73.5 | 72.3 |
| <i>120</i> | 71.2 | 70.1 | 69.0 | 68.0 | 66.9 | 65.9 | 64.9 | 63.9 | 63.0 | 62.1 |
| <i>130</i> | 61.2 | 60.3 | 59.4 | 58.5 | 57.7 | 56.9 | 56.1 | 55.3 | 54.5 | 53.8 |
| <i>140</i> | 53.0 | 52.3 | 51.6 | 50.9 | 50.2 | 49.6 | 48.9 | 48.3 | 47.6 | 47.0 |
| <i>150</i> | 46.4 | 45.8 | 45.2 | 44.7 | 44.1 | 43.5 | 43.0 | 42.5 | 41.9 | 41.4 |
| <i>160</i> | 40.9 | 40.4 | 40.0 | 39.5 | 39.0 | 38.5 | 38.1 | 37.7 | 37.2 | 36.8 |
| <i>170</i> | 36.4 | 35.9 | 35.5 | 35.1 | 34.7 | 34.4 | 34.0 | 33.6 | 33.2 | 32.9 |
| <i>180</i> | 32.5 | 32.2 | 31.8 | 31.5 | 31.1 | 30.8 | 30.5 | 30.2 | 29.8 | 29.5 |
| <i>190</i> | 29.2 | 28.9 | 28.6 | 28.3 | 28.1 | 27.8 | 27.5 | 27.2 | 27.0 | 26.7 |
| <i>200</i> | 26.4 | 26.2 | 25.9 | 25.7 | 25.4 | 25.2 | 24.9 | 24.7 | 24.5 | 24.2 |
| <i>210</i> | 24.0 | 23.8 | 23.6 | 23.3 | 23.1 | 22.9 | 22.7 | 22.5 | 22.3 | 22.1 |
| <i>220</i> | 21.9 | 21.7 | 21.5 | 21.3 | 21.1 | 20.9 | 20.8 | 20.6 | 20.4 | 20.2 |
| <i>230</i> | 20.0 | 19.9 | 19.7 | 19.5 | 19.4 | 19.2 | 19.1 | 18.9 | 18.7 | 18.6 |
| <i>240</i> | 18.4 | 18.3 | 18.1 | 18.0 | 17.8 | 17.7 | 17.5 | 17.4 | 17.3 | 17.1 |
| <i>250</i> | 17.0 | 16.9 | 16.7 | 16.6 | 16.5 | 16.3 | 16.2 | 16.1 | 16.0 | 15.8 |
| <i>260</i> | 15.7 | 15.6 | 15.5 | 15.4 | 15.3 | 15.1 | 15.0 | 14.9 | 14.8 | 14.7 |
| <i>270</i> | 14.6 | 14.5 | 14.4 | 14.3 | 14.2 | 14.1 | 14.0 | 13.9 | 13.8 | 13.7 |
| <i>280</i> | 13.6 | 13.5 | 13.4 | 13.3 | 13.2 | 13.1 | 13.0 | 12.9 | 12.8 | 12.7 |
| <i>290</i> | 12.7 | 12.6 | 12.5 | 12.4 | 12.3 | 12.2 | 12.2 | 12.1 | 12.0 | 11.9 |
| <i>300</i> | 11.8 | 11.8 | 11.7 | 11.6 | 11.5 | 11.5 | 11.4 | 11.3 | 11.2 | 11.2 |
| <i>310</i> | 11.1 | 11.0 | 10.9 | 10.9 | 10.8 | 10.7 | 10.7 | 10.6 | 10.5 | 10.5 |
| <i>320</i> | 10.4 | 10.3 | 10.3 | 10.2 | 10.2 | 10.1 | 10.0 | 10.0 | 9.9 | 9.9 |
| <i>330</i> | 9.8 | 9.7 | 9.7 | 9.6 | 9.6 | 9.5 | 9.4 | 9.4 | 9.3 | 9.3 |
| <i>340</i> | 9.2 | 9.2 | 9.1 | 9.1 | 9.0 | 9.0 | 8.9 | 8.9 | 8.8 | 8.8 |
| <i>350</i> | 8.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

