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## CERTIFICATE OF APPROVAL

### No CF 5725

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This is to certify that, in accordance with  
TS00 General Requirements for Certification of Fire Protection Products  
The undermentioned products of

## Tor Coatings Limited

2 Shaddon Way, Portobello Industrial Estate, Birtley, Chester-Le-  
Street, County Durham,  
DH3 2RE  
TEL: 0191 410 6611

Have been assessed against the requirements of the Technical Schedule(s)  
denoted below and are approved for use subject to the conditions  
appended hereto:

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**CERTIFIED PRODUCT**  
**BROSTEEL ULTRA 60**

**TECHNICAL SCHEDULE**  
**TS15 Intumescent Coatings for**  
**Steelwork**

**Signed and sealed for and on behalf of Warringtonfire Testing and Certification Limited**

**Paul Duggan**  
**Certification Manager**



Issued: 14<sup>th</sup> Aug 2019  
Valid to: 31<sup>st</sup> July 2024





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## CERTIFICATE No CF 5725

### Tor Coatings Limited

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1. This approval relates to the use of BROSTEEL ULTRA 60 for the fire protection of steel I-shaped beams and columns, circular hollow columns, rectangular hollow columns and beams. The precise scope is given in Tables 1 to 21 which show the total dry film thickness of BROSTEEL ULTRA 60 (excluding primer and topcoat) required to provide fire resistance periods in accordance with BS476: Part 21: 1987 of 15 minutes up to 90 minutes for differing sections, section factors and design temperatures.
2. This certification is provided to the client for their own purposes and we cannot opine on whether it will be accepted by Building Control authorities or any other third parties for any purpose.
3. The products are approved on the basis of:
  - i) Initial type testing.
  - ii) A design appraisal against TS15.
  - iii) Certification of quality management system to ISO 9001: 2015.
  - iv) Inspection and surveillance of factory production control.
  - v) Audit testing.
4. The data referring to three-sided fire exposure of beams relate to beams supporting concrete floor slabs. Separate consideration is required where this is not the case.
5. The data shown is applicable to steel sections blast cleaned to ISO 8501-1 Sa 2<sup>1/2</sup> or equivalent and primed with a suitable and compatible primer. Specifications of surface preparations, primers and topcoats are available from the manufacturer whose responsibility is to ensure that BROSTEEL ULTRA 60 is compatible for use in respect of both ambient and fire conditions. The total dry film thickness of primer and topcoat together should not exceed that tested.
6. Specific data given in the tables applies to horizontal, vertical, flexural and compression members supporting loads up to the maximum design loads specified in BS449: Part 2.
7. The approval relates to on-going production. Product and/or its immediate packaging is identified with the manufacturers' name, the product name or number, the CERTIFIRE name or name and mark, together with the CERTIFIRE certificate number and application where appropriate.
8. The data shown in the tables is based on assessments which comply with the criteria for acceptability now incorporated within the CERTIFIRE scheme.

Signed  
E/057

Issued: 14<sup>th</sup> Aug 2019  
Valid to: 31/07/2024



## CERTIFICATE No CF 5725

### Tor Coatings Limited

#### BROSTEEL ULTRA 60

| Table 1 : I-Section Beams 15 Minutes |  |       |       |       |       |       |       |       |       |       |
|--------------------------------------|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Section Factor up to m <sup>-1</sup> | Thickness (mm) Required for a Design Temperature of :- |       |       |       |       |       |       |       |       |       |
|                                      | 350°C  | 400°C | 450°C | 500°C | 550°C | 600°C | 620°C | 650°C | 700°C | 750°C |
| 35                                   | 0.181  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 40                                   | 0.181  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 45                                   | 0.181  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 50                                   | 0.181  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 55                                   | 0.181  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 60                                   | 0.181  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 65                                   | 0.181  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 70                                   | 0.181  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 75                                   | 0.181  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 80                                   | 0.181  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 85                                   | 0.181  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 90                                   | 0.181  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 95                                   | 0.181  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 100                                  | 0.181  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 105                                  | 0.181  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 110                                  | 0.181  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 115                                  | 0.181  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 120                                  | 0.181  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 125                                  | 0.181  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 130                                  | 0.181  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 135                                  | 0.181  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 140                                  | 0.181  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 145                                  | 0.181  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 150                                  | 0.183  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 155                                  | 0.187  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 160                                  | 0.191  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 165                                  | 0.195  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 170                                  | 0.199  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 175                                  | 0.204  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 180                                  | 0.208  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 185                                  | 0.212  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 190                                  | 0.216  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 195                                  | 0.221  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 200                                  | 0.225  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 205                                  | 0.229  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 210                                  | 0.233  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 215                                  | 0.237  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 220                                  | 0.242  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 225                                  | 0.246  | 0.183 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 230                                  | 0.250  | 0.186 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 235                                  | 0.254  | 0.189 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 240                                  | 0.259  | 0.192 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 245                                  | 0.263  | 0.196 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 250                                  | 0.267  | 0.199 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 255                                  | 0.271  | 0.202 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 260                                  | 0.275  | 0.205 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 265                                  | 0.280  | 0.209 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 270                                  | 0.284  | 0.212 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 275                                  | 0.288  | 0.215 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 280                                  | 0.292  | 0.218 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 285                                  | 0.297  | 0.222 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 290                                  | 0.301  | 0.225 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 295                                  | 0.305  | 0.228 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 300                                  | 0.309  | 0.231 | 0.184 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 305                                  | 0.313  | 0.235 | 0.187 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 310                                  | 0.318  | 0.238 | 0.189 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 315                                  | 0.322  | 0.241 | 0.192 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 320                                  | 0.326  | 0.244 | 0.194 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 325                                  | 0.330  | 0.248 | 0.197 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 330                                  | 0.335  | 0.251 | 0.200 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 335                                  | 0.339  | 0.254 | 0.202 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 340                                  | 0.343  | 0.257 | 0.205 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |

Thickness is intumescent only.

Signed  
E/057

Issued: 14<sup>th</sup> Aug 2019  
Valid to: 31/07/2024



## CERTIFICATE No CF 5725

### Tor Coatings Limited

#### BROSTEEL ULTRA 60

| Table 2 : I-Section beams 30 Minutes |  |       |       |       |       |       |       |       |       |       |
|--------------------------------------|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Section Factor up to m <sup>-1</sup> | Thickness (mm) Required for a Design Temperature of :- |       |       |       |       |       |       |       |       |       |
|                                      | 350°C  | 400°C | 450°C | 500°C | 550°C | 600°C | 620°C | 650°C | 700°C | 750°C |
| 35                                   | 0.181  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 40                                   | 0.181  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 45                                   | 0.181  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 50                                   | 0.181  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 55                                   | 0.181  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 60                                   | 0.181  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 65                                   | 0.181  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 70                                   | 0.197  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 75                                   | 0.214  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 80                                   | 0.231  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 85                                   | 0.248  | 0.187 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 90                                   | 0.266  | 0.194 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 95                                   | 0.283  | 0.200 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 100                                  | 0.300  | 0.207 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 105                                  | 0.317  | 0.213 | 0.184 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 110                                  | 0.334  | 0.220 | 0.189 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 115                                  | 0.351  | 0.226 | 0.194 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 120                                  | 0.368  | 0.233 | 0.199 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 125                                  | 0.385  | 0.239 | 0.203 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 130                                  | 0.402  | 0.246 | 0.208 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 135                                  | 0.419  | 0.252 | 0.213 | 0.185 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 140                                  | 0.430  | 0.259 | 0.218 | 0.189 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 145                                  | 0.436  | 0.265 | 0.223 | 0.193 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 150                                  | 0.442  | 0.271 | 0.228 | 0.197 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 155                                  | 0.448  | 0.278 | 0.233 | 0.201 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 160                                  | 0.454  | 0.284 | 0.237 | 0.205 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 165                                  | 0.460  | 0.291 | 0.242 | 0.210 | 0.184 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 170                                  | 0.466  | 0.297 | 0.247 | 0.214 | 0.188 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 175                                  | 0.472  | 0.304 | 0.252 | 0.218 | 0.191 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 180                                  | 0.478  | 0.310 | 0.257 | 0.222 | 0.195 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 185                                  | 0.484  | 0.317 | 0.262 | 0.226 | 0.199 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 190                                  | 0.490  | 0.323 | 0.267 | 0.230 | 0.202 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 195                                  | 0.496  | 0.330 | 0.272 | 0.234 | 0.206 | 0.183 | 0.181 | 0.181 | 0.181 | 0.181 |
| 200                                  | 0.502  | 0.336 | 0.276 | 0.239 | 0.210 | 0.186 | 0.182 | 0.181 | 0.181 | 0.181 |
| 205                                  | 0.508  | 0.343 | 0.281 | 0.243 | 0.213 | 0.189 | 0.185 | 0.181 | 0.181 | 0.181 |
| 210                                  | 0.514  | 0.349 | 0.286 | 0.247 | 0.217 | 0.192 | 0.187 | 0.181 | 0.181 | 0.181 |
| 215                                  | 0.520  | 0.356 | 0.291 | 0.251 | 0.221 | 0.196 | 0.190 | 0.181 | 0.181 | 0.181 |
| 220                                  | 0.526  | 0.362 | 0.296 | 0.255 | 0.224 | 0.199 | 0.193 | 0.181 | 0.181 | 0.181 |
| 225                                  | 0.533  | 0.369 | 0.301 | 0.259 | 0.228 | 0.202 | 0.196 | 0.184 | 0.181 | 0.181 |
| 230                                  | 0.539  | 0.375 | 0.306 | 0.263 | 0.232 | 0.205 | 0.198 | 0.186 | 0.181 | 0.181 |
| 235                                  | 0.545  | 0.382 | 0.310 | 0.268 | 0.235 | 0.208 | 0.201 | 0.189 | 0.181 | 0.181 |
| 240                                  | 0.551  | 0.388 | 0.315 | 0.272 | 0.239 | 0.212 | 0.204 | 0.191 | 0.181 | 0.181 |
| 245                                  | 0.557  | 0.394 | 0.320 | 0.276 | 0.243 | 0.215 | 0.207 | 0.193 | 0.181 | 0.181 |
| 250                                  | 0.563  | 0.401 | 0.325 | 0.280 | 0.246 | 0.218 | 0.209 | 0.196 | 0.181 | 0.181 |
| 255                                  | 0.569  | 0.407 | 0.330 | 0.284 | 0.250 | 0.221 | 0.212 | 0.198 | 0.181 | 0.181 |
| 260                                  | 0.575  | 0.414 | 0.335 | 0.288 | 0.253 | 0.225 | 0.215 | 0.201 | 0.181 | 0.181 |
| 265                                  | 0.581  | 0.420 | 0.340 | 0.292 | 0.257 | 0.228 | 0.218 | 0.203 | 0.181 | 0.181 |
| 270                                  | 0.587  | 0.427 | 0.344 | 0.297 | 0.261 | 0.231 | 0.221 | 0.206 | 0.181 | 0.181 |
| 275                                  | 0.593  | 0.435 | 0.349 | 0.301 | 0.264 | 0.234 | 0.223 | 0.208 | 0.181 | 0.181 |
| 280                                  | 0.599  | 0.443 | 0.354 | 0.305 | 0.268 | 0.237 | 0.226 | 0.211 | 0.181 | 0.181 |
| 285                                  | 0.605  | 0.451 | 0.359 | 0.309 | 0.272 | 0.241 | 0.229 | 0.213 | 0.181 | 0.181 |
| 290                                  | 0.611  | 0.458 | 0.364 | 0.313 | 0.275 | 0.244 | 0.232 | 0.216 | 0.181 | 0.181 |
| 295                                  | 0.617  | 0.466 | 0.369 | 0.317 | 0.279 | 0.247 | 0.234 | 0.218 | 0.181 | 0.181 |
| 300                                  | 0.623  | 0.474 | 0.374 | 0.321 | 0.283 | 0.250 | 0.237 | 0.221 | 0.181 | 0.181 |
| 305                                  | 0.629  | 0.482 | 0.379 | 0.326 | 0.286 | 0.254 | 0.240 | 0.223 | 0.181 | 0.181 |
| 310                                  | 0.635  | 0.490 | 0.383 | 0.330 | 0.290 | 0.257 | 0.243 | 0.225 | 0.181 | 0.181 |
| 315                                  | 0.641  | 0.498 | 0.388 | 0.334 | 0.294 | 0.260 | 0.245 | 0.228 | 0.181 | 0.181 |
| 320                                  | -  | 0.506 | 0.393 | 0.338 | 0.297 | 0.263 | 0.248 | 0.230 | 0.181 | 0.181 |
| 325                                  | -  | 0.513 | 0.398 | 0.342 | 0.301 | 0.266 | 0.251 | 0.233 | 0.181 | 0.181 |
| 330                                  | -  | 0.521 | 0.403 | 0.346 | 0.305 | 0.270 | 0.254 | 0.235 | 0.182 | 0.181 |
| 335                                  | -  | 0.529 | 0.408 | 0.350 | 0.308 | 0.273 | 0.257 | 0.238 | 0.184 | 0.181 |
| 340                                  | -  | 0.537 | 0.413 | 0.355 | 0.312 | 0.276 | 0.259 | 0.240 | 0.186 | 0.181 |

Thickness is intumescent only.

