

# WELDLESS CHAIN SPECIFICATIONS



Adopted April 26, 2003  
by the  
National Association of Chain Manufacturers

### **Use and Performance Limitation**

These size and related specifications are applicable to chain in proper physical condition used at or below the working load limit in normal use conditions.

The conditions involving use in certain environmental situations such as unusual (high or low) temperature, chemical, etc., can cause changes in chain performance. Sudden application of dynamic loads, which cause the load in the chain to exceed the working load limit, are to be avoided. Individual manufacturers will provide information and recommendations concerning those conditions most likely to cause problems.

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## 1.0 TITLE

### 1.1 NACM Weldless Chain Specifications

## 2.0 SCOPE

2.1 These specifications cover the types and properties of weldless chain for industrial and commercial uses. The chains listed below are suitable for many purposes where lightness, flexibility and relative low strength are required. Actual application governs the size and type of chain which should be used.

|                          |  |
|--------------------------|--|
| <b>Single Loop Chain</b> | Suitable for operating valve wheels, overhead doors, ventilators, sprocket wheels, etc.                                |
| <b>Double Loop Chain</b> | Suitable for public playground and gymnasium equipment, animal chains, padlock chains, boat chains, gate chains, etc.  |
| <b>Single Jack Chain</b> | Suitable for suspension of fixtures such as flower pots, fluorescent lights, keeper chain, etc.                        |
| <b>Double Jack Chain</b> | Suitable for ornamental chain, suspension of light fixtures, children's toys, etc.                                     |
| <b>Register Chain</b>    | Suitable for operating furnace doors, ducts or dampers, skylight mechanisms, etc.                                      |
| <b>Sash Chain</b>        | Flat metal chain, suitable for suspension of double hung sash, pulley applications, etc.                               |
| <b>Plumbers' Chain</b>   | Flat metal chain, adaptable to many uses where a light chain is required, as for plumbing fixtures, keeper chain, etc. |

## 3.0 DEFINITIONS

- 3.1 **Working Load Limit (WLL)**  
The "Working Load Limit" (rated capacity) is the maximum load that shall be applied in direct tension to a new and undamaged straight length of chain.
- 3.2 **Minimum Breaking Force**  
The "Minimum Breaking Force" is the minimum force at which the chain during manufacture has been found by testing to break when a constantly increasing force is applied in direct tension. Breaking force values are not guarantees that all chain segments will endure these loads (see Section 5.2). This test is a manufacturer's attribute acceptance test and shall not be used as a criterion for service or design purposes.
- 3.3 **Overload**  
Any static or dynamic load in excess of "Working Load Limit."

## 4.0 MATERIALS AND MANUFACTURING

### 4.1 Material

The selection of the base material is left to the judgment of the individual chain manufacturer provided that the resultant chain complies with the requirements contained in this specification.

### 4.2 Manufacturing Methods

The manufacturer will select suitable manufacturing methods such that the chain complies with the requirements contained within this specification.

## 5.0 TESTING

### 5.1 Mechanical Properties

The mechanical properties of the various chain sizes and designations are given in Tables I through VII.

### 5.2 Selection of Samples

**5.2.1** For the purpose of acceptance testing of chain, a lot shall consist of 3,000 feet (1,000 meters) or fraction thereof of the same type and size of chain. If a continuous length of chain exceeds 3,000 feet (1,000 meters), it is also considered a lot.

**5.2.2** At least one sample from each lot shall be tensile tested. If the original test specimen fails to conform to the minimum breaking force requirements as prescribed in Tables I through VII for their respective sizes, two additional test specimens from the same lot may be tested. If both additional test specimens conform to the requirements specified, the chain will be considered acceptable.

### 5.3 Test Method

**5.3.1** A test specimen shall consist of a length not less than one foot (0.3 meter), taken from any stage of manufacture after the forming process.