Table 6.2

Grade 55

Material Thickness: >16 mm <=25 mm

Yield Stress: 430 N/mm²

| Used Allowable Compressive Stresses pc N/mm ² (Ref Table 17c BS449) | | | | | | | | | | |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| l/r | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 265.0 | 264.3 | 263.7 | 263.0 | 262.3 | 261.6 | 261.0 | 260.3 | 259.6 | 259.0 |
| 10 | 258.3 | 257.6 | 256.9 | 256.3 | 255.6 | 254.9 | 254.3 | 253.6 | 252.9 | 252.3 |
| 20 | 251.6 | 250.9 | 250.2 | 249.6 | 248.9 | 248.2 | 247.6 | 246.9 | 246.2 | 245.5 |
| 30 | 244.9 | 244.2 | 243.5 | 242.8 | 242.0 | 241.2 | 240.4 | 239.5 | 238.5 | 237.5 |
| 40 | 236.5 | 235.4 | 234.2 | 233.0 | 231.7 | 230.3 | 228.8 | 227.3 | 225.7 | 224.1 |
| 50 | 222.3 | 220.5 | 218.5 | 216.5 | 214.4 | 212.3 | 210.0 | 207.6 | 205.2 | 202.7 |
| 60 | 200.1 | 197.5 | 194.8 | 192.0 | 189.2 | 186.3 | 183.4 | 180.5 | 177.5 | 174.6 |
| 70 | 171.6 | 168.7 | 165.7 | 162.8 | 159.8 | 156.9 | 154.1 | 151.2 | 148.4 | 145.7 |
| 80 | 143.0 | 140.3 | 137.6 | 135.1 | 132.5 | 130.0 | 127.6 | 125.2 | 122.9 | 120.6 |
| 90 | 118.4 | 116.2 | 114.0 | 111.9 | 109.9 | 107.9 | 105.9 | 104.0 | 102.2 | 100.3 |
| 100 | 98.6 | 96.8 | 95.1 | 93.5 | 91.9 | 90.3 | 88.7 | 87.2 | 85.8 | 84.3 |
| 110 | 82.9 | 81.5 | 80.2 | 78.9 | 77.6 | 76.4 | 75.1 | 74.0 | 72.8 | 71.6 |
| 120 | 70.5 | 69.4 | 68.4 | 67.3 | 66.3 | 65.3 | 64.3 | 63.4 | 62.4 | 61.5 |
| 130 | 60.6 | 59.7 | 58.9 | 58.0 | 57.2 | 56.4 | 55.6 | 54.8 | 54.1 | 53.3 |
| 140 | 52.6 | 51.9 | 51.2 | 50.5 | 49.8 | 49.2 | 48.5 | 47.9 | 47.3 | 46.6 |
| 150 | 46.0 | 45.5 | 44.9 | 44.3 | 43.8 | 43.2 | 42.7 | 42.1 | 41.6 | 41.1 |
| 160 | 40.6 | 40.1 | 39.7 | 39.2 | 38.7 | 38.3 | 37.8 | 37.4 | 36.9 | 36.5 |
| 170 | 36.1 | 35.7 | 35.3 | 34.9 | 34.5 | 34.1 | 33.7 | 33.4 | 33.0 | 32.6 |
| 180 | 32.3 | 31.9 | 31.6 | 31.2 | 30.9 | 30.6 | 30.3 | 30.0 | 29.6 | 29.3 |
| 190 | 29.0 | 28.7 | 28.4 | 28.2 | 27.9 | 27.6 | 27.3 | 27.0 | 26.8 | 26.5 |
| 200 | 26.2 | 26.0 | 25.7 | 25.5 | 25.2 | 25.0 | 24.8 | 24.5 | 24.3 | 24.1 |
| 210 | 23.8 | 23.6 | 23.4 | 23.2 | 23.0 | 22.8 | 22.6 | 22.3 | 22.1 | 21.9 |
| 220 | 21.7 | 21.6 | 21.4 | 21.2 | 21.0 | 20.8 | 20.6 | 20.4 | 20.3 | 20.1 |
| 230 | 19.9 | 19.8 | 19.6 | 19.4 | 19.3 | 19.1 | 18.9 | 18.8 | 18.6 | 18.5 |
| 240 | 18.3 | 18.2 | 18.0 | 17.9 | 17.7 | 17.6 | 17.4 | 17.3 | 17.2 | 17.0 |
| 250 | 16.9 | 16.8 | 16.6 | 16.5 | 16.4 | 16.2 | 16.1 | 16.0 | 15.9 | 15.7 |
| 260 | 15.6 | 15.5 | 15.4 | 15.3 | 15.2 | 15.0 | 14.9 | 14.8 | 14.7 | 14.6 |
| 270 | 14.5 | 14.4 | 14.3 | 14.2 | 14.1 | 14.0 | 13.9 | 13.8 | 13.7 | 13.6 |
| 280 | 13.5 | 13.4 | 13.3 | 13.2 | 13.1 | 13.0 | 12.9 | 12.8 | 12.8 | 12.7 |
| 290 | 12.6 | 12.5 | 12.4 | 12.3 | 12.2 | 12.2 | 12.1 | 12.0 | 11.9 | 11.8 |
| 300 | 11.8 | 11.7 | 11.6 | 11.5 | 11.5 | 11.4 | 11.3 | 11.2 | 11.2 | 11.1 |
| 310 | 11.0 | 11.0 | 10.9 | 10.8 | 10.7 | 10.7 | 10.6 | 10.5 | 10.5 | 10.4 |
| 320 | 10.3 | 10.3 | 10.2 | 10.2 | 10.1 | 10.0 | 10.0 | 9.9 | 9.9 | 9.8 |
| 330 | 9.7 | 9.7 | 9.6 | 9.6 | 9.5 | 9.4 | 9.4 | 9.3 | 9.3 | 9.2 |
| 340 | 9.2 | 9.1 | 9.1 | 9.0 | 9.0 | 8.9 | 8.9 | 8.8 | 8.8 | 8.7 |
| 350 | 8.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