Signed  
E/057

Issued: 14<sup>th</sup> Aug 2019  
Valid to: 31/07/2024



## CERTIFICATE No CF 5725

### Tor Coatings Limited

#### BROSTEEL ULTRA 60

| Table 3 : I-Section Beams 45 Minutes |  |       |       |       |       |       |       |       |       |       |
|--------------------------------------|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Section Factor up to m <sup>-1</sup> | Thickness (mm) Required for a Design Temperature of :- |       |       |       |       |       |       |       |       |       |
|                                      | 350°C  | 400°C | 450°C | 500°C | 550°C | 600°C | 620°C | 650°C | 700°C | 750°C |
| 35                                   | 0.181  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 40                                   | 0.198  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 45                                   | 0.241  | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 50                                   | 0.283  | 0.187 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 55                                   | 0.326  | 0.207 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 60                                   | 0.369  | 0.227 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 65                                   | 0.412  | 0.248 | 0.191 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 70                                   | 0.435  | 0.268 | 0.206 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 75                                   | 0.449  | 0.288 | 0.221 | 0.189 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 80                                   | 0.463  | 0.308 | 0.235 | 0.196 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 85                                   | 0.477  | 0.328 | 0.250 | 0.204 | 0.186 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 90                                   | 0.491  | 0.348 | 0.265 | 0.211 | 0.191 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 95                                   | 0.505  | 0.368 | 0.280 | 0.219 | 0.196 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 100                                  | 0.519  | 0.389 | 0.295 | 0.226 | 0.202 | 0.184 | 0.181 | 0.181 | 0.181 | 0.181 |
| 105                                  | 0.533  | 0.409 | 0.309 | 0.234 | 0.207 | 0.189 | 0.185 | 0.181 | 0.181 | 0.181 |
| 110                                  | 0.547  | 0.427 | 0.324 | 0.241 | 0.212 | 0.193 | 0.189 | 0.181 | 0.181 | 0.181 |
| 115                                  | 0.561  | 0.437 | 0.339 | 0.249 | 0.217 | 0.198 | 0.194 | 0.184 | 0.181 | 0.181 |
| 120                                  | 0.575  | 0.446 | 0.354 | 0.256 | 0.223 | 0.203 | 0.198 | 0.188 | 0.181 | 0.181 |
| 125                                  | 0.589  | 0.456 | 0.369 | 0.264 | 0.228 | 0.208 | 0.202 | 0.192 | 0.181 | 0.181 |
| 130                                  | 0.603  | 0.465 | 0.383 | 0.271 | 0.233 | 0.213 | 0.206 | 0.196 | 0.181 | 0.181 |
| 135                                  | 0.617  | 0.474 | 0.398 | 0.279 | 0.238 | 0.217 | 0.210 | 0.200 | 0.181 | 0.181 |
| 140                                  | 0.631  | 0.484 | 0.413 | 0.286 | 0.244 | 0.222 | 0.215 | 0.204 | 0.181 | 0.181 |
| 145                                  | 0.645  | 0.493 | 0.427 | 0.294 | 0.249 | 0.227 | 0.219 | 0.208 | 0.181 | 0.181 |
| 150                                  | -  | 0.502 | 0.432 | 0.301 | 0.254 | 0.232 | 0.223 | 0.212 | 0.181 | 0.181 |
| 155                                  | -  | 0.512 | 0.438 | 0.309 | 0.259 | 0.236 | 0.227 | 0.216 | 0.184 | 0.181 |
| 160                                  | -  | 0.521 | 0.443 | 0.316 | 0.265 | 0.241 | 0.232 | 0.219 | 0.187 | 0.181 |
| 165                                  | -  | 0.531 | 0.449 | 0.324 | 0.270 | 0.246 | 0.236 | 0.223 | 0.191 | 0.181 |
| 170                                  | -  | 0.540 | 0.454 | 0.331 | 0.275 | 0.251 | 0.240 | 0.227 | 0.195 | 0.181 |
| 175                                  | -  | 0.549 | 0.460 | 0.339 | 0.280 | 0.256 | 0.244 | 0.231 | 0.198 | 0.181 |
| 180                                  | -  | 0.559 | 0.465 | 0.346 | 0.286 | 0.260 | 0.248 | 0.235 | 0.202 | 0.181 |
| 185                                  | -  | 0.568 | 0.471 | 0.354 | 0.291 | 0.265 | 0.253 | 0.239 | 0.205 | 0.181 |
| 190                                  | -  | 0.578 | 0.476 | 0.361 | 0.296 | 0.270 | 0.257 | 0.243 | 0.209 | 0.181 |
| 195                                  | -  | 0.587 | 0.482 | 0.369 | 0.301 | 0.275 | 0.261 | 0.247 | 0.213 | 0.181 |
| 200                                  | -  | 0.596 | 0.487 | 0.376 | 0.306 | 0.279 | 0.265 | 0.251 | 0.216 | 0.181 |
| 205                                  | -  | 0.606 | 0.493 | 0.384 | 0.312 | 0.284 | 0.270 | 0.254 | 0.220 | 0.181 |
| 210                                  | -  | 0.615 | 0.498 | 0.392 | 0.317 | 0.289 | 0.274 | 0.258 | 0.223 | 0.181 |
| 215                                  | -  | 0.625 | 0.504 | 0.399 | 0.322 | 0.294 | 0.278 | 0.262 | 0.227 | 0.181 |
| 220                                  | -  | 0.634 | 0.509 | 0.407 | 0.327 | 0.299 | 0.282 | 0.266 | 0.230 | 0.181 |
| 225                                  | -  | 0.643 | 0.515 | 0.414 | 0.333 | 0.303 | 0.287 | 0.270 | 0.234 | 0.181 |
| 230                                  | -  | -     | 0.520 | 0.422 | 0.338 | 0.308 | 0.291 | 0.274 | 0.238 | 0.181 |
| 235                                  | -  | -     | 0.526 | 0.429 | 0.343 | 0.313 | 0.295 | 0.278 | 0.241 | 0.181 |
| 240                                  | -  | -     | 0.531 | 0.436 | 0.348 | 0.318 | 0.299 | 0.282 | 0.245 | 0.181 |
| 245                                  | -  | -     | 0.537 | 0.443 | 0.354 | 0.322 | 0.303 | 0.286 | 0.248 | 0.181 |
| 250                                  | -  | -     | 0.542 | 0.451 | 0.359 | 0.327 | 0.308 | 0.290 | 0.252 | 0.184 |
| 255                                  | -  | -     | 0.548 | 0.458 | 0.364 | 0.332 | 0.312 | 0.293 | 0.256 | 0.188 |
| 260                                  | -  | -     | 0.553 | 0.465 | 0.369 | 0.337 | 0.316 | 0.297 | 0.259 | 0.192 |
| 265                                  | -  | -     | 0.559 | 0.472 | 0.375 | 0.341 | 0.320 | 0.301 | 0.263 | 0.195 |
| 270                                  | -  | -     | 0.564 | 0.480 | 0.380 | 0.346 | 0.325 | 0.305 | 0.266 | 0.199 |
| 275                                  | -  | -     | 0.570 | 0.487 | 0.385 | 0.351 | 0.329 | 0.309 | 0.270 | 0.202 |
| 280                                  | -  | -     | 0.575 | 0.494 | 0.390 | 0.356 | 0.333 | 0.313 | 0.273 | 0.206 |
| 285                                  | -  | -     | 0.581 | 0.501 | 0.396 | 0.361 | 0.337 | 0.317 | 0.277 | 0.210 |
| 290                                  | -  | -     | 0.586 | 0.508 | 0.401 | 0.365 | 0.341 | 0.321 | 0.281 | 0.213 |
| 295                                  | -  | -     | 0.592 | 0.516 | 0.406 | 0.370 | 0.346 | 0.325 | 0.284 | 0.217 |
| 300                                  | -  | -     | 0.597 | 0.523 | 0.411 | 0.375 | 0.350 | 0.328 | 0.288 | 0.221 |
| 305                                  | -  | -     | 0.603 | 0.530 | 0.417 | 0.380 | 0.354 | 0.332 | 0.291 | 0.224 |
| 310                                  | -  | -     | 0.608 | 0.537 | 0.422 | 0.384 | 0.358 | 0.336 | 0.295 | 0.228 |
| 315                                  | -  | -     | 0.614 | 0.545 | 0.428 | 0.389 | 0.363 | 0.340 | 0.298 | 0.232 |
| 320                                  | -  | -     | 0.619 | 0.552 | 0.437 | 0.394 | 0.367 | 0.344 | 0.302 | 0.235 |
| 325                                  | -  | -     | 0.625 | 0.559 | 0.447 | 0.399 | 0.371 | 0.348 | 0.306 | 0.239 |
| 330                                  | -  | -     | 0.630 | 0.566 | 0.456 | 0.404 | 0.375 | 0.352 | 0.309 | 0.242 |
| 335                                  | -  | -     | 0.636 | 0.574 | 0.466 | 0.408 | 0.380 | 0.356 | 0.313 | 0.246 |
| 340                                  | -  | -     | 0.641 | 0.581 | 0.475 | 0.413 | 0.384 | 0.360 | 0.316 | 0.250 |

Thickness is intumescent only.

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Issued: 14<sup>th</sup> Aug 2019  
Valid to: 31/07/2024



## CERTIFICATE No CF 5725

### Tor Coatings Limited

#### BROSTEEL ULTRA 60

| Table 4 : I-Section Beams 60 Minutes |  |       |       |       |       |       |       |       |       |       |
|--------------------------------------|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Section Factor up to m <sup>-1</sup> | Thickness (mm) Required for a Design Temperature of :- |       |       |       |       |       |       |       |       |       |
|                                      | 350°C  | 400°C | 450°C | 500°C | 550°C | 600°C | 620°C | 650°C | 700°C | 750°C |
| 35                                   | -  | 0.207 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 40                                   | -  | 0.259 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 45                                   | -  | 0.312 | 0.208 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 50                                   | -  | 0.364 | 0.242 | 0.189 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 55                                   | -  | 0.417 | 0.276 | 0.205 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 60                                   | -  | 0.437 | 0.310 | 0.222 | 0.191 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 65                                   | -  | 0.450 | 0.344 | 0.239 | 0.202 | 0.188 | 0.185 | 0.181 | 0.181 | 0.181 |
| 70                                   | -  | 0.464 | 0.378 | 0.255 | 0.214 | 0.195 | 0.191 | 0.184 | 0.181 | 0.181 |
| 75                                   | -  | 0.477 | 0.412 | 0.272 | 0.225 | 0.201 | 0.197 | 0.189 | 0.181 | 0.181 |
| 80                                   | -  | 0.490 | 0.432 | 0.288 | 0.237 | 0.208 | 0.203 | 0.195 | 0.181 | 0.181 |
| 85                                   | -  | 0.504 | 0.442 | 0.305 | 0.248 | 0.215 | 0.209 | 0.200 | 0.181 | 0.181 |
| 90                                   | -  | 0.517 | 0.452 | 0.321 | 0.260 | 0.222 | 0.215 | 0.205 | 0.183 | 0.181 |
| 95                                   | -  | 0.530 | 0.462 | 0.338 | 0.271 | 0.229 | 0.220 | 0.210 | 0.188 | 0.181 |
| 100                                  | -  | 0.543 | 0.472 | 0.355 | 0.283 | 0.236 | 0.226 | 0.215 | 0.192 | 0.181 |
| 105                                  | -  | 0.557 | 0.482 | 0.371 | 0.294 | 0.242 | 0.232 | 0.221 | 0.197 | 0.181 |
| 110                                  | -  | 0.570 | 0.492 | 0.388 | 0.305 | 0.249 | 0.238 | 0.226 | 0.202 | 0.181 |
| 115                                  | -  | 0.583 | 0.502 | 0.404 | 0.317 | 0.256 | 0.244 | 0.231 | 0.207 | 0.181 |
| 120                                  | -  | 0.597 | 0.512 | 0.421 | 0.328 | 0.263 | 0.250 | 0.236 | 0.212 | 0.181 |
| 125                                  | -  | 0.610 | 0.522 | 0.432 | 0.340 | 0.270 | 0.256 | 0.241 | 0.217 | 0.181 |
| 130                                  | -  | 0.623 | 0.532 | 0.441 | 0.351 | 0.276 | 0.262 | 0.247 | 0.222 | 0.181 |
| 135                                  | -  | 0.637 | 0.542 | 0.450 | 0.363 | 0.283 | 0.268 | 0.252 | 0.226 | 0.185 |
| 140                                  | -  | -     | 0.552 | 0.459 | 0.374 | 0.290 | 0.274 | 0.257 | 0.231 | 0.190 |
| 145                                  | -  | -     | 0.562 | 0.468 | 0.386 | 0.297 | 0.280 | 0.262 | 0.236 | 0.195 |
| 150                                  | -  | -     | 0.572 | 0.476 | 0.397 | 0.304 | 0.286 | 0.267 | 0.241 | 0.200 |
| 155                                  | -  | -     | 0.582 | 0.485 | 0.409 | 0.310 | 0.292 | 0.273 | 0.246 | 0.204 |
| 160                                  | -  | -     | 0.592 | 0.494 | 0.420 | 0.317 | 0.298 | 0.278 | 0.251 | 0.209 |
| 165                                  | -  | -     | 0.602 | 0.503 | 0.429 | 0.324 | 0.304 | 0.283 | 0.256 | 0.214 |
| 170                                  | -  | -     | 0.612 | 0.512 | 0.436 | 0.331 | 0.310 | 0.288 | 0.260 | 0.219 |
| 175                                  | -  | -     | 0.622 | 0.521 | 0.443 | 0.338 | 0.316 | 0.293 | 0.265 | 0.224 |
| 180                                  | -  | -     | 0.632 | 0.529 | 0.449 | 0.345 | 0.322 | 0.299 | 0.270 | 0.229 |
| 185                                  | -  | -     | 0.642 | 0.538 | 0.456 | 0.351 | 0.328 | 0.304 | 0.275 | 0.234 |
| 190                                  | -  | -     | -     | 0.547 | 0.463 | 0.358 | 0.334 | 0.309 | 0.280 | 0.238 |
| 195                                  | -  | -     | -     | 0.556 | 0.469 | 0.365 | 0.340 | 0.314 | 0.285 | 0.243 |
| 200                                  | -  | -     | -     | 0.565 | 0.476 | 0.372 | 0.346 | 0.320 | 0.290 | 0.248 |
| 205                                  | -  | -     | -     | 0.574 | 0.483 | 0.379 | 0.352 | 0.325 | 0.294 | 0.253 |
| 210                                  | -  | -     | -     | 0.583 | 0.489 | 0.385 | 0.358 | 0.330 | 0.299 | 0.258 |
| 215                                  | -  | -     | -     | 0.591 | 0.496 | 0.392 | 0.364 | 0.335 | 0.304 | 0.263 |
| 220                                  | -  | -     | -     | 0.600 | 0.503 | 0.399 | 0.370 | 0.340 | 0.309 | 0.268 |
| 225                                  | -  | -     | -     | 0.609 | 0.509 | 0.406 | 0.376 | 0.346 | 0.314 | 0.272 |
| 230                                  | -  | -     | -     | 0.618 | 0.516 | 0.413 | 0.382 | 0.351 | 0.319 | 0.277 |
| 235                                  | -  | -     | -     | 0.627 | 0.523 | 0.420 | 0.388 | 0.356 | 0.323 | 0.282 |
| 240                                  | -  | -     | -     | 0.636 | 0.529 | 0.426 | 0.393 | 0.361 | 0.328 | 0.287 |
| 245                                  | -  | -     | -     | 0.644 | 0.536 | 0.436 | 0.399 | 0.366 | 0.333 | 0.292 |
| 250                                  | -  | -     | -     | -     | 0.543 | 0.445 | 0.405 | 0.372 | 0.338 | 0.297 |
| 255                                  | -  | -     | -     | -     | 0.549 | 0.454 | 0.411 | 0.377 | 0.343 | 0.302 |
| 260                                  | -  | -     | -     | -     | 0.556 | 0.463 | 0.417 | 0.382 | 0.348 | 0.306 |
| 265                                  | -  | -     | -     | -     | 0.563 | 0.472 | 0.423 | 0.387 | 0.353 | 0.311 |
| 270                                  | -  | -     | -     | -     | 0.569 | 0.481 | 0.432 | 0.392 | 0.357 | 0.316 |
| 275                                  | -  | -     | -     | -     | 0.576 | 0.490 | 0.442 | 0.398 | 0.362 | 0.321 |
| 280                                  | -  | -     | -     | -     | 0.582 | 0.499 | 0.452 | 0.403 | 0.367 | 0.326 |
| 285                                  | -  | -     | -     | -     | 0.589 | 0.508 | 0.462 | 0.408 | 0.372 | 0.331 |
| 290                                  | -  | -     | -     | -     | 0.596 | 0.517 | 0.472 | 0.413 | 0.377 | 0.336 |
| 295                                  | -  | -     | -     | -     | 0.602 | 0.526 | 0.483 | 0.419 | 0.382 | 0.340 |
| 300                                  | -  | -     | -     | -     | 0.609 | 0.535 | 0.493 | 0.424 | 0.387 | 0.345 |
| 305                                  | -  | -     | -     | -     | 0.616 | 0.544 | 0.503 | 0.432 | 0.391 | 0.350 |
| 310                                  | -  | -     | -     | -     | 0.622 | 0.553 | 0.513 | 0.443 | 0.396 | 0.355 |
| 315                                  | -  | -     | -     | -     | 0.629 | 0.562 | 0.523 | 0.454 | 0.401 | 0.360 |
| 320                                  | -  | -     | -     | -     | 0.636 | 0.571 | 0.534 | 0.464 | 0.406 | 0.365 |
| 325                                  | -  | -     | -     | -     | 0.642 | 0.581 | 0.544 | 0.475 | 0.411 | 0.370 |
| 330                                  | -  | -     | -     | -     | -     | 0.590 | 0.554 | 0.486 | 0.416 | 0.374 |
| 335                                  | -  | -     | -     | -     | -     | 0.599 | 0.564 | 0.497 | 0.421 | 0.379 |
| 340                                  | -  | -     | -     | -     | -     | 0.608 | 0.574 | 0.508 | 0.425 | 0.384 |

Thickness is intumescent only.