**5.3.2** Fixtures for securing chain test specimens in the testing machine must securely support the link. Links engaged in the testing fixtures shall not be considered part of the test specimen.

## 6.0 DIMENSIONS

**6.1** The nominal dimensional requirements for the various types and sizes are given in Tables I through VII. The actual dimensions may vary by  $\pm 7\%$ . The inside length dimension can be measured either by individual link or by measuring the span of 100 links and dividing by 100.

### 6.2 Material Diameter

The diameter or thickness of the material from which the chain is manufactured shall be at least the dimension shown in Tables I through VII, subject to normal commercial tolerances. Oversized material may be used for all applications.

## 7.0 FINISH

**7.1** The manufacturer may apply a surface treatment or coating of his or the customer's choice for identification or corrosion resistance unless the customer specifies otherwise.

## 8.0 WARNING

The use of chain is subject to certain hazards that cannot be met by mechanical means, but only the exercise of intelligence, care and common sense. Serious hazards are: Overloading, improper rigging, bending, twisting and the use of damaged chain. Any such abuse or misuse may cause injury or property damage for which the manufacturer accepts no liability.

Under no conditions are loads to be transported or suspended over people.


All chains should be periodically inspected for wear, elongation, nicks, gouges, cracks, and suitability for the application. Excessive high or low temperatures or exposure to chemically active environments such as acids or corrosive liquids or fumes can reduce the performance of the chain. Chains should not be used outside of the -40 °F to 400 °F (-40 °C to 204 °C) temperature range without consulting the manufacturer.

Removal criteria for wear and damage have been established for the larger diameter chains covered under this specification, and are listed in Table VIII. All chain should be removed from service if the thickness at any location on the link is less than the listed minimum value. Sash and Plumbers' chain use non-round cross sections, and therefore the minimum diameter method cannot be used. For these chains as well as the smaller diameter loop and jack chains, observable wear or a change in the material dimension of more than 10% is cause for removal.

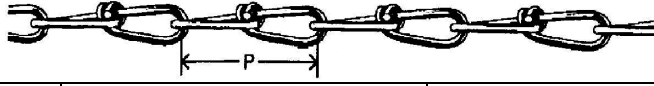
Manufacturers do not accept any liability for injury or damage which may result from chain used in excess of working load limit or used in a manner contrary to the manufacturer's instructions or recommendations. When mixing types of chain or components, all chain assemblies shall be rated at the working load limit of the lowest rated chain or component.

All chains specified within this specification are not to be used in overhead lifting applications.


NACM WELDLESS CHAIN SPECIFICATIONS

| TABLE I SINGLE LOOP CHAIN |               |     |                           |      |  |    |                    |     |       |     |                        |      |       |     |
|---------------------------|---------------|-----|---------------------------|------|--|----|--------------------|-----|-------|-----|------------------------|------|-------|-----|
| TRADE SIZE                | MATERIAL SIZE |     | NOMINAL INSIDE LENGTH (P) |      | APPROX. WGT. per 100 ft. (30.5 m)  |    | WORKING LOAD LIMIT |     |       |     | MINIMUM BREAKING FORCE |      |       |     |
|                           |               |     |                           |      |  |    | Steel              |     | Brass |     | Steel                  |      | Brass |     |
|                           | in            | mm  | in                        | mm   | lbs  | kg | lbs                | kg  | lbs   | kg  | lbs                    | kN   | lbs   | kN  |
| 2                         | .091          | 2.3 | 1.08                      | 27.4 | 10.0   | 5  | 155                | 70  | 110   | 50  | 620                    | 2.8  | 440   | 2.0 |
| 1/0                       | .120          | 3.0 | 1.29                      | 32.8 | 17.0   | 8  | 265                | 120 | 185   | 84  | 1060                   | 4.7  | 740   | 3.3 |
| 2/0                       | .135          | 3.4 | 1.48                      | 37.6 | 22.0   | 10 | 340                | 154 | 240   | 109 | 1360                   | 6.0  | 960   | 4.3 |
| 3/0                       | .148          | 3.8 | 1.63                      | 41.4 | 26.0   | 12 | 405                | 184 | 285   | 129 | 1620                   | 7.2  | 1140  | 5.1 |
| 4/0                       | .162          | 4.1 | 1.80                      | 45.7 | 31.0   | 14 | 485                | 220 | 340   | 154 | 1940                   | 8.6  | 1360  | 6.0 |
| 5/0                       | 1.77          | 4.5 | 2.15                      | 54.6 | 35.0   | 16 | 580                | 263 | 405   | 184 | 2320                   | 10.3 | 1620  | 7.2 |