Table 6.3

Grade 55

Material Thickness: >25 mm <=63 mm

Yield Stress: 400 N/mm²

| Used Allowable Compressive Stresses pc N/mm ² (Ref Table 17c BS449) | | | | | | | | | | |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| l/r | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 265.0 | 263.8 | 262.5 | 261.3 | 260.1 | 258.8 | 257.6 | 256.3 | 255.1 | 253.9 |
| 10 | 252.6 | 251.4 | 250.2 | 248.9 | 247.7 | 246.4 | 245.2 | 244.0 | 242.7 | 241.5 |
| 20 | 240.3 | 239.0 | 237.8 | 236.6 | 235.3 | 234.1 | 232.8 | 231.6 | 230.4 | 229.1 |
| 30 | 227.9 | 227.3 | 226.7 | 226.0 | 225.4 | 224.6 | 223.9 | 223.1 | 222.2 | 221.3 |
| 40 | 220.4 | 219.4 | 218.4 | 217.3 | 216.2 | 215.0 | 213.7 | 212.4 | 211.0 | 209.6 |
| 50 | 208.1 | 206.5 | 204.8 | 203.1 | 201.3 | 199.5 | 197.5 | 195.5 | 193.4 | 191.3 |
| 60 | 189.1 | 186.8 | 184.5 | 182.1 | 179.6 | 177.1 | 174.6 | 172.1 | 169.5 | 166.9 |
| 70 | 164.3 | 161.6 | 159.0 | 156.3 | 153.7 | 151.1 | 148.5 | 145.9 | 143.4 | 140.8 |
| 80 | 138.3 | 135.9 | 133.4 | 131.0 | 128.7 | 126.3 | 124.1 | 121.8 | 119.6 | 117.5 |
| 90 | 115.3 | 113.3 | 111.2 | 109.3 | 107.3 | 105.4 | 103.5 | 101.7 | 99.9 | 98.2 |
| 100 | 96.5 | 94.8 | 93.2 | 91.6 | 90.0 | 88.5 | 87.0 | 85.6 | 84.2 | 82.8 |
| 110 | 81.4 | 80.1 | 78.8 | 77.5 | 76.3 | 75.1 | 73.9 | 72.7 | 71.6 | 70.5 |
| 120 | 69.4 | 68.3 | 67.3 | 66.3 | 65.3 | 64.3 | 63.3 | 62.4 | 61.5 | 60.6 |
| 130 | 59.7 | 58.8 | 58.0 | 57.2 | 56.4 | 55.6 | 54.8 | 54.1 | 53.3 | 52.6 |
| 140 | 51.9 | 51.2 | 50.5 | 49.8 | 49.1 | 48.5 | 47.9 | 47.2 | 46.6 | 46.0 |
| 150 | 45.4 | 44.9 | 44.3 | 43.7 | 43.2 | 42.6 | 42.1 | 41.6 | 41.1 | 40.6 |
| 160 | 40.1 | 39.6 | 39.2 | 38.7 | 38.2 | 37.8 | 37.3 | 36.9 | 36.5 | 36.1 |
| 170 | 35.7 | 35.2 | 34.9 | 34.5 | 34.1 | 33.7 | 33.3 | 33.0 | 32.6 | 32.2 |
| 180 | 31.9 | 31.6 | 31.2 | 30.9 | 30.6 | 30.2 | 29.9 | 29.6 | 29.3 | 29.0 |
| 190 | 28.7 | 28.4 | 28.1 | 27.8 | 27.5 | 27.3 | 27.0 | 26.7 | 26.5 | 26.2 |
| 200 | 25.9 | 25.7 | 25.4 | 25.2 | 25.0 | 24.7 | 24.5 | 24.3 | 24.0 | 23.8 |
| 210 | 23.6 | 23.4 | 23.1 | 22.9 | 22.7 | 22.5 | 22.3 | 22.1 | 21.9 | 21.7 |
| 220 | 21.5 | 21.3 | 21.1 | 20.9 | 20.8 | 20.6 | 20.4 | 20.2 | 20.0 | 19.9 |
| 230 | 19.7 | 19.5 | 19.4 | 19.2 | 19.0 | 18.9 | 18.7 | 18.6 | 18.4 | 18.3 |
| 240 | 18.1 | 18.0 | 17.8 | 17.7 | 17.5 | 17.4 | 17.3 | 17.1 | 17.0 | 16.8 |
| 250 | 16.7 | 16.6 | 16.4 | 16.3 | 16.2 | 16.1 | 15.9 | 15.8 | 15.7 | 15.6 |
| 260 | 15.5 | 15.3 | 15.2 | 15.1 | 15.0 | 14.9 | 14.8 | 14.7 | 14.6 | 14.5 |
| 270 | 14.3 | 14.2 | 14.1 | 14.0 | 13.9 | 13.8 | 13.7 | 13.6 | 13.5 | 13.4 |
| 280 | 13.4 | 13.3 | 13.2 | 13.1 | 13.0 | 12.9 | 12.8 | 12.7 | 12.6 | 12.5 |
| 290 | 12.5 | 12.4 | 12.3 | 12.2 | 12.1 | 12.0 | 12.0 | 11.9 | 11.8 | 11.7 |
| 300 | 11.6 | 11.6 | 11.5 | 11.4 | 11.3 | 11.3 | 11.2 | 11.1 | 11.0 | 11.0 |
| 310 | 10.9 | 10.8 | 10.8 | 10.7 | 10.6 | 10.6 | 10.5 | 10.4 | 10.4 | 10.3 |
| 320 | 10.2 | 10.2 | 10.1 | 10.1 | 10.0 | 9.9 | 9.9 | 9.8 | 9.8 | 9.7 |
| 330 | 9.6 | 9.6 | 9.5 | 9.5 | 9.4 | 9.4 | 9.3 | 9.2 | 9.2 | 9.1 |
| 340 | 9.1 | 9.0 | 9.0 | 8.9 | 8.9 | 8.8 | 8.8 | 8.7 | 8.7 | 8.6 |
| 350 | 8.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

Table 7.1

Grade 43 Old Pre 89 Material Thickness: >0 mm <=40 mm Yield Stress: 250 N/mm2

| Used Allowable Compressive Stresses pc N/mm2 (Ref Table 17a BS449) | | | | | | | | | | |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| l/r | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 155.0 | 154.6 | 154.2 | 153.8 | 153.4 | 153.0 | 152.6 | 152.1 | 151.7 | 151.3 |
| 10 | 150.9 | 150.5 | 150.1 | 149.7 | 149.3 | 148.9 | 148.5 | 148.1 | 147.7 | 147.2 |
| 20 | 146.8 | 146.4 | 146.0 | 145.6 | 145.2 | 144.8 | 144.4 | 144.0 | 143.6 | 143.2 |
| 30 | 142.8 | 142.4 | 142.1 | 141.8 | 141.4 | 141.0 | 140.6 | 140.2 | 139.8 | 139.4 |
| 40 | 138.9 | 138.4 | 137.9 | 137.4 | 136.9 | 136.4 | 135.8 | 135.2 | 134.6 | 134.0 |
| 50 | 133.3 | 132.6 | 131.9 | 131.2 | 130.5 | 129.7 | 128.9 | 128.1 | 127.3 | 126.4 |
| 60 | 125.5 | 124.6 | 123.7 | 122.7 | 121.7 | 120.7 | 119.7 | 118.7 | 117.6 | 116.5 |
| 70 | 115.4 | 114.3 | 113.1 | 112.0 | 110.8 | 109.6 | 108.4 | 107.2 | 106.0 | 104.8 |
| 80 | 103.5 | 102.3 | 101.0 | 99.8 | 98.5 | 97.3 | 96.0 | 94.8 | 93.5 | 92.3 |
| 90 | 91.1 | 89.8 | 88.6 | 87.4 | 86.2 | 85.0 | 83.8 | 82.6 | 81.5 | 80.3 |
| 100 | 79.2 | 78.1 | 77.0 | 75.9 | 74.8 | 73.8 | 72.7 | 71.7 | 70.7 | 69.7 |
| 110 | 68.7 | 67.7 | 66.8 | 65.8 | 64.9 | 64.0 | 63.1 | 62.2 | 61.4 | 60.5 |
| 120 | 59.7 | 58.9 | 58.1 | 57.3 | 56.5 | 55.7 | 55.0 | 54.2 | 53.5 | 52.8 |
| 130 | 52.1 | 51.4 | 50.7 | 50.1 | 49.4 | 48.8 | 48.1 | 47.5 | 46.9 | 46.3 |
| 140 | 45.7 | 45.1 | 44.6 | 44.0 | 43.5 | 42.9 | 42.4 | 41.9 | 41.4 | 40.8 |
| 150 | 40.4 | 39.9 | 39.4 | 38.9 | 38.5 | 38.0 | 37.6 | 37.1 | 36.7 | 36.3 |
| 160 | 35.8 | 35.4 | 35.0 | 34.6 | 34.2 | 33.8 | 33.5 | 33.1 | 32.7 | 32.4 |
| 170 | 32.0 | 31.7 | 31.3 | 31.0 | 30.6 | 30.3 | 30.0 | 29.7 | 29.4 | 29.0 |
| 180 | 28.7 | 28.4 | 28.1 | 27.9 | 27.6 | 27.3 | 27.0 | 26.7 | 26.5 | 26.2 |
| 190 | 25.9 | 25.7 | 25.4 | 25.2 | 24.9 | 24.7 | 24.4 | 24.2 | 24.0 | 23.7 |
| 200 | 23.5 | 23.3 | 23.1 | 22.9 | 22.6 | 22.4 | 22.2 | 22.0 | 21.8 | 21.6 |
| 210 | 21.4 | 21.2 | 21.0 | 20.8 | 20.6 | 20.5 | 20.3 | 20.1 | 19.9 | 19.7 |
| 220 | 19.6 | 19.4 | 19.2 | 19.1 | 18.9 | 18.7 | 18.6 | 18.4 | 18.3 | 18.1 |
| 230 | 18.0 | 17.8 | 17.7 | 17.5 | 17.4 | 17.2 | 17.1 | 16.9 | 16.8 | 16.7 |
| 240 | 16.5 | 16.4 | 16.3 | 16.1 | 16.0 | 15.9 | 15.8 | 15.6 | 15.5 | 15.4 |
| 250 | 15.3 | 15.2 | 15.0 | 14.9 | 14.8 | 14.7 | 14.6 | 14.5 | 14.4 | 14.3 |
| 260 | 14.1 | 14.0 | 13.9 | 13.8 | 13.7 | 13.6 | 13.5 | 13.4 | 13.3 | 13.2 |
| 270 | 13.1 | 13.0 | 12.9 | 12.9 | 12.8 | 12.7 | 12.6 | 12.5 | 12.4 | 12.3 |
| 280 | 12.2 | 12.1 | 12.1 | 12.0 | 11.9 | 11.8 | 11.7 | 11.7 | 11.6 | 11.5 |
| 290 | 11.4 | 11.3 | 11.3 | 11.2 | 11.1 | 11.0 | 11.0 | 10.9 | 10.8 | 10.8 |
| 300 | 10.7 | 10.6 | 10.5 | 10.5 | 10.4 | 10.3 | 10.3 | 10.2 | 10.1 | 10.1 |
| 310 | 10.0 | 10.0 | 9.9 | 9.8 | 9.8 | 9.7 | 9.6 | 9.6 | 9.5 | 9.5 |
| 320 | 9.4 | 9.3 | 9.3 | 9.2 | 9.2 | 9.1 | 9.1 | 9.0 | 9.0 | 8.9 |
| 330 | 8.9 | 8.8 | 8.7 | 8.7 | 8.6 | 8.6 | 8.5 | 8.5 | 8.4 | 8.4 |
| 340 | 8.3 | 8.3 | 8.2 | 8.2 | 8.2 | 8.1 | 8.1 | 8.0 | 8.0 | 7.9 |
| 350 | 7.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