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Issued: 14<sup>th</sup> Aug 2019  
Valid to: 31/07/2024



## CERTIFICATE No CF 5725

### Tor Coatings Limited

#### BROSTEEL ULTRA 60

| Table 5 : I-Section Beams 75 Minutes       |  |       |       |       |       |       |       |       |       |       |
|--|--|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Section<br>Factor up<br>to m <sup>-1</sup> | Thickness (mm) Required for a Design Temperature of :- |       |       |       |       |       |       |       |       |       |
|  | 350°C  | 400°C | 450°C | 500°C | 550°C | 600°C | 620°C | 650°C | 700°C | 750°C |
| 35   | -  | -     | -     | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 40   | -  | -     | -     | 0.222 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 45   | -  | -     | -     | 0.281 | 0.191 | 0.181 | 0.181 | 0.181 | 0.181 | 0.181 |
| 50   | -  | -     | -     | 0.341 | 0.228 | 0.182 | 0.181 | 0.181 | 0.181 | 0.181 |
| 55   | -  | -     | -     | 0.400 | 0.266 | 0.203 | 0.194 | 0.181 | 0.181 | 0.181 |
| 60   | -  | -     | -     | 0.432 | 0.303 | 0.224 | 0.209 | 0.193 | 0.181 | 0.181 |
| 65   | -  | -     | -     | 0.442 | 0.341 | 0.244 | 0.224 | 0.206 | 0.181 | 0.181 |
| 70   | -  | -     | -     | 0.452 | 0.378 | 0.265 | 0.239 | 0.218 | 0.187 | 0.181 |
| 75   | -  | -     | -     | 0.462 | 0.415 | 0.286 | 0.254 | 0.231 | 0.197 | 0.181 |
| 80   | -  | -     | -     | 0.472 | 0.432 | 0.306 | 0.270 | 0.244 | 0.208 | 0.181 |
| 85   | -  | -     | -     | 0.482 | 0.441 | 0.327 | 0.285 | 0.256 | 0.218 | 0.185 |
| 90   | -  | -     | -     | 0.492 | 0.449 | 0.348 | 0.300 | 0.269 | 0.229 | 0.191 |
| 95   | -  | -     | -     | 0.502 | 0.457 | 0.368 | 0.315 | 0.281 | 0.239 | 0.198 |
| 100  | -  | -     | -     | 0.512 | 0.466 | 0.389 | 0.330 | 0.294 | 0.250 | 0.204 |
| 105  | -  | -     | -     | 0.522 | 0.474 | 0.410 | 0.345 | 0.307 | 0.260 | 0.211 |
| 110  | -  | -     | -     | 0.532 | 0.483 | 0.428 | 0.361 | 0.319 | 0.271 | 0.217 |
| 115  | -  | -     | -     | 0.542 | 0.491 | 0.435 | 0.376 | 0.332 | 0.281 | 0.224 |
| 120  | -  | -     | -     | 0.552 | 0.500 | 0.443 | 0.391 | 0.344 | 0.292 | 0.230 |
| 125  | -  | -     | -     | 0.562 | 0.508 | 0.450 | 0.406 | 0.357 | 0.302 | 0.237 |
| 130  | -  | -     | -     | 0.572 | 0.517 | 0.458 | 0.421 | 0.370 | 0.313 | 0.243 |
| 135  | -  | -     | -     | 0.582 | 0.525 | 0.465 | 0.431 | 0.382 | 0.323 | 0.249 |
| 140  | -  | -     | -     | 0.592 | 0.534 | 0.473 | 0.439 | 0.395 | 0.334 | 0.256 |
| 145  | -  | -     | -     | 0.602 | 0.542 | 0.480 | 0.447 | 0.407 | 0.344 | 0.262 |
| 150  | -  | -     | -     | 0.612 | 0.550 | 0.488 | 0.454 | 0.420 | 0.355 | 0.269 |
| 155  | -  | -     | -     | 0.622 | 0.559 | 0.495 | 0.462 | 0.429 | 0.365 | 0.275 |
| 160  | -  | -     | -     | 0.632 | 0.567 | 0.503 | 0.469 | 0.435 | 0.376 | 0.282 |
| 165  | -  | -     | -     | 0.642 | 0.576 | 0.510 | 0.477 | 0.442 | 0.386 | 0.288 |
| 170  | -  | -     | -     | -     | 0.584 | 0.518 | 0.485 | 0.448 | 0.397 | 0.295 |
| 175  | -  | -     | -     | -     | 0.593 | 0.525 | 0.492 | 0.454 | 0.407 | 0.301 |
| 180  | -  | -     | -     | -     | 0.601 | 0.533 | 0.500 | 0.460 | 0.418 | 0.308 |
| 185  | -  | -     | -     | -     | 0.610 | 0.541 | 0.508 | 0.467 | 0.427 | 0.314 |
| 190  | -  | -     | -     | -     | 0.618 | 0.548 | 0.515 | 0.473 | 0.433 | 0.321 |
| 195  | -  | -     | -     | -     | 0.627 | 0.556 | 0.523 | 0.479 | 0.439 | 0.327 |
| 200  | -  | -     | -     | -     | 0.635 | 0.563 | 0.530 | 0.485 | 0.444 | 0.334 |
| 205  | -  | -     | -     | -     | 0.643 | 0.571 | 0.538 | 0.491 | 0.450 | 0.340 |
| 210  | -  | -     | -     | -     | -     | 0.578 | 0.546 | 0.498 | 0.456 | 0.347 |
| 215  | -  | -     | -     | -     | -     | 0.586 | 0.553 | 0.504 | 0.461 | 0.353 |
| 220  | -  | -     | -     | -     | -     | 0.593 | 0.561 | 0.510 | 0.467 | 0.360 |
| 225  | -  | -     | -     | -     | -     | 0.601 | 0.569 | 0.516 | 0.473 | 0.366 |
| 230  | -  | -     | -     | -     | -     | 0.608 | 0.576 | 0.523 | 0.479 | 0.373 |
| 235  | -  | -     | -     | -     | -     | 0.616 | 0.584 | 0.529 | 0.484 | 0.379 |
| 240  | -  | -     | -     | -     | -     | 0.623 | 0.592 | 0.535 | 0.490 | 0.386 |
| 245  | -  | -     | -     | -     | -     | 0.631 | 0.599 | 0.541 | 0.496 | 0.392 |
| 250  | -  | -     | -     | -     | -     | 0.638 | 0.607 | 0.547 | 0.501 | 0.399 |
| 255  | -  | -     | -     | -     | -     | 0.646 | 0.614 | 0.554 | 0.507 | 0.405 |
| 260  | -  | -     | -     | -     | -     | -     | 0.622 | 0.560 | 0.513 | 0.412 |
| 265  | -  | -     | -     | -     | -     | -     | 0.630 | 0.566 | 0.519 | 0.418 |
| 270  | -  | -     | -     | -     | -     | -     | 0.637 | 0.572 | 0.524 | 0.425 |
| 275  | -  | -     | -     | -     | -     | -     | 0.645 | 0.578 | 0.530 | 0.432 |
| 280  | -  | -     | -     | -     | -     | -     | -     | 0.585 | 0.536 | 0.440 |
| 285  | -  | -     | -     | -     | -     | -     | -     | 0.591 | 0.541 | 0.448 |
| 290  | -  | -     | -     | -     | -     | -     | -     | 0.597 | 0.547 | 0.456 |
| 295  | -  | -     | -     | -     | -     | -     | -     | 0.603 | 0.553 | 0.464 |
| 300  | -  | -     | -     | -     | -     | -     | -     | 0.610 | 0.558 | 0.472 |
| 305  | -  | -     | -     | -     | -     | -     | -     | 0.616 | 0.564 | 0.480 |
| 310  | -  | -     | -     | -     | -     | -     | -     | 0.622 | 0.570 | 0.488 |
| 315  | -  | -     | -     | -     | -     | -     | -     | 0.628 | 0.576 | 0.496 |
| 320  | -  | -     | -     | -     | -     | -     | -     | 0.634 | 0.581 | 0.504 |
| 325  | -  | -     | -     | -     | -     | -     | -     | 0.641 | 0.587 | 0.512 |
| 330  | -  | -     | -     | -     | -     | -     | -     | -     | 0.593 | 0.520 |
| 335  | -  | -     | -     | -     | -     | -     | -     | -     | 0.598 | 0.528 |
| 340  | -  | -     | -     | -     | -     | -     | -     | -     | 0.604 | 0.536 |

Thickness is intumescent only.

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Valid to: 31/07/2024





## CERTIFICATE No CF 5725

### Tor Coatings Limited

#### BROSTEEL ULTRA 60

| Table 6 : I-Section Columns 15 Minutes     |  |       |       |       |       |       |       |       |       |
|--|--|-------|-------|-------|-------|-------|-------|-------|-------|
| Section<br>Factor up to<br>m <sup>-1</sup> | Thickness (mm) Required for a Design Temperature of :- |       |       |       |       |       |       |       |       |
|  | 350°C  | 400°C | 450°C | 500°C | 550°C | 600°C | 650°C | 700°C | 750°C |
| 25   | 0.206  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 30   | 0.206  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 35   | 0.206  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 40   | 0.206  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 45   | 0.206  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 50   | 0.206  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 55   | 0.206  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 60   | 0.206  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 65   | 0.206  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 70   | 0.206  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 75   | 0.206  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 80   | 0.206  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 85   | 0.206  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 90   | 0.206  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 95   | 0.206  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 100  | 0.206  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 105  | 0.206  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 110  | 0.206  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 115  | 0.206  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 120  | 0.206  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 125  | 0.206  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 130  | 0.206  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 135  | 0.206  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 140  | 0.206  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 145  | 0.206  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 150  | 0.207  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 155  | 0.210  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 160  | 0.214  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 165  | 0.217  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 170  | 0.221  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 175  | 0.224  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 180  | 0.228  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 185  | 0.231  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 190  | 0.235  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 195  | 0.238  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 200  | 0.242  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 205  | 0.245  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 210  | 0.249  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 215  | 0.252  | 0.181 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 220  | 0.256  | 0.187 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 225  | 0.259  | 0.193 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 230  | 0.263  | 0.199 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 235  | 0.266  | 0.205 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 240  | 0.270  | 0.211 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 245  | 0.273  | 0.217 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 250  | 0.277  | 0.223 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 255  | 0.280  | 0.228 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 260  | 0.284  | 0.231 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 265  | 0.287  | 0.234 | 0.180 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 270  | 0.291  | 0.237 | 0.184 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 275  | 0.294  | 0.239 | 0.188 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 280  | 0.298  | 0.242 | 0.192 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 285  | 0.301  | 0.244 | 0.196 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 290  | 0.305  | 0.247 | 0.200 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 295  | 0.308  | 0.250 | 0.204 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 300  | 0.312  | 0.252 | 0.208 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 305  | 0.315  | 0.255 | 0.212 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 310  | 0.319  | 0.258 | 0.216 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 315  | 0.322  | 0.260 | 0.220 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 320  | 0.326  | 0.263 | 0.224 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 325  | 0.329  | 0.265 | 0.228 | 0.180 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 330  | 0.333  | 0.268 | 0.231 | 0.183 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 335  | 0.336  | 0.271 | 0.233 | 0.186 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 340  | 0.340  | 0.273 | 0.235 | 0.189 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 345  | 0.343  | 0.276 | 0.237 | 0.192 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 350  | 0.347  | 0.279 | 0.239 | 0.196 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 355  | 0.350  | 0.281 | 0.241 | 0.199 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 360  | 0.354  | 0.284 | 0.243 | 0.202 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 365  | 0.357  | 0.286 | 0.245 | 0.205 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 370  | 0.361  | 0.289 | 0.247 | 0.208 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 375  | 0.364  | 0.292 | 0.249 | 0.212 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |

Thickness is intumescent only. Results also apply to beams with 4-side fire exposure subject to maximum DFT of 0.646 mm.