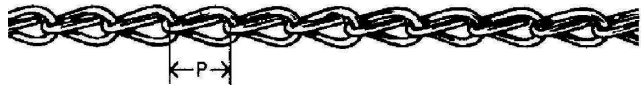
  

| TABLE II DOUBLE LOOP CHAIN |               |     |                           |      |  |    |                    |     |       |     |                        |      |       |     |
|----------------------------|---------------|-----|---------------------------|------|--|----|--------------------|-----|-------|-----|------------------------|------|-------|-----|
| TRADE SIZE                 | MATERIAL SIZE |     | NOMINAL INSIDE LENGTH (P) |      | APPROX. WGT. per 100 ft. (30.5 m)  |    | WORKING LOAD LIMIT |     |       |     | MINIMUM BREAKING FORCE |      |       |     |
|                            |               |     |                           |      |  |    | Steel              |     | Brass |     | Steel                  |      | Brass |     |
|                            | in            | mm  | in                        | mm   | lbs  | kg | lbs                | kg  | lbs   | kg  | lbs                    | kN   | lbs   | kN  |
| 5                          | 0.062         | 1.6 | 0.92                      | 23.4 | 3.6  | 2  | 55                 | 25  | 40    | 18  | 220                    | 1.0  | 160   | 0.7 |
| 4                          | 0.072         | 1.8 | 1.00                      | 25.4 | 4.7  | 2  | 70                 | 32  | 50    | 23  | 280                    | 1.2  | 200   | 0.9 |
| 3                          | 0.080         | 2.0 | 1.10                      | 27.9 | 5.9  | 3  | 90                 | 41  | 65    | 29  | 360                    | 1.6  | 260   | 1.2 |
| 2                          | 0.091         | 2.3 | 1.33                      | 33.8 | 7.7  | 4  | 115                | 52  | 80    | 36  | 460                    | 2.0  | 320   | 1.4 |
| 1                          | 0.105         | 2.7 | 1.54                      | 39.1 | 10.0   | 5  | 155                | 70  | 110   | 50  | 620                    | 2.8  | 440   | 2.0 |
| 1L*                        | 0.105         | 2.7 | 2.03                      | 51.6 | 9.0  | 4  | 155                | 70  | 110   | 50  | 620                    | 2.8  | 440   | 2.0 |
| 1/0                        | 0.120         | 3.0 | 1.78                      | 45.2 | 13.0   | 6  | 200                | 91  | 140   | 63  | 800                    | 3.6  | 560   | 2.5 |
| 1/0 L*                     | 0.120         | 3.0 | 2.24                      | 56.9 | 12.0   | 5  | 200                | 91  | 140   | 63  | 800                    | 3.6  | 560   | 2.5 |
| 2/0                        | 0.135         | 3.4 | 1.82                      | 46.2 | 17.0   | 8  | 255                | 116 | 180   | 82  | 1020                   | 4.5  | 720   | 3.2 |
| 2/0 L*                     | 0.135         | 3.4 | 2.24                      | 56.9 | 16.0   | 7  | 255                | 116 | 180   | 82  | 1020                   | 4.5  | 720   | 3.2 |
| 3/0                        | 0.148         | 3.8 | 2.17                      | 55.1 | 20.0   | 9  | 305                | 138 | 215   | 98  | 1220                   | 5.4  | 860   | 3.8 |
| 4/0                        | 0.162         | 4.1 | 2.19                      | 55.6 | 25.0   | 11 | 365                | 166 | 255   | 116 | 1460                   | 6.5  | 1020  | 4.5 |
| 6/0                        | 0.192         | 4.9 | 2.96                      | 73.8 | 34.0   | 15 | 510                | 232 | 355   | 161 | 2040                   | 9.1  | 1420  | 6.3 |
| 8/0                        | 0.225         | 5.7 | 2.90                      | 73.7 | 51.0   | 23 | 705                | 320 | 500   | 227 | 2820                   | 12.5 | 2000  | 8.9 |