Table 7.2

Grade 43 Old Pre 89 Material Thickness: >40 mm <=63 mm Yield Stress: 230 N/mm2

| Used Allowable Compressive Stresses pc N/mm2 (Ref Table 17a BS449) | | | | | | | | | | |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| l/r | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 155.0 | 154.2 | 153.4 | 152.6 | 151.8 | 151.1 | 150.3 | 149.5 | 148.7 | 147.9 |
| 10 | 147.1 | 146.3 | 145.5 | 144.8 | 144.0 | 143.2 | 142.4 | 141.6 | 140.8 | 140.0 |
| 20 | 139.2 | 138.5 | 137.7 | 136.9 | 136.1 | 135.3 | 134.5 | 133.7 | 132.9 | 132.2 |
| 30 | 131.4 | 131.1 | 130.8 | 130.5 | 130.1 | 129.8 | 129.5 | 129.1 | 128.7 | 128.3 |
| 40 | 127.9 | 127.5 | 127.1 | 126.6 | 126.1 | 125.6 | 125.1 | 124.6 | 124.1 | 123.5 |
| 50 | 123.0 | 122.4 | 121.8 | 121.1 | 120.5 | 119.8 | 119.1 | 118.4 | 117.7 | 117.0 |
| 60 | 116.2 | 115.4 | 114.6 | 113.8 | 112.9 | 112.1 | 111.2 | 110.3 | 109.4 | 108.4 |
| 70 | 107.5 | 106.5 | 105.5 | 104.5 | 103.5 | 102.5 | 101.4 | 100.4 | 99.3 | 98.3 |
| 80 | 97.2 | 96.1 | 95.0 | 93.9 | 92.8 | 91.7 | 90.6 | 89.5 | 88.4 | 87.3 |
| 90 | 86.2 | 85.1 | 84.1 | 83.0 | 81.9 | 80.8 | 79.8 | 78.7 | 77.7 | 76.6 |
| 100 | 75.6 | 74.6 | 73.6 | 72.6 | 71.6 | 70.6 | 69.7 | 68.7 | 67.8 | 66.9 |
| 110 | 66.0 | 65.1 | 64.2 | 63.3 | 62.5 | 61.6 | 60.8 | 60.0 | 59.1 | 58.4 |
| 120 | 57.6 | 56.8 | 56.0 | 55.3 | 54.6 | 53.8 | 53.1 | 52.4 | 51.8 | 51.1 |
| 130 | 50.4 | 49.8 | 49.1 | 48.5 | 47.9 | 47.3 | 46.7 | 46.1 | 45.5 | 44.9 |
| 140 | 44.4 | 43.8 | 43.3 | 42.7 | 42.2 | 41.7 | 41.2 | 40.7 | 40.2 | 39.7 |
| 150 | 39.2 | 38.8 | 38.3 | 37.9 | 37.4 | 37.0 | 36.6 | 36.1 | 35.7 | 35.3 |
| 160 | 34.9 | 34.5 | 34.1 | 33.7 | 33.4 | 33.0 | 32.6 | 32.3 | 31.9 | 31.6 |
| 170 | 31.2 | 30.9 | 30.5 | 30.2 | 29.9 | 29.6 | 29.3 | 29.0 | 28.7 | 28.4 |
| 180 | 28.1 | 27.8 | 27.5 | 27.2 | 26.9 | 26.7 | 26.4 | 26.1 | 25.9 | 25.6 |
| 190 | 25.3 | 25.1 | 24.8 | 24.6 | 24.4 | 24.1 | 23.9 | 23.7 | 23.4 | 23.2 |
| 200 | 23.0 | 22.8 | 22.6 | 22.3 | 22.1 | 21.9 | 21.7 | 21.5 | 21.3 | 21.1 |
| 210 | 20.9 | 20.8 | 20.6 | 20.4 | 20.2 | 20.0 | 19.8 | 19.7 | 19.5 | 19.3 |
| 220 | 19.2 | 19.0 | 18.8 | 18.7 | 18.5 | 18.3 | 18.2 | 18.0 | 17.9 | 17.7 |
| 230 | 17.6 | 17.4 | 17.3 | 17.1 | 17.0 | 16.9 | 16.7 | 16.6 | 16.5 | 16.3 |
| 240 | 16.2 | 16.1 | 15.9 | 15.8 | 15.7 | 15.6 | 15.4 | 15.3 | 15.2 | 15.1 |
| 250 | 15.0 | 14.8 | 14.7 | 14.6 | 14.5 | 14.4 | 14.3 | 14.2 | 14.1 | 14.0 |
| 260 | 13.9 | 13.8 | 13.7 | 13.6 | 13.5 | 13.4 | 13.3 | 13.2 | 13.1 | 13.0 |
| 270 | 12.9 | 12.8 | 12.7 | 12.6 | 12.5 | 12.4 | 12.3 | 12.2 | 12.2 | 12.1 |
| 280 | 12.0 | 11.9 | 11.8 | 11.7 | 11.7 | 11.6 | 11.5 | 11.4 | 11.3 | 11.3 |
| 290 | 11.2 | 11.1 | 11.0 | 11.0 | 10.9 | 10.8 | 10.8 | 10.7 | 10.6 | 10.5 |
| 300 | 10.5 | 10.4 | 10.3 | 10.3 | 10.2 | 10.1 | 10.1 | 10.0 | 9.9 | 9.9 |
| 310 | 9.8 | 9.8 | 9.7 | 9.6 | 9.6 | 9.5 | 9.5 | 9.4 | 9.3 | 9.3 |
| 320 | 9.2 | 9.2 | 9.1 | 9.1 | 9.0 | 9.0 | 8.9 | 8.8 | 8.8 | 8.7 |
| 330 | 8.7 | 8.6 | 8.6 | 8.5 | 8.5 | 8.4 | 8.4 | 8.3 | 8.3 | 8.2 |
| 340 | 8.2 | 8.1 | 8.1 | 8.0 | 8.0 | 8.0 | 7.9 | 7.9 | 7.8 | 7.8 |
| 350 | 7.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