Signed  
E/057

Issued: 14<sup>th</sup> Aug 2019  
Valid to: 31/07/2024



## CERTIFICATE No CF 5725

### Tor Coatings Limited

#### BROSTEEL ULTRA 60

| Table 7 : I-Section Columns 30 Minutes     |  |       |       |       |       |       |       |       |       |
|--|--|-------|-------|-------|-------|-------|-------|-------|-------|
| Section<br>Factor up to<br>m <sup>-1</sup> | Thickness (mm) Required for a Design Temperature of :- |       |       |       |       |       |       |       |       |
|  | 350°C  | 400°C | 450°C | 500°C | 550°C | 600°C | 650°C | 700°C | 750°C |
| 25   | 0.176  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 30   | 0.176  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 35   | 0.176  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 40   | 0.176  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 45   | 0.181  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 50   | 0.190  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 55   | 0.199  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 60   | 0.207  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 65   | 0.216  | 0.179 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 70   | 0.225  | 0.185 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 75   | 0.233  | 0.191 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 80   | 0.242  | 0.197 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 85   | 0.250  | 0.203 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 90   | 0.258  | 0.209 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 95   | 0.267  | 0.215 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 100  | 0.275  | 0.221 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 105  | 0.283  | 0.226 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 110  | 0.292  | 0.232 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 115  | 0.300  | 0.238 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 120  | 0.308  | 0.243 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 125  | 0.317  | 0.249 | 0.180 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 130  | 0.325  | 0.255 | 0.189 | 0.189 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 135  | 0.333  | 0.260 | 0.199 | 0.195 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 140  | 0.341  | 0.266 | 0.208 | 0.199 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 145  | 0.350  | 0.272 | 0.217 | 0.203 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 150  | 0.358  | 0.277 | 0.226 | 0.207 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 155  | 0.366  | 0.283 | 0.232 | 0.211 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 160  | 0.375  | 0.289 | 0.237 | 0.215 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 165  | 0.383  | 0.294 | 0.241 | 0.219 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 170  | 0.391  | 0.300 | 0.245 | 0.222 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 175  | 0.400  | 0.306 | 0.250 | 0.226 | 0.181 | 0.176 | 0.176 | 0.176 | 0.176 |
| 180  | 0.408  | 0.311 | 0.254 | 0.229 | 0.188 | 0.176 | 0.176 | 0.176 | 0.176 |
| 185  | 0.416  | 0.317 | 0.259 | 0.233 | 0.195 | 0.176 | 0.176 | 0.176 | 0.176 |
| 190  | 0.425  | 0.323 | 0.263 | 0.237 | 0.202 | 0.176 | 0.176 | 0.176 | 0.176 |
| 195  | 0.433  | 0.328 | 0.267 | 0.240 | 0.209 | 0.178 | 0.176 | 0.176 | 0.176 |
| 200  | 0.441  | 0.334 | 0.272 | 0.244 | 0.217 | 0.184 | 0.176 | 0.176 | 0.176 |
| 205  | 0.448  | 0.339 | 0.276 | 0.247 | 0.224 | 0.189 | 0.176 | 0.176 | 0.176 |
| 210  | 0.456  | 0.345 | 0.281 | 0.251 | 0.230 | 0.194 | 0.176 | 0.176 | 0.176 |
| 215  | 0.464  | 0.351 | 0.285 | 0.255 | 0.233 | 0.200 | 0.176 | 0.176 | 0.176 |
| 220  | 0.471  | 0.356 | 0.289 | 0.258 | 0.236 | 0.205 | 0.176 | 0.176 | 0.176 |
| 225  | 0.479  | 0.362 | 0.294 | 0.262 | 0.239 | 0.210 | 0.179 | 0.176 | 0.176 |
| 230  | 0.486  | 0.368 | 0.298 | 0.265 | 0.242 | 0.215 | 0.183 | 0.176 | 0.176 |
| 235  | 0.494  | 0.373 | 0.303 | 0.269 | 0.245 | 0.221 | 0.187 | 0.176 | 0.176 |
| 240  | 0.502  | 0.379 | 0.307 | 0.273 | 0.248 | 0.226 | 0.191 | 0.176 | 0.176 |
| 245  | 0.509  | 0.385 | 0.311 | 0.276 | 0.251 | 0.230 | 0.195 | 0.176 | 0.176 |
| 250  | 0.517  | 0.390 | 0.316 | 0.280 | 0.254 | 0.233 | 0.198 | 0.176 | 0.176 |
| 255  | 0.525  | 0.396 | 0.320 | 0.283 | 0.257 | 0.235 | 0.202 | 0.176 | 0.176 |
| 260  | 0.532  | 0.402 | 0.325 | 0.287 | 0.260 | 0.238 | 0.206 | 0.176 | 0.176 |
| 265  | 0.540  | 0.407 | 0.329 | 0.291 | 0.263 | 0.240 | 0.210 | 0.177 | 0.176 |
| 270  | 0.548  | 0.413 | 0.333 | 0.294 | 0.266 | 0.243 | 0.214 | 0.180 | 0.176 |
| 275  | 0.555  | 0.419 | 0.338 | 0.298 | 0.269 | 0.245 | 0.217 | 0.182 | 0.176 |
| 280  | 0.563  | 0.424 | 0.342 | 0.302 | 0.272 | 0.248 | 0.221 | 0.185 | 0.176 |
| 285  | 0.571  | 0.430 | 0.347 | 0.305 | 0.275 | 0.250 | 0.225 | 0.187 | 0.176 |
| 290  | 0.578  | 0.440 | 0.351 | 0.309 | 0.278 | 0.253 | 0.229 | 0.190 | 0.176 |
| 295  | 0.586  | 0.452 | 0.355 | 0.312 | 0.281 | 0.255 | 0.231 | 0.193 | 0.176 |
| 300  | 0.594  | 0.464 | 0.360 | 0.316 | 0.284 | 0.258 | 0.233 | 0.195 | 0.176 |
| 305  | 0.601  | 0.475 | 0.364 | 0.320 | 0.287 | 0.260 | 0.235 | 0.198 | 0.176 |
| 310  | 0.609  | 0.487 | 0.369 | 0.323 | 0.290 | 0.263 | 0.237 | 0.200 | 0.176 |
| 315  | 0.617  | 0.499 | 0.373 | 0.327 | 0.293 | 0.265 | 0.239 | 0.203 | 0.176 |
| 320  | 0.624  | 0.510 | 0.377 | 0.330 | 0.296 | 0.268 | 0.242 | 0.205 | 0.176 |
| 325  | 0.632  | 0.522 | 0.382 | 0.334 | 0.299 | 0.270 | 0.244 | 0.208 | 0.176 |
| 330  | 0.640  | 0.534 | 0.386 | 0.338 | 0.302 | 0.273 | 0.246 | 0.210 | 0.176 |
| 335  | 0.647  | 0.546 | 0.391 | 0.341 | 0.305 | 0.275 | 0.248 | 0.213 | 0.176 |
| 340  | 0.655  | 0.557 | 0.395 | 0.345 | 0.308 | 0.278 | 0.250 | 0.215 | 0.176 |
| 345  | 0.663  | 0.569 | 0.399 | 0.348 | 0.311 | 0.280 | 0.252 | 0.218 | 0.177 |
| 350  | 0.670  | 0.581 | 0.404 | 0.352 | 0.314 | 0.283 | 0.254 | 0.221 | 0.178 |
| 355  | 0.678  | 0.592 | 0.408 | 0.356 | 0.317 | 0.285 | 0.256 | 0.223 | 0.180 |
| 360  | 0.685  | 0.604 | 0.413 | 0.359 | 0.320 | 0.288 | 0.258 | 0.226 | 0.181 |
| 365  | 0.693  | 0.616 | 0.417 | 0.363 | 0.323 | 0.290 | 0.260 | 0.228 | 0.182 |
| 370  | 0.701  | 0.628 | 0.421 | 0.366 | 0.326 | 0.293 | 0.263 | 0.230 | 0.184 |
| 375  | 0.708  | 0.639 | 0.426 | 0.370 | 0.329 | 0.295 | 0.265 | 0.232 | 0.185 |

Thickness is intumescent only. Results also apply to beams with 4-side fire exposure subject to maximum DFT of 0.646 mm.

Signed  
E/057



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## CERTIFICATE No CF 5725

### Tor Coatings Limited

#### BROSTEEL ULTRA 60

| Table 8 : I-Section Columns 45 Minutes |  |       |       |       |       |       |       |       |       |
|--|--|-------|-------|-------|-------|-------|-------|-------|-------|
| Section Factor up to m <sup>-1</sup>   | Thickness (mm) Required for a Design Temperature of :- |       |       |       |       |       |       |       |       |
|  | 350°C  | 400°C | 450°C | 500°C | 550°C | 600°C | 650°C | 700°C | 750°C |
| 25                                     | 0.268  | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 30                                     | 0.274  | 0.179 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 35                                     | 0.334  | 0.194 | 0.180 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 40                                     | 0.395  | 0.210 | 0.187 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 45                                     | 0.456  | 0.225 | 0.194 | 0.179 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 50                                     | -  | 0.241 | 0.200 | 0.184 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 55                                     | -  | 0.256 | 0.207 | 0.189 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 60                                     | -  | 0.272 | 0.214 | 0.194 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 65                                     | -  | 0.287 | 0.220 | 0.199 | 0.180 | 0.176 | 0.176 | 0.176 | 0.176 |
| 70                                     | -  | 0.303 | 0.227 | 0.204 | 0.184 | 0.176 | 0.176 | 0.176 | 0.176 |
| 75                                     | -  | 0.318 | 0.234 | 0.209 | 0.188 | 0.176 | 0.176 | 0.176 | 0.176 |
| 80                                     | -  | 0.334 | 0.241 | 0.214 | 0.192 | 0.176 | 0.176 | 0.176 | 0.176 |
| 85                                     | -  | 0.349 | 0.249 | 0.219 | 0.196 | 0.176 | 0.176 | 0.176 | 0.176 |
| 90                                     | -  | 0.365 | 0.256 | 0.224 | 0.200 | 0.176 | 0.176 | 0.176 | 0.176 |
| 95                                     | -  | 0.381 | 0.263 | 0.229 | 0.204 | 0.176 | 0.176 | 0.176 | 0.176 |
| 100                                    | -  | 0.396 | 0.270 | 0.235 | 0.209 | 0.176 | 0.176 | 0.176 | 0.176 |
| 105                                    | -  | 0.412 | 0.278 | 0.241 | 0.213 | 0.178 | 0.178 | 0.176 | 0.176 |
| 110                                    | -  | 0.427 | 0.285 | 0.246 | 0.217 | 0.183 | 0.183 | 0.176 | 0.176 |
| 115                                    | -  | 0.437 | 0.292 | 0.252 | 0.221 | 0.189 | 0.189 | 0.176 | 0.176 |
| 120                                    | -  | 0.446 | 0.299 | 0.258 | 0.225 | 0.195 | 0.195 | 0.176 | 0.176 |
| 125                                    | -  | 0.455 | 0.307 | 0.264 | 0.229 | 0.201 | 0.201 | 0.176 | 0.176 |
| 130                                    | -  | 0.463 | 0.314 | 0.269 | 0.234 | 0.206 | 0.206 | 0.176 | 0.176 |
| 135                                    | -  | 0.472 | 0.321 | 0.275 | 0.238 | 0.212 | 0.206 | 0.176 | 0.176 |
| 140                                    | -  | 0.481 | 0.328 | 0.281 | 0.243 | 0.218 | 0.206 | 0.176 | 0.176 |
| 145                                    | -  | 0.489 | 0.335 | 0.287 | 0.247 | 0.223 | 0.210 | 0.176 | 0.176 |
| 150                                    | -  | 0.498 | 0.343 | 0.292 | 0.252 | 0.229 | 0.213 | 0.176 | 0.176 |
| 155                                    | -  | 0.507 | 0.350 | 0.298 | 0.256 | 0.233 | 0.217 | 0.176 | 0.176 |
| 160                                    | -  | 0.515 | 0.357 | 0.304 | 0.261 | 0.237 | 0.221 | 0.176 | 0.176 |
| 165                                    | -  | 0.524 | 0.364 | 0.310 | 0.266 | 0.241 | 0.224 | 0.176 | 0.177 |
| 170                                    | -  | 0.533 | 0.372 | 0.315 | 0.270 | 0.245 | 0.228 | 0.176 | 0.179 |
| 175                                    | -  | 0.541 | 0.379 | 0.321 | 0.275 | 0.249 | 0.231 | 0.184 | 0.182 |
| 180                                    | -  | 0.550 | 0.386 | 0.327 | 0.279 | 0.253 | 0.235 | 0.192 | 0.185 |
| 185                                    | -  | 0.558 | 0.393 | 0.332 | 0.284 | 0.257 | 0.238 | 0.200 | 0.187 |
| 190                                    | -  | 0.567 | 0.401 | 0.338 | 0.288 | 0.261 | 0.242 | 0.208 | 0.190 |
| 195                                    | -  | 0.576 | 0.408 | 0.344 | 0.293 | 0.266 | 0.245 | 0.217 | 0.193 |
| 200                                    | -  | 0.584 | 0.415 | 0.350 | 0.298 | 0.270 | 0.249 | 0.225 | 0.196 |
| 205                                    | -  | 0.593 | 0.422 | 0.355 | 0.302 | 0.274 | 0.253 | 0.231 | 0.198 |
| 210                                    | -  | 0.602 | 0.430 | 0.361 | 0.307 | 0.278 | 0.256 | 0.234 | 0.201 |
| 215                                    | -  | 0.610 | 0.438 | 0.367 | 0.311 | 0.282 | 0.260 | 0.237 | 0.204 |
| 220                                    | -  | 0.619 | 0.447 | 0.373 | 0.316 | 0.286 | 0.263 | 0.240 | 0.207 |
| 225                                    | -  | 0.628 | 0.457 | 0.378 | 0.321 | 0.290 | 0.267 | 0.243 | 0.209 |
| 230                                    | -  | 0.636 | 0.466 | 0.384 | 0.325 | 0.294 | 0.270 | 0.246 | 0.212 |
| 235                                    | -  | 0.645 | 0.475 | 0.390 | 0.330 | 0.298 | 0.274 | 0.249 | 0.215 |
| 240                                    | -  | 0.653 | 0.484 | 0.396 | 0.334 | 0.302 | 0.277 | 0.252 | 0.217 |
| 245                                    | -  | 0.662 | 0.493 | 0.401 | 0.339 | 0.306 | 0.281 | 0.255 | 0.220 |
| 250                                    | -  | 0.671 | 0.503 | 0.407 | 0.343 | 0.310 | 0.284 | 0.258 | 0.223 |
| 255                                    | -  | 0.679 | 0.512 | 0.413 | 0.348 | 0.314 | 0.288 | 0.261 | 0.226 |
| 260                                    | -  | 0.688 | 0.521 | 0.419 | 0.353 | 0.318 | 0.292 | 0.264 | 0.228 |
| 265                                    | -  | 0.697 | 0.530 | 0.424 | 0.357 | 0.322 | 0.295 | 0.267 | 0.231 |
| 270                                    | -  | 0.705 | 0.539 | 0.430 | 0.362 | 0.326 | 0.299 | 0.270 | 0.234 |
| 275                                    | -  | -     | 0.548 | 0.442 | 0.366 | 0.330 | 0.302 | 0.273 | 0.236 |
| 280                                    | -  | -     | 0.558 | 0.455 | 0.371 | 0.334 | 0.306 | 0.276 | 0.239 |
| 285                                    | -  | -     | 0.567 | 0.469 | 0.376 | 0.339 | 0.309 | 0.279 | 0.241 |
| 290                                    | -  | -     | 0.576 | 0.482 | 0.380 | 0.343 | 0.313 | 0.282 | 0.244 |
| 295                                    | -  | -     | 0.585 | 0.495 | 0.385 | 0.347 | 0.316 | 0.285 | 0.246 |
| 300                                    | -  | -     | 0.594 | 0.509 | 0.389 | 0.351 | 0.320 | 0.288 | 0.249 |
| 305                                    | -  | -     | 0.604 | 0.522 | 0.394 | 0.355 | 0.323 | 0.291 | 0.252 |
| 310                                    | -  | -     | 0.613 | 0.535 | 0.398 | 0.359 | 0.327 | 0.294 | 0.254 |
| 315                                    | -  | -     | 0.622 | 0.549 | 0.403 | 0.363 | 0.331 | 0.297 | 0.257 |
| 320                                    | -  | -     | 0.631 | 0.562 | 0.408 | 0.367 | 0.334 | 0.300 | 0.259 |
| 325                                    | -  | -     | 0.640 | 0.575 | 0.412 | 0.371 | 0.338 | 0.303 | 0.262 |
| 330                                    | -  | -     | 0.649 | 0.589 | 0.417 | 0.375 | 0.341 | 0.306 | 0.264 |
| 335                                    | -  | -     | 0.659 | 0.602 | 0.421 | 0.379 | 0.345 | 0.309 | 0.267 |
| 340                                    | -  | -     | 0.668 | 0.615 | 0.426 | 0.383 | 0.348 | 0.312 | 0.270 |
| 345                                    | -  | -     | 0.677 | 0.629 | 0.431 | 0.387 | 0.352 | 0.315 | 0.272 |
| 350                                    | -  | -     | 0.686 | 0.642 | 0.447 | 0.391 | 0.355 | 0.318 | 0.275 |
| 355                                    | -  | -     | 0.695 | 0.655 | 0.464 | 0.395 | 0.359 | 0.322 | 0.277 |
| 360                                    | -  | -     | 0.705 | 0.669 | 0.482 | 0.399 | 0.362 | 0.325 | 0.280 |
| 365                                    | -  | -     | -     | 0.682 | 0.499 | 0.403 | 0.366 | 0.328 | 0.282 |
| 370                                    | -  | -     | -     | 0.695 | 0.517 | 0.407 | 0.370 | 0.331 | 0.285 |
| 375                                    | -  | -     | -     | 0.709 | 0.535 | 0.412 | 0.373 | 0.334 | 0.288 |

Thickness is intumescent only. Results also apply to beams with 4-side fire exposure subject to maximum DFT of 0.646 mm.