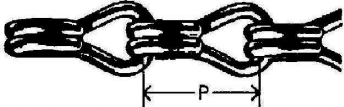
  

| TABLE III SINGLE JACK CHAIN |               |     |                           |      |  |    |                    |    |       |    |                        |     |       |     |
|-----------------------------|---------------|-----|---------------------------|------|--|----|--------------------|----|-------|----|------------------------|-----|-------|-----|
| TRADE SIZE                  | MATERIAL SIZE |     | NOMINAL INSIDE LENGTH (P) |      | APPROX. WGT. per 100 ft. (30.5 m)  |    | WORKING LOAD LIMIT |    |       |    | MINIMUM BREAKING FORCE |     |       |     |
|                             |               |     |                           |      |  |    | Steel              |    | Brass |    | Steel                  |     | Brass |     |
|                             | in            | mm  | in                        | mm   | lbs  | kg | lbs                | kg | lbs   | kg | lbs                    | kN  | lbs   | kN  |
| 20                          | 0.034         | 0.9 | 0.30                      | 7.6  | 1.0  | 1  | 3                  | 1  | 2     | 1  | 12                     | 0.1 | 8     | 0.1 |
| 18                          | 0.047         | 1.2 | 0.39                      | 9.9  | 1.7  | 1  | 5                  | 2  | 4     | 2  | 20                     | 0.1 | 15    | 0.1 |
| 16                          | 0.062         | 1.6 | 0.50                      | 12.7 | 2.9  | 1  | 10                 | 5  | 8     | 4  | 40                     | 0.2 | 30    | 0.1 |
| 14                          | 0.080         | 2.0 | 0.63                      | 16.0 | 4.8  | 2  | 16                 | 7  | 11    | 5  | 65                     | 0.3 | 45    | 0.2 |
| 12                          | 0.105         | 2.7 | 0.75                      | 19.1 | 8.5  | 4  | 29                 | 13 | 20    | 9  | 115                    | 0.5 | 80    | 0.4 |
| 10                          | 0.135         | 3.4 | 0.93                      | 23.6 | 14.0   | 6  | 43                 | 20 | 34    | 15 | 170                    | 0.8 | 135   | 0.6 |
| 8                           | 0.162         | 4.1 | 1.09                      | 27.7 | 21.0   | 10 | 60                 | 27 | 43    | 20 | 240                    | 1.1 | 170   | 0.8 |
| 6                           | 0.192         | 4.9 | 1.24                      | 31.5 | 30.0   | 14 | 88                 | 40 | 66    | 30 | 350                    | 1.6 | 265   | 1.2 |