Table 8.1

Grade 50 Old Pre 89 Material Thickness: >0 mm <=65 mm Yield Stress: 350 N/mm2

| Used Allowable Compressive Stresses pc N/mm2 (Ref Table 17b BS449) | | | | | | | | | | |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| l/r | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 215.0 | 214.5 | 214.0 | 213.5 | 212.9 | 212.4 | 211.9 | 211.4 | 210.9 | 210.4 |
| 10 | 209.9 | 209.3 | 208.8 | 208.3 | 207.8 | 207.3 | 206.8 | 206.3 | 205.7 | 205.2 |
| 20 | 204.7 | 204.2 | 203.7 | 203.2 | 202.7 | 202.1 | 201.6 | 201.1 | 200.6 | 200.1 |
| 30 | 199.6 | 199.1 | 198.6 | 198.0 | 197.5 | 196.9 | 196.2 | 195.6 | 194.9 | 194.2 |
| 40 | 193.4 | 192.7 | 191.8 | 191.0 | 190.1 | 189.1 | 188.1 | 187.1 | 186.0 | 184.9 |
| 50 | 183.8 | 182.6 | 181.3 | 180.0 | 178.6 | 177.2 | 175.7 | 174.2 | 172.6 | 171.0 |
| 60 | 169.3 | 167.6 | 165.8 | 164.0 | 162.1 | 160.2 | 158.3 | 156.3 | 154.3 | 152.2 |
| 70 | 150.2 | 148.1 | 146.0 | 143.9 | 141.8 | 139.6 | 137.5 | 135.4 | 133.3 | 131.2 |
| 80 | 129.1 | 127.0 | 124.9 | 122.9 | 120.8 | 118.8 | 116.8 | 114.9 | 113.0 | 111.1 |
| 90 | 109.2 | 107.4 | 105.6 | 103.8 | 102.0 | 100.3 | 98.6 | 97.0 | 95.4 | 93.8 |
| 100 | 92.2 | 90.7 | 89.2 | 87.8 | 86.3 | 84.9 | 83.5 | 82.2 | 80.9 | 79.6 |
| 110 | 78.3 | 77.1 | 75.9 | 74.7 | 73.5 | 72.4 | 71.2 | 70.2 | 69.1 | 68.0 |
| 120 | 67.0 | 66.0 | 65.0 | 64.1 | 63.1 | 62.2 | 61.3 | 60.4 | 59.5 | 58.7 |
| 130 | 57.8 | 57.0 | 56.2 | 55.4 | 54.7 | 53.9 | 53.2 | 52.5 | 51.7 | 51.0 |
| 140 | 50.4 | 49.7 | 49.0 | 48.4 | 47.8 | 47.1 | 46.5 | 45.9 | 45.3 | 44.8 |
| 150 | 44.2 | 43.6 | 43.1 | 42.6 | 42.0 | 41.5 | 41.0 | 40.5 | 40.0 | 39.5 |
| 160 | 39.1 | 38.6 | 38.1 | 37.7 | 37.3 | 36.8 | 36.4 | 36.0 | 35.6 | 35.2 |
| 170 | 34.8 | 34.4 | 34.0 | 33.6 | 33.2 | 32.9 | 32.5 | 32.1 | 31.8 | 31.5 |
| 180 | 31.1 | 30.8 | 30.5 | 30.1 | 29.8 | 29.5 | 29.2 | 28.9 | 28.6 | 28.3 |
| 190 | 28.0 | 27.7 | 27.4 | 27.2 | 26.9 | 26.6 | 26.4 | 26.1 | 25.8 | 25.6 |
| 200 | 25.3 | 25.1 | 24.9 | 24.6 | 24.4 | 24.2 | 23.9 | 23.7 | 23.5 | 23.3 |
| 210 | 23.0 | 22.8 | 22.6 | 22.4 | 22.2 | 22.0 | 21.8 | 21.6 | 21.4 | 21.2 |
| 220 | 21.0 | 20.8 | 20.7 | 20.5 | 20.3 | 20.1 | 19.9 | 19.8 | 19.6 | 19.4 |
| 230 | 19.3 | 19.1 | 18.9 | 18.8 | 18.6 | 18.5 | 18.3 | 18.2 | 18.0 | 17.9 |
| 240 | 17.7 | 17.6 | 17.4 | 17.3 | 17.2 | 17.0 | 16.9 | 16.7 | 16.6 | 16.5 |
| 250 | 16.4 | 16.2 | 16.1 | 16.0 | 15.8 | 15.7 | 15.6 | 15.5 | 15.4 | 15.2 |
| 260 | 15.1 | 15.0 | 14.9 | 14.8 | 14.7 | 14.6 | 14.5 | 14.4 | 14.3 | 14.1 |
| 270 | 14.0 | 13.9 | 13.8 | 13.7 | 13.6 | 13.5 | 13.4 | 13.4 | 13.3 | 13.2 |
| 280 | 13.1 | 13.0 | 12.9 | 12.8 | 12.7 | 12.6 | 12.5 | 12.4 | 12.4 | 12.3 |
| 290 | 12.2 | 12.1 | 12.0 | 11.9 | 11.9 | 11.8 | 11.7 | 11.6 | 11.6 | 11.5 |
| 300 | 11.4 | 11.3 | 11.3 | 11.2 | 11.1 | 11.0 | 11.0 | 10.9 | 10.8 | 10.8 |
| 310 | 10.7 | 10.6 | 10.5 | 10.5 | 10.4 | 10.4 | 10.3 | 10.2 | 10.2 | 10.1 |
| 320 | 10.0 | 10.0 | 9.9 | 9.8 | 9.8 | 9.7 | 9.7 | 9.6 | 9.6 | 9.5 |
| 330 | 9.4 | 9.4 | 9.3 | 9.3 | 9.2 | 9.2 | 9.1 | 9.1 | 9.0 | 8.9 |
| 340 | 8.9 | 8.8 | 8.8 | 8.7 | 8.7 | 8.6 | 8.6 | 8.5 | 8.5 | 8.4 |
| 350 | 8.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