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E/057



Issued: 14<sup>th</sup> Aug 2019  
Valid to: 31/07/2024



## CERTIFICATE No CF 5725

### Tor Coatings Limited

#### BROSTEEL ULTRA 60

| Section<br>Factor up to<br>m <sup>-1</sup> | Table 9 : I-Section Columns 60 Minutes                 |       |       |       |       |       |       |       |       |
|--|--|-------|-------|-------|-------|-------|-------|-------|-------|
|  | Thickness (mm) Required for a Design Temperature of :- |       |       |       |       |       |       |       |       |
|  | 350°C  | 400°C | 450°C | 500°C | 550°C | 600°C | 650°C | 700°C | 750°C |
| 25   | -  | -     | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 30   | -  | -     | 0.231 | 0.188 | 0.181 | 0.176 | 0.176 | 0.176 | 0.176 |
| 35   | -  | -     | 0.279 | 0.197 | 0.187 | 0.178 | 0.176 | 0.176 | 0.176 |
| 40   | -  | -     | 0.307 | 0.205 | 0.193 | 0.183 | 0.176 | 0.176 | 0.176 |
| 45   | -  | -     | 0.334 | 0.213 | 0.198 | 0.187 | 0.176 | 0.176 | 0.176 |
| 50   | -  | -     | 0.362 | 0.222 | 0.204 | 0.192 | 0.180 | 0.176 | 0.176 |
| 55   | -  | -     | 0.389 | 0.230 | 0.210 | 0.197 | 0.184 | 0.176 | 0.176 |
| 60   | -  | -     | 0.417 | 0.238 | 0.216 | 0.202 | 0.189 | 0.176 | 0.176 |
| 65   | -  | -     | 0.435 | 0.247 | 0.222 | 0.207 | 0.193 | 0.176 | 0.176 |
| 70   | -  | -     | 0.444 | 0.255 | 0.227 | 0.212 | 0.197 | 0.178 | 0.176 |
| 75   | -  | -     | 0.453 | 0.263 | 0.234 | 0.216 | 0.201 | 0.181 | 0.176 |
| 80   | -  | -     | 0.461 | 0.272 | 0.241 | 0.221 | 0.205 | 0.185 | 0.176 |
| 85   | -  | -     | 0.470 | 0.280 | 0.248 | 0.226 | 0.209 | 0.189 | 0.176 |
| 90   | -  | -     | 0.479 | 0.288 | 0.255 | 0.231 | 0.213 | 0.192 | 0.176 |
| 95   | -  | -     | 0.487 | 0.297 | 0.262 | 0.237 | 0.217 | 0.196 | 0.176 |
| 100  | -  | -     | 0.496 | 0.305 | 0.269 | 0.243 | 0.221 | 0.200 | 0.176 |
| 105  | -  | -     | 0.505 | 0.313 | 0.276 | 0.249 | 0.225 | 0.203 | 0.176 |
| 110  | -  | -     | 0.513 | 0.322 | 0.283 | 0.255 | 0.230 | 0.207 | 0.176 |
| 115  | -  | -     | 0.522 | 0.330 | 0.291 | 0.260 | 0.235 | 0.211 | 0.176 |
| 120  | -  | -     | 0.531 | 0.338 | 0.298 | 0.266 | 0.240 | 0.214 | 0.176 |
| 125  | -  | -     | 0.539 | 0.347 | 0.305 | 0.272 | 0.244 | 0.218 | 0.176 |
| 130  | -  | -     | 0.548 | 0.355 | 0.312 | 0.278 | 0.249 | 0.222 | 0.176 |
| 135  | -  | -     | 0.557 | 0.363 | 0.319 | 0.284 | 0.254 | 0.225 | 0.176 |
| 140  | -  | -     | 0.565 | 0.372 | 0.326 | 0.290 | 0.259 | 0.229 | 0.176 |
| 145  | -  | -     | 0.574 | 0.380 | 0.333 | 0.296 | 0.264 | 0.234 | 0.178 |
| 150  | -  | -     | 0.583 | 0.389 | 0.340 | 0.301 | 0.269 | 0.238 | 0.188 |
| 155  | -  | -     | 0.592 | 0.397 | 0.347 | 0.307 | 0.274 | 0.242 | 0.197 |
| 160  | -  | -     | 0.600 | 0.405 | 0.354 | 0.313 | 0.279 | 0.247 | 0.207 |
| 165  | -  | -     | 0.609 | 0.414 | 0.361 | 0.319 | 0.284 | 0.251 | 0.216 |
| 170  | -  | -     | 0.618 | 0.422 | 0.368 | 0.325 | 0.289 | 0.255 | 0.225 |
| 175  | -  | -     | 0.626 | 0.430 | 0.375 | 0.331 | 0.294 | 0.260 | 0.231 |
| 180  | -  | -     | 0.635 | 0.446 | 0.382 | 0.336 | 0.299 | 0.264 | 0.235 |
| 185  | -  | -     | 0.644 | 0.461 | 0.389 | 0.342 | 0.304 | 0.269 | 0.239 |
| 190  | -  | -     | 0.652 | 0.477 | 0.396 | 0.348 | 0.309 | 0.273 | 0.243 |
| 195  | -  | -     | 0.661 | 0.493 | 0.404 | 0.354 | 0.313 | 0.277 | 0.247 |
| 200  | -  | -     | 0.670 | 0.509 | 0.411 | 0.360 | 0.318 | 0.282 | 0.251 |
| 205  | -  | -     | 0.678 | 0.525 | 0.418 | 0.366 | 0.323 | 0.286 | 0.255 |
| 210  | -  | -     | 0.687 | 0.541 | 0.425 | 0.371 | 0.328 | 0.291 | 0.259 |
| 215  | -  | -     | 0.696 | 0.557 | 0.432 | 0.377 | 0.333 | 0.295 | 0.263 |
| 220  | -  | -     | 0.704 | 0.573 | 0.444 | 0.383 | 0.338 | 0.299 | 0.267 |
| 225  | -  | -     | 0.713 | 0.589 | 0.455 | 0.389 | 0.343 | 0.304 | 0.270 |
| 230  | -  | -     | -     | 0.605 | 0.467 | 0.395 | 0.348 | 0.308 | 0.274 |
| 235  | -  | -     | -     | 0.621 | 0.479 | 0.401 | 0.353 | 0.313 | 0.278 |
| 240  | -  | -     | -     | 0.637 | 0.490 | 0.406 | 0.358 | 0.317 | 0.282 |
| 245  | -  | -     | -     | 0.653 | 0.502 | 0.412 | 0.363 | 0.321 | 0.286 |
| 250  | -  | -     | -     | 0.668 | 0.513 | 0.418 | 0.368 | 0.326 | 0.290 |
| 255  | -  | -     | -     | 0.684 | 0.525 | 0.424 | 0.373 | 0.330 | 0.294 |
| 260  | -  | -     | -     | 0.700 | 0.537 | 0.430 | 0.378 | 0.335 | 0.298 |
| 265  | -  | -     | -     | -     | 0.548 | 0.442 | 0.382 | 0.339 | 0.302 |
| 270  | -  | -     | -     | -     | 0.560 | 0.455 | 0.387 | 0.343 | 0.306 |
| 275  | -  | -     | -     | -     | 0.571 | 0.468 | 0.392 | 0.348 | 0.310 |
| 280  | -  | -     | -     | -     | 0.583 | 0.481 | 0.397 | 0.352 | 0.313 |
| 285  | -  | -     | -     | -     | 0.595 | 0.495 | 0.402 | 0.356 | 0.317 |
| 290  | -  | -     | -     | -     | 0.606 | 0.508 | 0.407 | 0.361 | 0.321 |
| 295  | -  | -     | -     | -     | 0.618 | 0.521 | 0.412 | 0.365 | 0.325 |
| 300  | -  | -     | -     | -     | 0.629 | 0.535 | 0.417 | 0.370 | 0.329 |
| 305  | -  | -     | -     | -     | 0.641 | 0.548 | 0.422 | 0.374 | 0.333 |
| 310  | -  | -     | -     | -     | 0.653 | 0.561 | 0.427 | 0.378 | 0.337 |
| 315  | -  | -     | -     | -     | 0.664 | 0.574 | 0.433 | 0.383 | 0.341 |
| 320  | -  | -     | -     | -     | 0.676 | 0.588 | 0.449 | 0.387 | 0.345 |
| 325  | -  | -     | -     | -     | 0.687 | 0.601 | 0.464 | 0.392 | 0.349 |
| 330  | -  | -     | -     | -     | 0.699 | 0.614 | 0.480 | 0.396 | 0.352 |
| 335  | -  | -     | -     | -     | 0.711 | 0.627 | 0.495 | 0.400 | 0.356 |
| 340  | -  | -     | -     | -     | -     | 0.641 | 0.511 | 0.405 | 0.360 |
| 345  | -  | -     | -     | -     | -     | 0.654 | 0.526 | 0.409 | 0.364 |
| 350  | -  | -     | -     | -     | -     | 0.667 | 0.542 | 0.414 | 0.368 |
| 355  | -  | -     | -     | -     | -     | 0.680 | 0.557 | 0.418 | 0.372 |
| 360  | -  | -     | -     | -     | -     | 0.694 | 0.573 | 0.422 | 0.376 |
| 365  | -  | -     | -     | -     | -     | 0.707 | 0.588 | 0.427 | 0.380 |
| 370  | -  | -     | -     | -     | -     | -     | 0.604 | 0.431 | 0.384 |
| 375  | -  | -     | -     | -     | -     | -     | 0.619 | 0.450 | 0.388 |

Thickness is intumescent only. Results also apply to beams with 4-side fire exposure subject to maximum DFT of 0.646 mm.

Signed  
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Issued: 14<sup>th</sup> Aug 2019  
Valid to: 31/07/2024



## CERTIFICATE No CF 5725

### Tor Coatings Limited

#### BROSTEEL ULTRA 60

| Table 10 : I-Section Columns 75 Minutes    |  |       |       |       |       |       |       |       |       |
|--|--|-------|-------|-------|-------|-------|-------|-------|-------|
| Section<br>Factor up to<br>m <sup>-1</sup> | Thickness (mm) Required for a Design Temperature of :- |       |       |       |       |       |       |       |       |
|  | 350°C  | 400°C | 450°C | 500°C | 550°C | 600°C | 650°C | 700°C | 750°C |
| 25   | -  | -     | -     | 0.311 | 0.176 | 0.176 | 0.176 | 0.176 | 0.176 |
| 30   | -  | -     | -     | 0.331 | 0.222 | 0.190 | 0.183 | 0.176 | 0.176 |
| 35   | -  | -     | -     | 0.366 | 0.263 | 0.196 | 0.188 | 0.180 | 0.176 |
| 40   | -  | -     | -     | 0.402 | 0.280 | 0.203 | 0.194 | 0.185 | 0.176 |
| 45   | -  | -     | -     | 0.432 | 0.298 | 0.209 | 0.199 | 0.189 | 0.179 |
| 50   | -  | -     | -     | 0.441 | 0.316 | 0.216 | 0.205 | 0.194 | 0.182 |
| 55   | -  | -     | -     | 0.450 | 0.334 | 0.222 | 0.210 | 0.198 | 0.185 |
| 60   | -  | -     | -     | 0.458 | 0.352 | 0.229 | 0.215 | 0.203 | 0.189 |
| 65   | -  | -     | -     | 0.467 | 0.369 | 0.237 | 0.221 | 0.207 | 0.192 |
| 70   | -  | -     | -     | 0.476 | 0.387 | 0.245 | 0.226 | 0.211 | 0.195 |
| 75   | -  | -     | -     | 0.484 | 0.405 | 0.253 | 0.233 | 0.216 | 0.199 |
| 80   | -  | -     | -     | 0.493 | 0.423 | 0.261 | 0.240 | 0.220 | 0.202 |
| 85   | -  | -     | -     | 0.502 | 0.436 | 0.269 | 0.247 | 0.225 | 0.205 |
| 90   | -  | -     | -     | 0.510 | 0.444 | 0.277 | 0.254 | 0.229 | 0.209 |
| 95   | -  | -     | -     | 0.519 | 0.453 | 0.286 | 0.261 | 0.235 | 0.212 |
| 100  | -  | -     | -     | 0.528 | 0.462 | 0.294 | 0.268 | 0.241 | 0.215 |
| 105  | -  | -     | -     | 0.536 | 0.470 | 0.302 | 0.274 | 0.247 | 0.219 |
| 110  | -  | -     | -     | 0.545 | 0.479 | 0.310 | 0.281 | 0.253 | 0.222 |
| 115  | -  | -     | -     | 0.554 | 0.488 | 0.318 | 0.288 | 0.259 | 0.225 |
| 120  | -  | -     | -     | 0.562 | 0.496 | 0.326 | 0.295 | 0.265 | 0.229 |
| 125  | -  | -     | -     | 0.571 | 0.505 | 0.335 | 0.302 | 0.271 | 0.234 |
| 130  | -  | -     | -     | 0.580 | 0.514 | 0.343 | 0.309 | 0.277 | 0.239 |
| 135  | -  | -     | -     | 0.588 | 0.522 | 0.351 | 0.316 | 0.283 | 0.244 |
| 140  | -  | -     | -     | 0.597 | 0.531 | 0.359 | 0.323 | 0.289 | 0.249 |
| 145  | -  | -     | -     | 0.606 | 0.540 | 0.367 | 0.330 | 0.295 | 0.255 |
| 150  | -  | -     | -     | 0.614 | 0.548 | 0.375 | 0.337 | 0.301 | 0.260 |
| 155  | -  | -     | -     | 0.623 | 0.557 | 0.383 | 0.344 | 0.307 | 0.265 |
| 160  | -  | -     | -     | 0.631 | 0.566 | 0.392 | 0.351 | 0.313 | 0.271 |
| 165  | -  | -     | -     | 0.640 | 0.574 | 0.400 | 0.358 | 0.319 | 0.276 |
| 170  | -  | -     | -     | 0.649 | 0.583 | 0.408 | 0.365 | 0.325 | 0.281 |
| 175  | -  | -     | -     | 0.657 | 0.592 | 0.416 | 0.372 | 0.331 | 0.287 |
| 180  | -  | -     | -     | 0.666 | 0.600 | 0.424 | 0.379 | 0.337 | 0.292 |
| 185  | -  | -     | -     | 0.675 | 0.609 | 0.434 | 0.386 | 0.343 | 0.297 |
| 190  | -  | -     | -     | 0.683 | 0.618 | 0.450 | 0.393 | 0.349 | 0.302 |
| 195  | -  | -     | -     | 0.692 | 0.626 | 0.466 | 0.400 | 0.355 | 0.308 |
| 200  | -  | -     | -     | 0.701 | 0.635 | 0.482 | 0.407 | 0.361 | 0.313 |
| 205  | -  | -     | -     | 0.709 | 0.643 | 0.498 | 0.414 | 0.367 | 0.318 |
| 210  | -  | -     | -     | -     | 0.652 | 0.514 | 0.421 | 0.373 | 0.324 |
| 215  | -  | -     | -     | -     | 0.661 | 0.530 | 0.428 | 0.379 | 0.329 |
| 220  | -  | -     | -     | -     | 0.669 | 0.546 | 0.438 | 0.385 | 0.334 |
| 225  | -  | -     | -     | -     | 0.678 | 0.562 | 0.449 | 0.391 | 0.339 |
| 230  | -  | -     | -     | -     | 0.687 | 0.579 | 0.460 | 0.397 | 0.345 |
| 235  | -  | -     | -     | -     | 0.695 | 0.595 | 0.472 | 0.403 | 0.350 |
| 240  | -  | -     | -     | -     | 0.704 | 0.611 | 0.483 | 0.409 | 0.355 |
| 245  | -  | -     | -     | -     | 0.713 | 0.627 | 0.494 | 0.415 | 0.361 |
| 250  | -  | -     | -     | -     | -     | 0.643 | 0.506 | 0.421 | 0.366 |
| 255  | -  | -     | -     | -     | -     | 0.659 | 0.517 | 0.427 | 0.371 |
| 260  | -  | -     | -     | -     | -     | 0.675 | 0.528 | 0.436 | 0.377 |
| 265  | -  | -     | -     | -     | -     | 0.691 | 0.539 | 0.450 | 0.382 |
| 270  | -  | -     | -     | -     | -     | 0.707 | 0.551 | 0.464 | 0.387 |
| 275  | -  | -     | -     | -     | -     | -     | 0.562 | 0.478 | 0.392 |
| 280  | -  | -     | -     | -     | -     | -     | 0.573 | 0.491 | 0.398 |
| 285  | -  | -     | -     | -     | -     | -     | 0.585 | 0.505 | 0.403 |
| 290  | -  | -     | -     | -     | -     | -     | 0.596 | 0.519 | 0.408 |
| 295  | -  | -     | -     | -     | -     | -     | 0.607 | 0.532 | 0.414 |
| 300  | -  | -     | -     | -     | -     | -     | 0.618 | 0.546 | 0.419 |
| 305  | -  | -     | -     | -     | -     | -     | 0.630 | 0.560 | 0.424 |
| 310  | -  | -     | -     | -     | -     | -     | 0.641 | 0.573 | 0.430 |
| 315  | -  | -     | -     | -     | -     | -     | 0.652 | 0.587 | 0.448 |
| 320  | -  | -     | -     | -     | -     | -     | 0.663 | 0.601 | 0.473 |
| 325  | -  | -     | -     | -     | -     | -     | 0.675 | 0.614 | 0.497 |
| 330  | -  | -     | -     | -     | -     | -     | 0.686 | 0.628 | 0.521 |
| 335  | -  | -     | -     | -     | -     | -     | 0.697 | 0.642 | 0.545 |
| 340  | -  | -     | -     | -     | -     | -     | 0.709 | 0.655 | 0.569 |
| 345  | -  | -     | -     | -     | -     | -     | -     | 0.669 | 0.594 |
| 350  | -  | -     | -     | -     | -     | -     | -     | 0.683 | 0.618 |
| 355  | -  | -     | -     | -     | -     | -     | -     | 0.696 | 0.642 |
| 360  | -  | -     | -     | -     | -     | -     | -     | 0.710 | 0.666 |
| 365  | -  | -     | -     | -     | -     | -     | -     | -     | 0.690 |

Thickness is intumescent only. Results also apply to beams with 4-side fire exposure subject to maximum DFT of 0.646 mm.