NACM WELDLESS CHAIN SPECIFICATIONS

| TABLE IV DOUBLE JACK CHAIN |               |     |                           |     |  |    |                    |    |       |    |                        |     |       |     |
|----------------------------|---------------|-----|---------------------------|-----|--|----|--------------------|----|-------|----|------------------------|-----|-------|-----|
| TRADE SIZE                 | MATERIAL SIZE |     | NOMINAL INSIDE LENGTH (P) |     | APPROX. WGT. per 100 ft. (30.5 m)  |    | WORKING LOAD LIMIT |    |       |    | MINIMUM BREAKING FORCE |     |       |     |
|                            |               |     |                           |     |  |    | Steel              |    | Brass |    | Steel                  |     | Brass |     |
|                            | in            | mm  | in                        | mm  | lbs  | kg | lbs                | kg | lbs   | kg | lbs                    | kN  | lbs   | kN  |
| 16                         | 0.062         | 1.6 | 0.34                      | 8.6 | 4.0  | 2  | 11                 | 5  | 8     | 4  | 45                     | 0.2 | 30    | 0.1 |

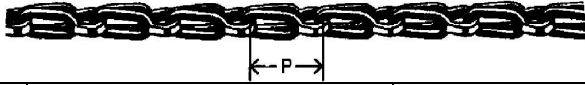
  

| TABLE V REGISTER CHAIN |               |     |                           |      |  |    |                    |    |       |    |                        |     |       |     |
|------------------------|---------------|-----|---------------------------|------|--|----|--------------------|----|-------|----|------------------------|-----|-------|-----|
| TRADE SIZE             | MATERIAL SIZE |     | NOMINAL INSIDE LENGTH (P) |      | APPROX. WGT. per 100 ft. (30.5 m)  |    | WORKING LOAD LIMIT |    |       |    | MINIMUM BREAKING FORCE |     |       |     |
|                        |               |     |                           |      |  |    | Steel              |    | Brass |    | Steel                  |     | Brass |     |
|                        | in            | mm  | in                        | mm   | lbs  | kg | lbs                | kg | lbs   | kg | lbs                    | kN  | lbs   | kN  |
| 18                     | 0.047         | 1.2 | 0.39                      | 9.9  | 2.7  | 1  | 9                  | 4  | 5     | 2  | 35                     | 0.2 | 20    | 0.1 |
| 12                     | 0.105         | 2.7 | 0.80                      | 20.3 | 15.0   | 7  | 50                 | 23 | 35    | 16 | 200                    | 0.9 | 140   | 0.6 |
| 10                     | 0.135         | 3.4 | 1.02                      | 25.9 | 19.0   | 9  | 83                 | 38 | 58    | 26 | 330                    | 1.5 | 230   | 1.0 |

| TABLE VI SASH CHAIN |               |     |                           |      |  |    |                    |     |                  |     |                        |     |                  |     |
|---------------------|---------------|-----|---------------------------|------|--|----|--------------------|-----|------------------|-----|------------------------|-----|------------------|-----|
| TRADE SIZE          | MATERIAL SIZE |     | NOMINAL INSIDE LENGTH (P) |      | APPROX. WGT. per 100 ft. (30.5 m)  |    | WORKING LOAD LIMIT |     |                  |     | MINIMUM BREAKING FORCE |     |                  |     |
|                     |               |     |                           |      |  |    | Steel              |     | Brass and Bronze |     | Steel                  |     | Brass and Bronze |     |
|                     | in            | mm  | in                        | mm   | lbs  | kg | lbs                | kg  | lbs              | kg  | lbs                    | kN  | lbs              | kN  |
| 8                   | 0.035         | 0.9 | 0.56                      | 14.1 | 3.9  | 2  | 75                 | 34  | 68               | 31  | 300                    | 1.3 | 270              | 1.2 |
| 25                  | 0.042         | 1.1 | 0.56                      | 14.1 | 4.9  | 2  | 94                 | 43  | 80               | 36  | 375                    | 1.7 | 320              | 1.4 |
| 30                  | 0.028         | 0.7 | 0.57                      | 14.4 | 4.9  | 2  | 81                 | 37  | 75               | 34  | 325                    | 1.4 | 300              | 1.3 |
| 35                  | 0.035         | 0.9 | 0.57                      | 14.4 | 5.7  | 3  | 106                | 48  | 100              | 45  | 425                    | 1.9 | 400              | 1.8 |
| 40                  | 0.042         | 1.1 | 0.57                      | 14.4 | 7.0  | 3  | 131                | 59  | 125              | 57  | 525                    | 2.3 | 500              | 2.2 |
| 45                  | 0.050         | 1.3 | 0.57                      | 14.4 | 8.7  | 4  | 175                | 79  | 163              | 74  | 700                    | 3.1 | 650              | 2.9 |
| 50                  | 0.060         | 1.5 | 0.65                      | 15.1 | 12.0   | 5  | 225                | 102 | 210              | 95  | 900                    | 4.0 | 840              | 3.7 |
| 60                  | 0.062         | 1.6 | 0.76                      | 19.3 | 15.0   | 7  | 231                | 105 | 225              | 102 | 925                    | 4.1 | 900              | 4.0 |
| 65                  | 0.072         | 1.8 | 0.88                      | 22.2 | 19.0   | 9  | 319                | 145 | 300              | 136 | 1275                   | 5.7 | 1200             | 5.3 |