Table 8.2

Grade 50 Old Pre 89

Material Thickness: >65 mm <=100 mm

Yield Stress: 325 N/mm2

| Used Allowable Compressive Stresses pc N/mm2 (Ref Table 17b BS449) | | | | | | | | | | |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| l/r | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 215.0 | 214.0 | 213.0 | 212.0 | 211.1 | 210.1 | 209.1 | 208.1 | 207.1 | 206.1 |
| 10 | 205.1 | 204.1 | 203.2 | 202.2 | 201.2 | 200.2 | 199.2 | 198.2 | 197.2 | 196.2 |
| 20 | 195.3 | 194.3 | 193.3 | 192.3 | 191.3 | 190.3 | 189.3 | 188.3 | 187.4 | 186.4 |
| 30 | 185.4 | 184.9 | 184.5 | 184.0 | 183.5 | 182.9 | 182.4 | 181.8 | 181.2 | 180.5 |
| 40 | 179.9 | 179.2 | 178.4 | 177.7 | 176.9 | 176.1 | 175.2 | 174.3 | 173.4 | 172.4 |
| 50 | 171.4 | 170.3 | 169.2 | 168.1 | 166.9 | 165.7 | 164.4 | 163.1 | 161.7 | 160.3 |
| 60 | 158.9 | 157.4 | 155.8 | 154.3 | 152.7 | 151.0 | 149.3 | 147.6 | 145.9 | 144.1 |
| 70 | 142.3 | 140.5 | 138.6 | 136.8 | 134.9 | 133.0 | 131.2 | 129.3 | 127.4 | 125.5 |
| 80 | 123.6 | 121.7 | 119.9 | 118.0 | 116.2 | 114.3 | 112.5 | 110.7 | 109.0 | 107.2 |
| 90 | 105.5 | 103.8 | 102.1 | 100.5 | 98.8 | 97.2 | 95.7 | 94.1 | 92.6 | 91.1 |
| 100 | 89.6 | 88.2 | 86.8 | 85.4 | 84.0 | 82.7 | 81.4 | 80.1 | 78.9 | 77.6 |
| 110 | 76.4 | 75.2 | 74.1 | 72.9 | 71.8 | 70.7 | 69.6 | 68.6 | 67.6 | 66.6 |
| 120 | 65.6 | 64.6 | 63.7 | 62.7 | 61.8 | 60.9 | 60.0 | 59.2 | 58.3 | 57.5 |
| 130 | 56.7 | 55.9 | 55.1 | 54.4 | 53.6 | 52.9 | 52.2 | 51.5 | 50.8 | 50.1 |
| 140 | 49.4 | 48.8 | 48.2 | 47.5 | 46.9 | 46.3 | 45.7 | 45.1 | 44.5 | 44.0 |
| 150 | 43.4 | 42.9 | 42.4 | 41.8 | 41.3 | 40.8 | 40.3 | 39.8 | 39.4 | 38.9 |
| 160 | 38.4 | 38.0 | 37.5 | 37.1 | 36.7 | 36.2 | 35.8 | 35.4 | 35.0 | 34.6 |
| 170 | 34.2 | 33.8 | 33.5 | 33.1 | 32.7 | 32.4 | 32.0 | 31.7 | 31.3 | 31.0 |
| 180 | 30.6 | 30.3 | 30.0 | 29.7 | 29.4 | 29.1 | 28.8 | 28.5 | 28.2 | 27.9 |
| 190 | 27.6 | 27.3 | 27.0 | 26.8 | 26.5 | 26.2 | 26.0 | 25.7 | 25.5 | 25.2 |
| 200 | 25.0 | 24.7 | 24.5 | 24.3 | 24.0 | 23.8 | 23.6 | 23.4 | 23.1 | 22.9 |
| 210 | 22.7 | 22.5 | 22.3 | 22.1 | 21.9 | 21.7 | 21.5 | 21.3 | 21.1 | 20.9 |
| 220 | 20.7 | 20.6 | 20.4 | 20.2 | 20.0 | 19.8 | 19.7 | 19.5 | 19.3 | 19.2 |
| 230 | 19.0 | 18.8 | 18.7 | 18.5 | 18.4 | 18.2 | 18.1 | 17.9 | 17.8 | 17.6 |
| 240 | 17.5 | 17.3 | 17.2 | 17.1 | 16.9 | 16.8 | 16.7 | 16.5 | 16.4 | 16.3 |
| 250 | 16.1 | 16.0 | 15.9 | 15.8 | 15.6 | 15.5 | 15.4 | 15.3 | 15.2 | 15.0 |
| 260 | 14.9 | 14.8 | 14.7 | 14.6 | 14.5 | 14.4 | 14.3 | 14.2 | 14.1 | 14.0 |
| 270 | 13.9 | 13.8 | 13.7 | 13.6 | 13.5 | 13.4 | 13.3 | 13.2 | 13.1 | 13.0 |
| 280 | 12.9 | 12.8 | 12.7 | 12.6 | 12.5 | 12.5 | 12.4 | 12.3 | 12.2 | 12.1 |
| 290 | 12.0 | 12.0 | 11.9 | 11.8 | 11.7 | 11.6 | 11.6 | 11.5 | 11.4 | 11.3 |
| 300 | 11.3 | 11.2 | 11.1 | 11.0 | 11.0 | 10.9 | 10.8 | 10.8 | 10.7 | 10.6 |
| 310 | 10.6 | 10.5 | 10.4 | 10.4 | 10.3 | 10.2 | 10.2 | 10.1 | 10.0 | 10.0 |
| 320 | 9.9 | 9.8 | 9.8 | 9.7 | 9.7 | 9.6 | 9.5 | 9.5 | 9.4 | 9.4 |
| 330 | 9.3 | 9.3 | 9.2 | 9.2 | 9.1 | 9.0 | 9.0 | 8.9 | 8.9 | 8.8 |
| 340 | 8.8 | 8.7 | 8.7 | 8.6 | 8.6 | 8.5 | 8.5 | 8.4 | 8.4 | 8.3 |
| 350 | 8.3 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