Signed  
E/057

Issued: 14<sup>th</sup> Aug 2019  
Valid to: 31/07/2024



## CERTIFICATE No CF 5725

### Tor Coatings Limited

#### BROSTEEL ULTRA 60

| Table 11 : I-Section Columns 90 Minutes |  |       |       |       |       |       |       |       |       |
|---|--|-------|-------|-------|-------|-------|-------|-------|-------|
| Section Factor up to m <sup>-1</sup>    | Thickness (mm) Required for a Design Temperature of :- |       |       |       |       |       |       |       |       |
|   | 350°C  | 400°C | 450°C | 500°C | 550°C | 600°C | 650°C | 700°C | 750°C |
| 25                                      | -  | -     | -     | -     | 0.416 | 0.285 | 0.176 | 0.176 | 0.176 |
| 30                                      | -  | -     | -     | -     | 0.423 | 0.307 | 0.202 | 0.189 | 0.182 |
| 35                                      | -  | -     | -     | -     | 0.432 | 0.333 | 0.239 | 0.194 | 0.186 |
| 40                                      | -  | -     | -     | -     | 0.441 | 0.359 | 0.251 | 0.200 | 0.191 |
| 45                                      | -  | -     | -     | -     | 0.450 | 0.384 | 0.263 | 0.206 | 0.195 |
| 50                                      | -  | -     | -     | -     | 0.459 | 0.410 | 0.274 | 0.211 | 0.199 |
| 55                                      | -  | -     | -     | -     | 0.468 | 0.433 | 0.286 | 0.217 | 0.204 |
| 60                                      | -  | -     | -     | -     | 0.477 | 0.441 | 0.298 | 0.222 | 0.208 |
| 65                                      | -  | -     | -     | -     | 0.485 | 0.449 | 0.310 | 0.228 | 0.212 |
| 70                                      | -  | -     | -     | -     | 0.494 | 0.458 | 0.322 | 0.236 | 0.217 |
| 75                                      | -  | -     | -     | -     | 0.503 | 0.466 | 0.333 | 0.244 | 0.221 |
| 80                                      | -  | -     | -     | -     | 0.512 | 0.474 | 0.345 | 0.251 | 0.225 |
| 85                                      | -  | -     | -     | -     | 0.521 | 0.483 | 0.357 | 0.259 | 0.230 |
| 90                                      | -  | -     | -     | -     | 0.530 | 0.491 | 0.369 | 0.267 | 0.237 |
| 95                                      | -  | -     | -     | -     | 0.539 | 0.499 | 0.381 | 0.275 | 0.244 |
| 100                                     | -  | -     | -     | -     | 0.548 | 0.507 | 0.392 | 0.283 | 0.251 |
| 105                                     | -  | -     | -     | -     | 0.556 | 0.516 | 0.404 | 0.291 | 0.258 |
| 110                                     | -  | -     | -     | -     | 0.565 | 0.524 | 0.416 | 0.299 | 0.265 |
| 115                                     | -  | -     | -     | -     | 0.574 | 0.532 | 0.428 | 0.307 | 0.272 |
| 120                                     | -  | -     | -     | -     | 0.583 | 0.541 | 0.439 | 0.315 | 0.279 |
| 125                                     | -  | -     | -     | -     | 0.592 | 0.549 | 0.449 | 0.323 | 0.286 |
| 130                                     | -  | -     | -     | -     | 0.601 | 0.557 | 0.460 | 0.330 | 0.293 |
| 135                                     | -  | -     | -     | -     | 0.610 | 0.566 | 0.470 | 0.338 | 0.300 |
| 140                                     | -  | -     | -     | -     | 0.618 | 0.574 | 0.481 | 0.346 | 0.307 |
| 145                                     | -  | -     | -     | -     | 0.627 | 0.582 | 0.491 | 0.354 | 0.314 |
| 150                                     | -  | -     | -     | -     | 0.636 | 0.590 | 0.502 | 0.362 | 0.321 |
| 155                                     | -  | -     | -     | -     | 0.645 | 0.599 | 0.512 | 0.370 | 0.328 |
| 160                                     | -  | -     | -     | -     | 0.654 | 0.607 | 0.523 | 0.378 | 0.335 |
| 165                                     | -  | -     | -     | -     | 0.663 | 0.616 | 0.533 | 0.386 | 0.342 |
| 170                                     | -  | -     | -     | -     | 0.672 | 0.624 | 0.544 | 0.394 | 0.349 |
| 175                                     | -  | -     | -     | -     | 0.681 | 0.632 | 0.554 | 0.401 | 0.356 |
| 180                                     | -  | -     | -     | -     | 0.689 | 0.640 | 0.565 | 0.409 | 0.363 |
| 185                                     | -  | -     | -     | -     | 0.698 | 0.649 | 0.575 | 0.417 | 0.370 |
| 190                                     | -  | -     | -     | -     | 0.707 | 0.657 | 0.586 | 0.425 | 0.377 |
| 195                                     | -  | -     | -     | -     | -     | 0.665 | 0.597 | 0.435 | 0.384 |
| 200                                     | -  | -     | -     | -     | -     | 0.674 | 0.607 | 0.452 | 0.391 |
| 205                                     | -  | -     | -     | -     | -     | 0.682 | 0.616 | 0.469 | 0.398 |
| 210                                     | -  | -     | -     | -     | -     | 0.690 | 0.628 | 0.486 | 0.405 |
| 215                                     | -  | -     | -     | -     | -     | 0.698 | 0.639 | 0.502 | 0.412 |
| 220                                     | -  | -     | -     | -     | -     | 0.707 | 0.649 | 0.519 | 0.419 |
| 225                                     | -  | -     | -     | -     | -     | -     | 0.660 | 0.536 | 0.426 |
| 230                                     | -  | -     | -     | -     | -     | -     | 0.670 | 0.553 | 0.436 |
| 235                                     | -  | -     | -     | -     | -     | -     | 0.681 | 0.569 | 0.453 |
| 240                                     | -  | -     | -     | -     | -     | -     | 0.691 | 0.586 | 0.470 |
| 245                                     | -  | -     | -     | -     | -     | -     | 0.702 | 0.603 | 0.486 |
| 250                                     | -  | -     | -     | -     | -     | -     | 0.712 | 0.620 | 0.503 |
| 255                                     | -  | -     | -     | -     | -     | -     | -     | 0.637 | 0.519 |
| 260                                     | -  | -     | -     | -     | -     | -     | -     | 0.653 | 0.536 |
| 265                                     | -  | -     | -     | -     | -     | -     | -     | 0.670 | 0.553 |
| 270                                     | -  | -     | -     | -     | -     | -     | -     | 0.687 | 0.569 |
| 275                                     | -  | -     | -     | -     | -     | -     | -     | 0.704 | 0.586 |
| 280                                     | -  | -     | -     | -     | -     | -     | -     | -     | 0.602 |
| 285                                     | -  | -     | -     | -     | -     | -     | -     | -     | 0.619 |
| 290                                     | -  | -     | -     | -     | -     | -     | -     | -     | 0.636 |
| 295                                     | -  | -     | -     | -     | -     | -     | -     | -     | 0.652 |
| 300                                     | -  | -     | -     | -     | -     | -     | -     | -     | 0.669 |
| 305                                     | -  | -     | -     | -     | -     | -     | -     | -     | 0.685 |
| 310                                     | -  | -     | -     | -     | -     | -     | -     | -     | 0.702 |

Thickness is intumescent only. Results not applicable to beams with 4-side fire exposure.

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Issued: 14<sup>th</sup> Aug 2019  
Valid to: 31/07/2024



## CERTIFICATE No CF 5725

### Tor Coatings Limited

#### BROSTEEL ULTRA 60

| Table 12: Hollow Section Columns 15 Minutes |   |       |       |       |       |       |       |       |       |       |
|---|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Section Factor up to m <sup>-1</sup>        | Thickness (mm) Required for a Design Temperature of |       |       |       |       |       |       |       |       |       |
|   | 350°C   | 400°C | 450°C | 500°C | 520°C | 550°C | 600°C | 650°C | 700°C | 750°C |
| 75  | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 80  | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 85  | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 90  | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 95  | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 100   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 105   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 110   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 115   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 120   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 125   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 130   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 135   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 140   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 145   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 150   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 155   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 160   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 165   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 170   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 175   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 180   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 185   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 190   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 195   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 200   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 205   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 210   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 215   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 220   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 225   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 230   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 235   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 240   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 245   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 250   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 255   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 260   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 265   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 270   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 275   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 280   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 285   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 290   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 295   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 300   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 305   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 310   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 315   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 320   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |

Thickness is intumescent only. Results apply to both circular and square/rectangular hollow columns. Results also apply to square/rectangular hollow section beams with 4-side fire exposure subject to maximum DFT of 0.796mm.

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Issued: 14<sup>th</sup> Aug 2019  
Valid to: 31/07/2024





## CERTIFICATE No CF 5725

### Tor Coatings Limited

#### BROSTEEL ULTRA 60

| Table 13: Hollow Section Columns 30 Minutes |   |       |       |       |       |       |       |       |       |       |
|---|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Section Factor up to m <sup>-1</sup>        | Thickness (mm) Required for a Design Temperature of |       |       |       |       |       |       |       |       |       |
|   | 350°C   | 400°C | 450°C | 500°C | 520°C | 550°C | 600°C | 650°C | 700°C | 750°C |
| 75  | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 80  | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 85  | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 90  | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 95  | 0.369   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 100   | 0.391   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 105   | 0.414   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 110   | 0.437   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 115   | 0.460   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 120   | 0.483   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 125   | 0.506   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 130   | 0.529   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 135   | 0.551   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 140   | 0.574   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 145   | 0.597   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 150   | 0.620   | 0.377 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 155   | 0.643   | 0.404 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 160   | 0.666   | 0.432 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 165   | 0.689   | 0.460 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 170   | 0.711   | 0.487 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 175   | 0.734   | 0.515 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 180   | 0.765   | 0.543 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 185   | 0.823   | 0.570 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 190   | 0.881   | 0.598 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 195   | 0.939   | 0.626 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 200   | 0.997   | 0.653 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 205   | 1.055   | 0.681 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 210   | 1.113   | 0.709 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 215   | 1.171   | 0.737 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 220   | 1.229   | 0.778 | 0.386 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 225   | 1.287   | 0.837 | 0.428 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 230   | -   | 0.896 | 0.470 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 235   | -   | 0.955 | 0.512 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 240   | -   | 1.015 | 0.554 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 245   | -   | 1.074 | 0.596 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 250   | -   | 1.133 | 0.638 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 255   | -   | 1.192 | 0.680 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 260   | -   | 1.251 | 0.722 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 265   | -   | -     | 0.775 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 270   | -   | -     | 0.858 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 275   | -   | -     | 0.941 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 280   | -   | -     | 1.023 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 285   | -   | -     | 1.106 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 290   | -   | -     | 1.188 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 295   | -   | -     | 1.271 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 300   | -   | -     | -     | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 305   | -   | -     | -     | 0.464 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 310   | -   | -     | -     | 0.565 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 315   | -   | -     | -     | 0.667 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 320   | -   | -     | -     | 0.768 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |

Thickness is intumescent only. Results apply to both circular and square/rectangular hollow columns. Results also apply to square/rectangular hollow section beams with 4-side fire exposure subject to maximum DFT of 0.796mm.

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Issued: 14<sup>th</sup> Aug 2019  
Valid to: 31/07/2024





## CERTIFICATE No CF 5725

### Tor Coatings Limited

#### BROSTEEL ULTRA 60

| Table 14: Hollow Section Columns 45 Minutes |   |       |       |       |       |       |       |       |       |       |
|---|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Section Factor up to m <sup>-1</sup>        | Thickness (mm) Required for a Design Temperature of |       |       |       |       |       |       |       |       |       |
|   | 350°C   | 400°C | 450°C | 500°C | 520°C | 550°C | 600°C | 650°C | 700°C | 750°C |
| 75  | 0.823   | 0.549 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 80  | 0.859   | 0.549 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 85  | 0.900   | 0.577 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 90  | 0.940   | 0.669 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 95  | 0.980   | 0.754 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 100   | 1.020   | 0.779 | 0.381 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 105   | 1.060   | 0.804 | 0.427 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 110   | 1.101   | 0.828 | 0.473 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 115   | 1.141   | 0.853 | 0.518 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 120   | 1.181   | 0.878 | 0.564 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 125   | 1.221   | 0.902 | 0.610 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 130   | 1.262   | 0.927 | 0.656 | 0.377 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 135   | -   | 0.952 | 0.701 | 0.407 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 140   | -   | 0.976 | 0.747 | 0.436 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 145   | -   | 1.001 | 0.781 | 0.465 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 150   | -   | 1.026 | 0.814 | 0.495 | 0.382 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 155   | -   | 1.051 | 0.847 | 0.524 | 0.414 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 160   | -   | 1.075 | 0.880 | 0.553 | 0.447 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 165   | -   | 1.100 | 0.913 | 0.583 | 0.479 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 170   | -   | 1.125 | 0.946 | 0.612 | 0.511 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 175   | -   | 1.149 | 0.979 | 0.642 | 0.543 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 180   | -   | 1.174 | 1.012 | 0.671 | 0.575 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 185   | -   | 1.199 | 1.045 | 0.700 | 0.607 | 0.400 | 0.365 | 0.365 | 0.365 | 0.365 |
| 190   | -   | 1.223 | 1.078 | 0.730 | 0.640 | 0.439 | 0.365 | 0.365 | 0.365 | 0.365 |
| 195   | -   | 1.248 | 1.111 | 0.766 | 0.672 | 0.477 | 0.365 | 0.365 | 0.365 | 0.365 |
| 200   | -   | 1.273 | 1.144 | 0.826 | 0.704 | 0.515 | 0.365 | 0.365 | 0.365 | 0.365 |
| 205   | -   | -     | 1.177 | 0.885 | 0.736 | 0.554 | 0.365 | 0.365 | 0.365 | 0.365 |
| 210   | -   | -     | 1.210 | 0.945 | 0.784 | 0.592 | 0.365 | 0.365 | 0.365 | 0.365 |
| 215   | -   | -     | 1.243 | 1.004 | 0.848 | 0.630 | 0.365 | 0.365 | 0.365 | 0.365 |
| 220   | -   | -     | 1.276 | 1.064 | 0.911 | 0.669 | 0.365 | 0.365 | 0.365 | 0.365 |
| 225   | -   | -     | -     | 1.123 | 0.974 | 0.707 | 0.365 | 0.365 | 0.365 | 0.365 |
| 230   | -   | -     | -     | 1.183 | 1.037 | 0.746 | 0.365 | 0.365 | 0.365 | 0.365 |
| 235   | -   | -     | -     | 1.242 | 1.101 | 0.812 | 0.365 | 0.365 | 0.365 | 0.365 |
| 240   | -   | -     | -     | -     | 1.164 | 0.884 | 0.365 | 0.365 | 0.365 | 0.365 |
| 245   | -   | -     | -     | -     | 1.227 | 0.956 | 0.365 | 0.365 | 0.365 | 0.365 |
| 250   | -   | -     | -     | -     | 1.291 | 1.027 | 0.365 | 0.365 | 0.365 | 0.365 |
| 255   | -   | -     | -     | -     | -     | 1.099 | 0.365 | 0.365 | 0.365 | 0.365 |
| 260   | -   | -     | -     | -     | -     | 1.171 | 0.442 | 0.365 | 0.365 | 0.365 |
| 265   | -   | -     | -     | -     | -     | 1.243 | 0.520 | 0.365 | 0.365 | 0.365 |
| 270   | -   | -     | -     | -     | -     | -     | 0.599 | 0.365 | 0.365 | 0.365 |
| 275   | -   | -     | -     | -     | -     | -     | 0.677 | 0.365 | 0.365 | 0.365 |
| 280   | -   | -     | -     | -     | -     | -     | 0.755 | 0.365 | 0.365 | 0.365 |
| 285   | -   | -     | -     | -     | -     | -     | 0.829 | 0.365 | 0.365 | 0.365 |
| 290   | -   | -     | -     | -     | -     | -     | 0.903 | 0.365 | 0.365 | 0.365 |
| 295   | -   | -     | -     | -     | -     | -     | 0.977 | 0.365 | 0.365 | 0.365 |
| 300   | -   | -     | -     | -     | -     | -     | 1.051 | 0.365 | 0.365 | 0.365 |
| 305   | -   | -     | -     | -     | -     | -     | 1.124 | 0.365 | 0.365 | 0.365 |
| 310   | -   | -     | -     | -     | -     | -     | 1.198 | 0.365 | 0.365 | 0.365 |
| 315   | -   | -     | -     | -     | -     | -     | 1.272 | 0.365 | 0.365 | 0.365 |
| 320   | -   | -     | -     | -     | -     | -     | -     | 0.365 | 0.365 | 0.365 |

Thickness is intumescent only. Results apply to both circular and square/rectangular hollow columns. Results also apply to square/rectangular hollow section beams with 4-side fire exposure subject to maximum DFT of 0.796mm.

#### BROSTEEL ULTRA 60

Signed  
E/057

Issued: 14<sup>th</sup> Aug 2019  
Valid to: 31/07/2024



## CERTIFICATE No CF 5725

### Tor Coatings Limited

Table 15: Hollow Section Columns 60 Minutes

| Section Factor up to m <sup>-1</sup> | Thickness (mm) Required for a Design Temperature of |       |       |       |       |       |       |       |       |       |
|--------------------------------------|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|
|                                      | 350°C   | 400°C | 450°C | 500°C | 520°C | 550°C | 600°C | 650°C | 700°C | 750°C |
| 75                                   | -   | -     | 0.836 | 0.567 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 80                                   | -   | -     | 0.872 | 0.567 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 85                                   | -   | -     | 0.909 | 0.567 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 90                                   | -   | -     | 0.945 | 0.748 | 0.401 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 95                                   | -   | -     | 0.982 | 0.778 | 0.541 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 100                                  | -   | -     | 1.018 | 0.804 | 0.682 | 0.379 | 0.365 | 0.365 | 0.365 | 0.365 |
| 105                                  | -   | -     | 1.055 | 0.830 | 0.765 | 0.442 | 0.365 | 0.365 | 0.365 | 0.365 |
| 110                                  | -   | -     | 1.091 | 0.856 | 0.791 | 0.506 | 0.365 | 0.365 | 0.365 | 0.365 |
| 115                                  | -   | -     | 1.127 | 0.882 | 0.816 | 0.569 | 0.365 | 0.365 | 0.365 | 0.365 |
| 120                                  | -   | -     | 1.164 | 0.908 | 0.842 | 0.633 | 0.365 | 0.365 | 0.365 | 0.365 |
| 125                                  | -   | -     | 1.200 | 0.934 | 0.868 | 0.696 | 0.377 | 0.365 | 0.365 | 0.365 |
| 130                                  | -   | -     | 1.237 | 0.960 | 0.893 | 0.756 | 0.407 | 0.365 | 0.365 | 0.365 |
| 135                                  | -   | -     | 1.273 | 0.987 | 0.919 | 0.787 | 0.437 | 0.365 | 0.365 | 0.365 |
| 140                                  | -   | -     | -     | 1.013 | 0.945 | 0.819 | 0.467 | 0.365 | 0.365 | 0.365 |
| 145                                  | -   | -     | -     | 1.039 | 0.970 | 0.851 | 0.497 | 0.365 | 0.365 | 0.365 |
| 150                                  | -   | -     | -     | 1.065 | 0.996 | 0.883 | 0.527 | 0.365 | 0.365 | 0.365 |
| 155                                  | -   | -     | -     | 1.091 | 1.022 | 0.914 | 0.557 | 0.365 | 0.365 | 0.365 |
| 160                                  | -   | -     | -     | 1.117 | 1.047 | 0.946 | 0.586 | 0.365 | 0.365 | 0.365 |
| 165                                  | -   | -     | -     | 1.143 | 1.073 | 0.978 | 0.616 | 0.365 | 0.365 | 0.365 |
| 170                                  | -   | -     | -     | 1.170 | 1.099 | 1.009 | 0.646 | 0.365 | 0.365 | 0.365 |
| 175                                  | -   | -     | -     | 1.196 | 1.124 | 1.041 | 0.676 | 0.372 | 0.365 | 0.365 |
| 180                                  | -   | -     | -     | 1.222 | 1.150 | 1.073 | 0.706 | 0.411 | 0.365 | 0.365 |
| 185                                  | -   | -     | -     | 1.248 | 1.176 | 1.104 | 0.736 | 0.449 | 0.365 | 0.365 |
| 190                                  | -   | -     | -     | 1.274 | 1.202 | 1.136 | 0.782 | 0.488 | 0.365 | 0.365 |
| 195                                  | -   | -     | -     | -     | 1.227 | 1.168 | 0.849 | 0.527 | 0.365 | 0.365 |
| 200                                  | -   | -     | -     | -     | 1.253 | 1.199 | 0.915 | 0.565 | 0.365 | 0.365 |
| 205                                  | -   | -     | -     | -     | 1.279 | 1.231 | 0.981 | 0.604 | 0.365 | 0.365 |
| 210                                  | -   | -     | -     | -     | -     | 1.263 | 1.048 | 0.642 | 0.365 | 0.365 |
| 215                                  | -   | -     | -     | -     | -     | -     | 1.114 | 0.681 | 0.365 | 0.365 |
| 220                                  | -   | -     | -     | -     | -     | -     | 1.180 | 0.720 | 0.365 | 0.365 |
| 225                                  | -   | -     | -     | -     | -     | -     | 1.247 | 0.760 | 0.365 | 0.365 |
| 230                                  | -   | -     | -     | -     | -     | -     | -     | 0.806 | 0.365 | 0.365 |
| 235                                  | -   | -     | -     | -     | -     | -     | -     | 0.852 | 0.365 | 0.365 |
| 240                                  | -   | -     | -     | -     | -     | -     | -     | 0.899 | 0.365 | 0.365 |
| 245                                  | -   | -     | -     | -     | -     | -     | -     | 0.945 | 0.365 | 0.365 |
| 250                                  | -   | -     | -     | -     | -     | -     | -     | 0.992 | 0.365 | 0.365 |
| 255                                  | -   | -     | -     | -     | -     | -     | -     | 1.038 | 0.365 | 0.365 |
| 260                                  | -   | -     | -     | -     | -     | -     | -     | 1.084 | 0.441 | 0.365 |
| 265                                  | -   | -     | -     | -     | -     | -     | -     | 1.131 | 0.525 | 0.365 |
| 270                                  | -   | -     | -     | -     | -     | -     | -     | 1.177 | 0.609 | 0.365 |
| 275                                  | -   | -     | -     | -     | -     | -     | -     | 1.224 | 0.693 | 0.365 |
| 280                                  | -   | -     | -     | -     | -     | -     | -     | 1.270 | 0.766 | 0.365 |
| 285                                  | -   | -     | -     | -     | -     | -     | -     | -     | 0.812 | 0.365 |
| 290                                  | -   | -     | -     | -     | -     | -     | -     | -     | 0.858 | 0.365 |
| 295                                  | -   | -     | -     | -     | -     | -     | -     | -     | 0.904 | 0.365 |
| 300                                  | -   | -     | -     | -     | -     | -     | -     | -     | 0.950 | 0.365 |
| 305                                  | -   | -     | -     | -     | -     | -     | -     | -     | 0.996 | 0.365 |
| 310                                  | -   | -     | -     | -     | -     | -     | -     | -     | 1.042 | 0.365 |
| 315                                  | -   | -     | -     | -     | -     | -     | -     | -     | 1.088 | 0.365 |
| 320                                  | -   | -     | -     | -     | -     | -     | -     | -     | 1.134 | 0.365 |

Thickness is intumescent only. Results apply to both circular and square/rectangular hollow columns. Results also apply to square/rectangular hollow section beams with 4-side fire exposure subject to maximum DFT of 0.796mm.

### BROSTEEL ULTRA 60

Signed  
E/057

Issued: 14<sup>th</sup> Aug 2019  
Valid to: 31/07/2024



## CERTIFICATE No CF 5725

### Tor Coatings Limited

| Table 16 : Square/Rectangular Hollow Section Beams 15 Minutes |   |       |       |       |       |       |       |       |       |       |       |
|---|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Section Factor<br>$m^{-1}$                                    | Thickness (mm) Required for a Design Temperature of |       |       |       |       |       |       |       |       |       |       |
|   | 350°C   | 400°C | 450°C | 500°C | 520°C | 550°C | 600°C | 620°C | 650°C | 700°C | 750°C |
| 80  | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 85  | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 90  | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 95  | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 100   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 105   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 110   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 115   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 120   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 125   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 130   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 135   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 140   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 145   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 150   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 155   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 160   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 165   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 170   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 175   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 180   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 185   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 190   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 195   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 200   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 205   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 210   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 215   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 220   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 225   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 230   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 235   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 240   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 245   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 250   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 255   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 260   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 265   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 270   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 275   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 280   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 285   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 290   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 295   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 300   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 305   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 310   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 315   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 320   | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |

Thickness is intumescent only.

**BROSTEEL ULTRA 60**

Signed  
E/057

Issued: 14<sup>th</sup> Aug 2019  
Valid to: 31/07/2024



## CERTIFICATE No CF 5725

### Tor Coatings Limited

| Table 17 : Square/Rectangular Hollow Section Beams 30 Minutes |   |       |       |       |       |       |       |       |       |       |       |
|---|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Section Factor<br>m <sup>-1</sup>                             | Thickness (mm) Required for a Design Temperature of |       |       |       |       |       |       |       |       |       |       |
|   | 350°C   | 400°C | 450°C | 500°C | 520°C | 550°C | 600°C | 620°C | 650°C | 700°C | 750°C |
| 80  | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 85  | 0.365   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 90  | 0.369   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 95  | 0.394   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 100   | 0.419   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 105   | 0.443   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 110   | 0.468   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 115   | 0.492   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 120   | 0.517   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 125   | 0.541   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 130   | 0.566   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 135   | 0.591   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 140   | 0.615   | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 145   | 0.640   | 0.383 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 150   | 0.664   | 0.411 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 155   | 0.689   | 0.438 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 160   | 0.714   | 0.465 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 165   | 0.738   | 0.492 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 170   | 0.777   | 0.519 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 175   | -   | 0.546 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 180   | -   | 0.573 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 185   | -   | 0.600 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 190   | -   | 0.627 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 195   | -   | 0.655 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 200   | -   | 0.682 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 205   | -   | 0.709 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 210   | -   | 0.736 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 215   | -   | 0.778 | 0.369 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 220   | -   | -     | 0.410 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 225   | -   | -     | 0.452 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 230   | -   | -     | 0.493 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 235   | -   | -     | 0.534 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 240   | -   | -     | 0.576 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 245   | -   | -     | 0.617 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 250   | -   | -     | 0.658 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 255   | -   | -     | 0.700 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 260   | -   | -     | 0.741 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 265   | -   | -     | 0.782 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 270   | -   | -     | -     | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 275   | -   | -     | -     | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 280   | -   | -     | -     | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 285   | -   | -     | -     | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 290   | -   | -     | -     | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 295   | -   | -     | -     | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 300   | -   | -     | -     | 0.380 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 305   | -   | -     | -     | 0.489 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 310   | -   | -     | -     | 0.598 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 315   | -   | -     | -     | 0.707 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 320   | -   | -     | -     | -     | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |

Thickness is intumescent only.

### BROSTEEL ULTRA 60

Signed  
E/057

Issued: 14<sup>th</sup> Aug 2019  
Valid to: 31/07/2024



## CERTIFICATE No CF 5725

### Tor Coatings Limited

| Table 18 : Square/Rectangular Hollow Section Beams 45 Minutes |   |       |       |       |       |       |       |       |       |       |       |
|---|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Section Factor<br>m <sup>-1</sup>                             | Thickness (mm) Required for a Design Temperature of |       |       |       |       |       |       |       |       |       |       |
|   | 350°C   | 400°C | 450°C | 500°C | 520°C | 550°C | 600°C | 620°C | 650°C | 700°C | 750°C |
| 80  | 0.750   | 0.435 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 85  | 0.750   | 0.468 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 90  | 0.750   | 0.502 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 95  | -   | 0.535 | 0.376 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 100   | -   | 0.568 | 0.404 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 105   | -   | 0.601 | 0.433 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 110   | -   | 0.634 | 0.461 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 115   | -   | 0.667 | 0.490 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 120   | -   | 0.700 | 0.518 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 125   | -   | 0.733 | 0.547 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 130   | -   | 0.772 | 0.575 | 0.383 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 135   | -   | -     | 0.604 | 0.412 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 140   | -   | -     | 0.632 | 0.442 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 145   | -   | -     | 0.660 | 0.471 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 150   | -   | -     | 0.689 | 0.500 | 0.392 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 155   | -   | -     | 0.717 | 0.529 | 0.424 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 160   | -   | -     | 0.746 | 0.558 | 0.456 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 165   | -   | -     | 0.794 | 0.588 | 0.488 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 170   | -   | -     | -     | 0.617 | 0.521 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 175   | -   | -     | -     | 0.646 | 0.553 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 180   | -   | -     | -     | 0.675 | 0.585 | 0.386 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 185   | -   | -     | -     | 0.704 | 0.617 | 0.424 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 190   | -   | -     | -     | 0.734 | 0.650 | 0.463 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 195   | -   | -     | -     | 0.776 | 0.682 | 0.501 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 200   | -   | -     | -     | -     | 0.714 | 0.540 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 205   | -   | -     | -     | -     | 0.746 | 0.578 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 210   | -   | -     | -     | -     | 0.779 | 0.617 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 215   | -   | -     | -     | -     | -     | 0.655 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 220   | -   | -     | -     | -     | -     | 0.694 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 225   | -   | -     | -     | -     | -     | 0.732 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 230   | -   | -     | -     | -     | -     | 0.788 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 235   | -   | -     | -     | -     | -     | -     | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 240   | -   | -     | -     | -     | -     | -     | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 245   | -   | -     | -     | -     | -     | -     | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 250   | -   | -     | -     | -     | -     | -     | 0.381 | 0.365 | 0.365 | 0.365 | 0.365 |
| 255   | -   | -     | -     | -     | -     | -     | 0.455 | 0.365 | 0.365 | 0.365 | 0.365 |
| 260   | -   | -     | -     | -     | -     | -     | 0.529 | 0.365 | 0.365 | 0.365 | 0.365 |
| 265   | -   | -     | -     | -     | -     | -     | 0.603 | 0.365 | 0.365 | 0.365 | 0.365 |
| 270   | -   | -     | -     | -     | -     | -     | 0.676 | 0.365 | 0.365 | 0.365 | 0.365 |
| 275   | -   | -     | -     | -     | -     | -     | 0.750 | 0.365 | 0.365 | 0.365 | 0.365 |
| 280   | -   | -     | -     | -     | -     | -     | -     | 0.365 | 0.365 | 0.365 | 0.365 |
| 285   | -   | -     | -     | -     | -     | -     | -     | 0.365 | 0.365 | 0.365 | 0.365 |
| 290   | -   | -     | -     | -     | -     | -     | -     | 0.456 | 0.365 | 0.365 | 0.365 |
| 295   | -   | -     | -     | -     | -     | -     | -     | 0.658 | 0.365 | 0.365 | 0.365 |
| 300   | -   | -     | -     | -     | -     | -     | -     | 0.790 | 0.365 | 0.365 | 0.365 |
| 305   | -   | -     | -     | -     | -     | -     | -     | -     | 0.365 | 0.365 | 0.365 |
| 310   | -   | -     | -     | -     | -     | -     | -     | -     | 0.365 | 0.365 | 0.365 |
| 315   | -   | -     | -     | -     | -     | -     | -     | -     | 0.365 | 0.365 | 0.365 |
| 320   | -   | -     | -     | -     | -     | -     | -     | -     | 0.365 | 0.365 | 0.365 |

Thickness is intumescent only.

Signed  
E/057

Issued: 14<sup>th</sup> Aug 2019  
Valid to: 31/07/2024



## CERTIFICATE No CF 5725

### Tor Coatings Limited

#### BROSTEEL ULTRA 60

| Table 19 : Square/Rectangular Hollow Section Beams 60 Minutes |   |       |       |       |       |       |       |       |       |       |       |
|---|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Section Factor<br>m <sup>-1</sup>                             | Thickness (mm) Required for a Design Temperature of |       |       |       |       |       |       |       |       |       |       |
|   | 350°C   | 400°C | 450°C | 500°C | 520°C | 550°C | 600°C | 620°C | 650°C | 700°C | 750°C |
| 80  | -   | 0.750 | 0.524 | 0.411 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 85  | -   | 0.750 | 0.559 | 0.442 | 0.394 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 90  | -   | -     | 0.594 | 0.473 | 0.424 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 95  | -   | -     | 0.629 | 0.504 | 0.455 | 0.383 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 100   | -   | -     | 0.664 | 0.535 | 0.486 | 0.413 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 105   | -   | -     | 0.699 | 0.566 | 0.516 | 0.443 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 110   | -   | -     | 0.734 | 0.598 | 0.547 | 0.473 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 115   | -   | -     | 0.769 | 0.629 | 0.578 | 0.503 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 120   | -   | -     | -     | 0.660 | 0.608 | 0.533 | 0.365 | 0.365 | 0.365 | 0.365 | 0.365 |
| 125   | -   | -     | -     | 0.691 | 0.639 | 0.563 | 0.393 | 0.365 | 0.365 | 0.365 | 0.365 |
| 130   | -   | -     | -     | 0.722 | 0.670 | 0.593 | 0.423 | 0.365 | 0.365 | 0.365 | 0.365 |
| 135   | -   | -     | -     | 0.756 | 0.700 | 0.622 | 0.453 | 0.365 | 0.365 | 0.365 | 0.365 |
| 140   | -   | -     | -     | 0.789 | 0.731 | 0.652 | 0.483 | 0.386 | 0.365 | 0.365 | 0.365 |
| 145   | -   | -     | -     | -     | 0.771 | 0.682 | 0.513 | 0.417 | 0.365 | 0.365 | 0.365 |
| 150   | -   | -     | -     | -     | -     | 0.712 | 0.543 | 0.449 | 0.365 | 0.365 | 0.365 |
| 155   | -   | -     | -     | -     | -     | 0.742 | 0.573 | 0.481 | 0.365 | 0.365 | 0.365 |
| 160   | -   | -     | -     | -     | -     | 0.792 | 0.603 | 0.512 | 0.365 | 0.365 | 0.365 |
| 165   | -   | -     | -     | -     | -     | -     | 0.632 | 0.544 | 0.365 | 0.365 | 0.365 |
| 170   | -   | -     | -     | -     | -     | -     | 0.662 | 0.576 | 0.365 | 0.365 | 0.365 |
| 175   | -   | -     | -     | -     | -     | -     | 0.692 | 0.607 | 0.402 | 0.365 | 0.365 |
| 180   | -   | -     | -     | -     | -     | -     | 0.722 | 0.639 | 0.441 | 0.365 | 0.365 |
| 185   | -   | -     | -     | -     | -     | -     | 0.755 | 0.670 | 0.479 | 0.365 | 0.365 |
| 190   | -   | -     | -     | -     | -     | -     | 0.788 | 0.702 | 0.518 | 0.365 | 0.365 |
| 195   | -   | -     | -     | -     | -     | -     | -     | 0.734 | 0.556 | 0.365 | 0.365 |
| 200   | -   | -     | -     | -     | -     | -     | -     | 0.783 | 0.595 | 0.365 | 0.365 |
| 205   | -   | -     | -     | -     | -     | -     | -     | -     | 0.633 | 0.365 | 0.365 |
| 210   | -   | -     | -     | -     | -     | -     | -     | -     | 0.672 | 0.365 | 0.365 |
| 215   | -   | -     | -     | -     | -     | -     | -     | -     | 0.710 | 0.365 | 0.365 |
| 220   | -   | -     | -     | -     | -     | -     | -     | -     | 0.749 | 0.365 | 0.365 |
| 225   | -   | -     | -     | -     | -     | -     | -     | -     | 0.796 | 0.365 | 0.365 |
| 230   | -   | -     | -     | -     | -     | -     | -     | -     | -     | 0.365 | 0.365 |
| 235   | -   | -     | -     | -     | -     | -     | -     | -     | -     | 0.365 | 0.365 |
| 240   | -   | -     | -     | -     | -     | -     | -     | -     | -     | 0.365 | 0.365 |
| 245   | -   | -     | -     | -     | -     | -     | -     | -     | -     | 0.365 | 0.365 |
| 250   | -   | -     | -     | -     | -     | -     | -     | -     | -     | 0.384 | 0.365 |
| 255   | -   | -     | -     | -     | -     | -     | -     | -     | -     | 0.464 | 0.365 |
| 260   | -   | -     | -     | -     | -     | -     | -     | -     | -     | 0.544 | 0.365 |
| 265   | -   | -     | -     | -     | -     | -     | -     | -     | -     | 0.624 | 0.365 |
| 270   | -   | -     | -     | -     | -     | -     | -     | -     | -     | 0.705 | 0.365 |
| 275   | -   | -     | -     | -     | -     | -     | -     | -     | -     | 0.769 | 0.365 |
| 280   | -   | -     | -     | -     | -     | -     | -     | -     | -     | -     | 0.365 |
| 285   | -   | -     | -     | -     | -     | -     | -     | -     | -     | -     | 0.365 |
| 290   | -   | -     | -     | -     | -     | -     | -     | -     | -     | -     | 0.365 |
| 295   | -   | -     | -     | -     | -     | -     | -     | -     | -     | -     | 0.365 |
| 300   | -   | -     | -     | -     | -     | -     | -     | -     | -     | -     | 0.365 |
| 305   | -   | -     | -     | -     | -     | -     | -     | -     | -     | -     | 0.365 |
| 310   | -   | -     | -     | -     | -     | -     | -     | -     | -     | -     | 0.365 |
| 315   | -   | -     | -     | -     | -     | -     | -     | -     | -     | -     | 0.365 |
| 320   | -   | -     | -     | -     | -     | -     | -     | -     | -     | -     | 0.365 |

Thickness is intumescent only.

#### BROSTEEL ULTRA 60

Signed  
E/057

Issued: 14<sup>th</sup> Aug 2019  
Valid to: 31/07/2024



## CERTIFICATE No CF 5725

### Tor Coatings Limited

| Table 20 : Square/Rectangular Hollow Section Beams 75 Minutes |   |       |       |       |       |       |       |       |       |       |       |
|---|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Section Factor<br>m <sup>-1</sup>                             | Thickness (mm) Required for a Design Temperature of |       |       |       |       |       |       |       |       |       |       |
|   | 350°C   | 400°C | 450°C | 500°C | 520°C | 550°C | 600°C | 620°C | 650°C | 700°C | 750°C |
| 80  | -   | -     | -     | 0.597 | 0.542 | 0.482 | 0.396 | 0.365 | 0.365 | 0.365 | 0.365 |
| 85  | -   | -     | -     | 0.630 | 0.578 | 0.518 | 0.429 | 0.384 | 0.365 | 0.365 | 0.365 |
| 90  | -   | -     | -     | 0.663 | 0.614 | 0.554 | 0.461 | 0.416 | 0.365 | 0.365 | 0.365 |
| 95  | -   | -     | -     | 0.697 | 0.650 | 0.590 | 0.493 | 0.447 | 0.369 | 0.365 | 0.365 |
| 100   | -   | -     | -     | 0.730 | 0.686 | 0.626 | 0.526 | 0.479 | 0.399 | 0.365 | 0.365 |
| 105   | -   | -     | -     | 0.763 | 0.722 | 0.661 | 0.558 | 0.510 | 0.429 | 0.365 | 0.365 |
| 110   | -   | -     | -     | -     | 0.758 | 0.697 | 0.590 | 0.542 | 0.459 | 0.365 | 0.365 |
| 115   | -   | -     | -     | -     | 0.794 | 0.733 | 0.622 | 0.573 | 0.489 | 0.365 | 0.365 |
| 120   | -   | -     | -     | -     | -     | 0.769 | 0.655 | 0.605 | 0.519 | 0.365 | 0.365 |
| 125   | -   | -     | -     | -     | -     | -     | 0.687 | 0.636 | 0.550 | 0.365 | 0.365 |
| 130   | -   | -     | -     | -     | -     | -     | 0.719 | 0.668 | 0.580 | 0.372 | 0.365 |
| 135   | -   | -     | -     | -     | -     | -     | 0.753 | 0.699 | 0.610 | 0.403 | 0.365 |
| 140   | -   | -     | -     | -     | -     | -     | 0.787 | 0.730 | 0.640 | 0.433 | 0.365 |
| 145   | -   | -     | -     | -     | -     | -     | -     | 0.776 | 0.670 | 0.463 | 0.365 |
| 150   | -   | -     | -     | -     | -     | -     | -     | -     | 0.700 | 0.494 | 0.365 |
| 155   | -   | -     | -     | -     | -     | -     | -     | -     | 0.731 | 0.524 | 0.365 |
| 160   | -   | -     | -     | -     | -     | -     | -     | -     | 0.778 | 0.554 | 0.365 |
| 165   | -   | -     | -     | -     | -     | -     | -     | -     | -     | 0.585 | 0.365 |
| 170   | -   | -     | -     | -     | -     | -     | -     | -     | -     | 0.615 | 0.365 |
| 175   | -   | -     | -     | -     | -     | -     | -     | -     | -     | 0.645 | 0.365 |
| 180   | -   | -     | -     | -     | -     | -     | -     | -     | -     | 0.676 | 0.365 |
| 185   | -   | -     | -     | -     | -     | -     | -     | -     | -     | 0.706 | 0.365 |
| 190   | -   | -     | -     | -     | -     | -     | -     | -     | -     | 0.736 | 0.365 |
| 195   | -   | -     | -     | -     | -     | -     | -     | -     | -     | -     | 0.404 |
| 200   | -   | -     | -     | -     | -     | -     | -     | -     | -     | -     | 0.447 |
| 205   | -   | -     | -     | -     | -     | -     | -     | -     | -     | -     | 0.489 |
| 210   | -   | -     | -     | -     | -     | -     | -     | -     | -     | -     | 0.531 |
| 215   | -   | -     | -     | -     | -     | -     | -     | -     | -     | -     | 0.574 |
| 220   | -   | -     | -     | -     | -     | -     | -     | -     | -     | -     | 0.616 |
| 225   | -   | -     | -     | -     | -     | -     | -     | -     | -     | -     | 0.658 |
| 230   | -   | -     | -     | -     | -     | -     | -     | -     | -     | -     | 0.700 |
| 235   | -   | -     | -     | -     | -     | -     | -     | -     | -     | -     | 0.743 |
| 240   | -   | -     | -     | -     | -     | -     | -     | -     | -     | -     | 0.795 |

Thickness is intumescent only.

### BROSTEEL ULTRA 60

Signed  
E/057

Issued: 14<sup>th</sup> Aug 2019  
Valid to: 31/07/2024





## CERTIFICATE No CF 5725

### Tor Coatings Limited

| Table 21 : Square/Rectangular Hollow Section Beams 90 Minutes |   |       |       |       |       |       |       |       |       |       |       |
|---|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Section Factor<br>$m^{-1}$                                    | Thickness (mm) Required for a Design Temperature of |       |       |       |       |       |       |       |       |       |       |
|   | 350°C   | 400°C | 450°C | 500°C | 520°C | 550°C | 600°C | 620°C | 650°C | 700°C | 750°C |
| 80  | -   | -     | -     | -     | -     | 0.750 | 0.563 | 0.524 | 0.469 | 0.365 | 0.365 |
| 85  | -   | -     | -     | -     | -     | 0.750 | 0.599 | 0.561 | 0.504 | 0.395 | 0.365 |
| 90  | -   | -     | -     | -     | -     | 0.750 | 0.636 | 0.597 | 0.540 | 0.427 | 0.365 |
| 95  | -   | -     | -     | -     | -     | -     | 0.672 | 0.634 | 0.575 | 0.458 | 0.365 |
| 100   | -   | -     | -     | -     | -     | -     | 0.708 | 0.671 | 0.610 | 0.490 | 0.365 |
| 105   | -   | -     | -     | -     | -     | -     | 0.745 | 0.707 | 0.646 | 0.522 | 0.365 |
| 110   | -   | -     | -     | -     | -     | -     | 0.781 | 0.744 | 0.681 | 0.554 | 0.369 |
| 115   | -   | -     | -     | -     | -     | -     | -     | 0.781 | 0.716 | 0.586 | 0.400 |
| 120   | -   | -     | -     | -     | -     | -     | -     | -     | 0.752 | 0.618 | 0.432 |
| 125   | -   | -     | -     | -     | -     | -     | -     | -     | 0.787 | 0.650 | 0.463 |
| 130   | -   | -     | -     | -     | -     | -     | -     | -     | -     | 0.682 | 0.494 |
| 135   | -   | -     | -     | -     | -     | -     | -     | -     | -     | 0.713 | 0.525 |
| 140   | -   | -     | -     | -     | -     | -     | -     | -     | -     | 0.745 | 0.557 |
| 145   | -   | -     | -     | -     | -     | -     | -     | -     | -     | 0.777 | 0.588 |
| 150   | -   | -     | -     | -     | -     | -     | -     | -     | -     | -     | 0.619 |
| 155   | -   | -     | -     | -     | -     | -     | -     | -     | -     | -     | 0.650 |
| 160   | -   | -     | -     | -     | -     | -     | -     | -     | -     | -     | 0.681 |
| 165   | -   | -     | -     | -     | -     | -     | -     | -     | -     | -     | 0.713 |
| 170   | -   | -     | -     | -     | -     | -     | -     | -     | -     | -     | 0.744 |
| 175   | -   | -     | -     | -     | -     | -     | -     | -     | -     | -     | 0.775 |

Thickness is intumescent only.

Signed  
E/057

Issued: 14<sup>th</sup> Aug 2019  
Valid to: 31/07/2024