| TABLE VII PLUMBERS' CHAIN |               |     |                           |      |  |    |                    |    |       |    |                        |     |       |     |
|---------------------------|---------------|-----|---------------------------|------|--|----|--------------------|----|-------|----|------------------------|-----|-------|-----|
| TRADE SIZE                | MATERIAL SIZE |     | MAXIMUM INSIDE LENGTH (P) |      | APPROX. WGT. per 100 ft. (30.5 m)  |    | WORKING LOAD LIMIT |    |       |    | MINIMUM BREAKING FORCE |     |       |     |
|                           |               |     |                           |      |  |    | Steel              |    | Brass |    | Steel                  |     | Brass |     |
|                           | in            | mm  | in                        | mm   | lbs  | kg | lbs                | kg | lbs   | kg | lbs                    | kN  | lbs   | kN  |
| 2/0                       | 0.018         | 0.5 | 0.60                      | 15.3 | 1.4  | 1  | 31                 | 14 | 23    | 10 | 125                    | 0.5 | 90    | 0.4 |
| 1/0                       | 0.023         | 0.6 | 0.60                      | 15.3 | 2.0  | 1  | 40                 | 18 | 35    | 16 | 160                    | 0.7 | 140   | 0.6 |
| 1                         | 0.028         | 0.7 | 0.70                      | 17.8 | 3.3  | 2  | 58                 | 26 | 45    | 20 | 230                    | 1.0 | 180   | 0.8 |

**TABLE VIII**  
**Minimum Allowable Thickness Measurement at Any Location on the Chain**

| Type of Chain  | Trade Size | Nominal Material Diameter |     | Minimum Allowable Thickness on Link |      |
|--|------------|---------------------------|-----|-------------------------------------|------|
|  | in         | in                        | mm  | in                                  | mm   |
| Double Loop<br>And<br>Single Loop  | 1/0        | .120                      | 3.0 | .104                                | 2.64 |
|  | 2/0        | .135                      | 3.4 | .117                                | 2.97 |
|  | 3/0        | .148                      | 3.8 | .128                                | 3.25 |
|  | 4/0        | .162                      | 4.1 | .140                                | 3.55 |
|  | 5/0        | .177                      | 4.5 | .153                                | 3.88 |
|  | 6/0        | .192                      | 4.9 | .166                                | 4.21 |
|  | 8/0        | .225                      | 5.7 | .195                                | 4.95 |
| Single Jack<br>And<br>Register   | 10         | .135                      | 3.4 | .117                                | 2.97 |
|  | 8          | .162                      | 4.1 | .140                                | 3.55 |
|  | 6          | .192                      | 4.9 | .166                                | 4.21 |
| <b>! Warning:</b> Remove chain from service if the thickness is less than the minimum shown in Table VIII at any location on the link. |            |                           |     |                                     |      |

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Campbell Chain Operation  
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