Table 9.1

Grade 55 Old Pre 89 Material Thickness: >0 mm <=40 mm Yield Stress: 430 N/mm2

| Used Allowable Compressive Stresses pc N/mm2 (Ref Table 17c BS449) | | | | | | | | | | |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| l/r | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 265.0 | 264.3 | 263.7 | 263.0 | 262.3 | 261.6 | 261.0 | 260.3 | 259.6 | 259.0 |
| 10 | 258.3 | 257.6 | 256.9 | 256.3 | 255.6 | 254.9 | 254.3 | 253.6 | 252.9 | 252.3 |
| 20 | 251.6 | 250.9 | 250.2 | 249.6 | 248.9 | 248.2 | 247.6 | 246.9 | 246.2 | 245.5 |
| 30 | 244.9 | 244.2 | 243.5 | 242.8 | 242.0 | 241.2 | 240.4 | 239.5 | 238.5 | 237.5 |
| 40 | 236.5 | 235.4 | 234.2 | 233.0 | 231.7 | 230.3 | 228.8 | 227.3 | 225.7 | 224.1 |
| 50 | 222.3 | 220.5 | 218.5 | 216.5 | 214.4 | 212.3 | 210.0 | 207.6 | 205.2 | 202.7 |
| 60 | 200.1 | 197.5 | 194.8 | 192.0 | 189.2 | 186.3 | 183.4 | 180.5 | 177.5 | 174.6 |
| 70 | 171.6 | 168.7 | 165.7 | 162.8 | 159.8 | 156.9 | 154.1 | 151.2 | 148.4 | 145.7 |
| 80 | 143.0 | 140.3 | 137.6 | 135.1 | 132.5 | 130.0 | 127.6 | 125.2 | 122.9 | 120.6 |
| 90 | 118.4 | 116.2 | 114.0 | 111.9 | 109.9 | 107.9 | 105.9 | 104.0 | 102.2 | 100.3 |
| 100 | 98.6 | 96.8 | 95.1 | 93.5 | 91.9 | 90.3 | 88.7 | 87.2 | 85.8 | 84.3 |
| 110 | 82.9 | 81.5 | 80.2 | 78.9 | 77.6 | 76.4 | 75.1 | 74.0 | 72.8 | 71.6 |
| 120 | 70.5 | 69.4 | 68.4 | 67.3 | 66.3 | 65.3 | 64.3 | 63.4 | 62.4 | 61.5 |
| 130 | 60.6 | 59.7 | 58.9 | 58.0 | 57.2 | 56.4 | 55.6 | 54.8 | 54.1 | 53.3 |
| 140 | 52.6 | 51.9 | 51.2 | 50.5 | 49.8 | 49.2 | 48.5 | 47.9 | 47.3 | 46.6 |
| 150 | 46.0 | 45.5 | 44.9 | 44.3 | 43.8 | 43.2 | 42.7 | 42.1 | 41.6 | 41.1 |
| 160 | 40.6 | 40.1 | 39.7 | 39.2 | 38.7 | 38.3 | 37.8 | 37.4 | 36.9 | 36.5 |
| 170 | 36.1 | 35.7 | 35.3 | 34.9 | 34.5 | 34.1 | 33.7 | 33.4 | 33.0 | 32.6 |
| 180 | 32.3 | 31.9 | 31.6 | 31.2 | 30.9 | 30.6 | 30.3 | 30.0 | 29.6 | 29.3 |
| 190 | 29.0 | 28.7 | 28.4 | 28.2 | 27.9 | 27.6 | 27.3 | 27.0 | 26.8 | 26.5 |
| 200 | 26.2 | 26.0 | 25.7 | 25.5 | 25.2 | 25.0 | 24.8 | 24.5 | 24.3 | 24.1 |
| 210 | 23.8 | 23.6 | 23.4 | 23.2 | 23.0 | 22.8 | 22.6 | 22.3 | 22.1 | 21.9 |
| 220 | 21.7 | 21.6 | 21.4 | 21.2 | 21.0 | 20.8 | 20.6 | 20.4 | 20.3 | 20.1 |
| 230 | 19.9 | 19.8 | 19.6 | 19.4 | 19.3 | 19.1 | 18.9 | 18.8 | 18.6 | 18.5 |
| 240 | 18.3 | 18.2 | 18.0 | 17.9 | 17.7 | 17.6 | 17.4 | 17.3 | 17.2 | 17.0 |
| 250 | 16.9 | 16.8 | 16.6 | 16.5 | 16.4 | 16.2 | 16.1 | 16.0 | 15.9 | 15.7 |
| 260 | 15.6 | 15.5 | 15.4 | 15.3 | 15.2 | 15.0 | 14.9 | 14.8 | 14.7 | 14.6 |
| 270 | 14.5 | 14.4 | 14.3 | 14.2 | 14.1 | 14.0 | 13.9 | 13.8 | 13.7 | 13.6 |
| 280 | 13.5 | 13.4 | 13.3 | 13.2 | 13.1 | 13.0 | 12.9 | 12.8 | 12.8 | 12.7 |
| 290 | 12.6 | 12.5 | 12.4 | 12.3 | 12.2 | 12.2 | 12.1 | 12.0 | 11.9 | 11.8 |
| 300 | 11.8 | 11.7 | 11.6 | 11.5 | 11.5 | 11.4 | 11.3 | 11.2 | 11.2 | 11.1 |
| 310 | 11.0 | 11.0 | 10.9 | 10.8 | 10.7 | 10.7 | 10.6 | 10.5 | 10.5 | 10.4 |
| 320 | 10.3 | 10.3 | 10.2 | 10.2 | 10.1 | 10.0 | 10.0 | 9.9 | 9.9 | 9.8 |
| 330 | 9.7 | 9.7 | 9.6 | 9.6 | 9.5 | 9.4 | 9.4 | 9.3 | 9.3 | 9.2 |
| 340 | 9.2 | 9.1 | 9.1 | 9.0 | 9.0 | 8.9 | 8.9 | 8.8 | 8.8 | 8.7 |
| 350 | 8.7 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

Table 9.2

Grade 550ld Pre 89 Material Thickness: >40 mm <=100 mm Yield Stress: 395 N/mm²

| Used Allowable Compressive Stresses pc N/mm ² (Ref Table 17c BS449) | | | | | | | | | | |
|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| l/r | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| 0 | 265.0 | 263.7 | 262.3 | 261.0 | 259.7 | 258.3 | 257.0 | 255.7 | 254.4 | 253.0 |
| 10 | 251.7 | 250.4 | 249.0 | 247.7 | 246.4 | 245.0 | 243.7 | 242.4 | 241.0 | 239.7 |
| 20 | 238.4 | 237.0 | 235.7 | 234.4 | 233.1 | 231.7 | 230.4 | 229.1 | 227.7 | 226.4 |
| 30 | 225.1 | 224.5 | 223.9 | 223.2 | 222.6 | 221.9 | 221.1 | 220.3 | 219.5 | 218.6 |
| 40 | 217.7 | 216.8 | 215.8 | 214.7 | 213.6 | 212.4 | 211.2 | 209.9 | 208.6 | 207.2 |
| 50 | 205.7 | 204.1 | 202.5 | 200.8 | 199.1 | 197.3 | 195.4 | 193.4 | 191.4 | 189.3 |
| 60 | 187.2 | 184.9 | 182.7 | 180.3 | 178.0 | 175.5 | 173.1 | 170.6 | 168.1 | 165.5 |
| 70 | 162.9 | 160.4 | 157.8 | 155.2 | 152.6 | 150.1 | 147.5 | 145.0 | 142.4 | 140.0 |
| 80 | 137.5 | 135.1 | 132.7 | 130.3 | 128.0 | 125.7 | 123.4 | 121.2 | 119.0 | 116.9 |
| 90 | 114.8 | 112.7 | 110.7 | 108.8 | 106.8 | 105.0 | 103.1 | 101.3 | 99.5 | 97.8 |
| 100 | 96.1 | 94.5 | 92.8 | 91.3 | 89.7 | 88.2 | 86.7 | 85.3 | 83.9 | 82.5 |
| 110 | 81.1 | 79.8 | 78.5 | 77.3 | 76.0 | 74.8 | 73.6 | 72.5 | 71.4 | 70.2 |
| 120 | 69.2 | 68.1 | 67.1 | 66.1 | 65.1 | 64.1 | 63.1 | 62.2 | 61.3 | 60.4 |
| 130 | 59.5 | 58.7 | 57.8 | 57.0 | 56.2 | 55.4 | 54.7 | 53.9 | 53.2 | 52.4 |
| 140 | 51.7 | 51.0 | 50.3 | 49.7 | 49.0 | 48.4 | 47.7 | 47.1 | 46.5 | 45.9 |
| 150 | 45.3 | 44.7 | 44.2 | 43.6 | 43.1 | 42.5 | 42.0 | 41.5 | 41.0 | 40.5 |
| 160 | 40.0 | 39.5 | 39.1 | 38.6 | 38.1 | 37.7 | 37.3 | 36.8 | 36.4 | 36.0 |
| 170 | 35.6 | 35.2 | 34.8 | 34.4 | 34.0 | 33.6 | 33.3 | 32.9 | 32.5 | 32.2 |
| 180 | 31.8 | 31.5 | 31.1 | 30.8 | 30.5 | 30.2 | 29.8 | 29.5 | 29.2 | 28.9 |
| 190 | 28.6 | 28.3 | 28.1 | 27.8 | 27.5 | 27.2 | 26.9 | 26.7 | 26.4 | 26.1 |
| 200 | 25.9 | 25.6 | 25.4 | 25.1 | 24.9 | 24.7 | 24.4 | 24.2 | 24.0 | 23.7 |
| 210 | 23.5 | 23.3 | 23.1 | 22.9 | 22.7 | 22.5 | 22.3 | 22.1 | 21.9 | 21.7 |
| 220 | 21.5 | 21.3 | 21.1 | 20.9 | 20.7 | 20.5 | 20.4 | 20.2 | 20.0 | 19.8 |
| 230 | 19.7 | 19.5 | 19.3 | 19.2 | 19.0 | 18.8 | 18.7 | 18.5 | 18.4 | 18.2 |
| 240 | 18.1 | 17.9 | 17.8 | 17.6 | 17.5 | 17.4 | 17.2 | 17.1 | 16.9 | 16.8 |
| 250 | 16.7 | 16.5 | 16.4 | 16.3 | 16.2 | 16.0 | 15.9 | 15.8 | 15.7 | 15.6 |
| 260 | 15.4 | 15.3 | 15.2 | 15.1 | 15.0 | 14.9 | 14.8 | 14.6 | 14.5 | 14.4 |
| 270 | 14.3 | 14.2 | 14.1 | 14.0 | 13.9 | 13.8 | 13.7 | 13.6 | 13.5 | 13.4 |
| 280 | 13.3 | 13.2 | 13.1 | 13.0 | 13.0 | 12.9 | 12.8 | 12.7 | 12.6 | 12.5 |
| 290 | 12.4 | 12.3 | 12.3 | 12.2 | 12.1 | 12.0 | 11.9 | 11.9 | 11.8 | 11.7 |
| 300 | 11.6 | 11.5 | 11.5 | 11.4 | 11.3 | 11.2 | 11.2 | 11.1 | 11.0 | 11.0 |
| 310 | 10.9 | 10.8 | 10.8 | 10.7 | 10.6 | 10.5 | 10.5 | 10.4 | 10.4 | 10.3 |
| 320 | 10.2 | 10.2 | 10.1 | 10.0 | 10.0 | 9.9 | 9.9 | 9.8 | 9.7 | 9.7 |
| 330 | 9.6 | 9.6 | 9.5 | 9.4 | 9.4 | 9.3 | 9.3 | 9.2 | 9.2 | 9.1 |
| 340 | 9.1 | 9.0 | 9.0 | 8.9 | 8.9 | 8.8 | 8.8 | 8.7 | 8.7 | 8.6 |
| 350 | 8.6 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |