# Wheel Load CAPACITIES

## For Construction/Municipal Castings

Superior Construction • Exceptional Durability • Proven Load Strength

NEENAH FOUNDRY

*"Word on the Street is Neenah"*

# WHEEL LOAD CAPACITIES FOR CONSTRUCTION/MUNICIPAL CASTINGS

NEENAH FOUNDRY

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# FULL SCALE TESTING REACHING TRUE CASTING PERFORMANCE

Neenah proof load compression testing machine in the process of testing a frame and lid per AASHTO M306.

Close-up of the 9” x 9” load block rubber pad lid and frame with the lid broken from proof load testing.

# THE NEENAH LOAD TEST PROGRAM

## EVENTS LEADING TO THE TEST PROGRAM

Not much is known about the history of construction casting design. For many years past, manufactures quietly produced castings in accordance with owners' specifications without much more apparent involvement than that. But with the massive road building program of the 50's and 60's, and the accelerated infrastructure development during the same period, the relationships between the specifier and the casting manufacturer began to change.

The first indication of change appeared when highway designed inlet grates used on city streets caused hazards for the then new narrow tired bicycle wheels. Engineers demanded bicycle safe replacement grates with equal or better hydraulic capacity. Neenah responded by initiating a hydraulic testing program to determine true capacities for the inlet grates offered in the catalog line. This led to other discoveries and the introduction of the hydraulically efficient Vane Grate.

With design changes, engineers became concerned whether their new choices would have the structural integrity to meet modern day roadway loads. Again the response was to furnish load capacity information through the use of strength of material equations. But there were some basic assumptions in the strength of material equations that conflicted with the characteristics of Gray Iron. Some of the assumptions include the following:

1. The material has equal tensile and compressive strengths.
2. The tensile and compressive strengths will not vary throughout the object.
3. The neutral axis is at the physical center of the object.

These assumptions may be invalid because:

• Gray Iron is similar to a steel that has been supersaturated with carbon. Its microstructure readily shows the excess carbon as graphite flakes, the balance of the carbon occurring in a manner similar to steel. The *compressive strength* of gray iron will be from *3 to 4 times* its *tensile strength* because of the unique character of the graphite flakes present.

• As described above, gray iron microstructures demonstrate the heterogeneity of the material. Gray iron, like all carbon rich ferrous metals, possesses a property known as section sensitivity. These two characteristics result in the fact that a casting's strength and hardness may differ within that casting if it varies widely in section size or if the cooling rate is not uniform in all parts of the casting.

Actual test results indicate ASTM Class 35B[1] Gray Iron solidifying in a section 2" thick can have a tensile strength below 30,000-psi. The same iron solidifying in a section 1/4" thick can exceed 45,000-psi. Gray iron *tensile and compression strengths can differ* within castings of varying section sizes.

• The assumption of the neutral axis in the center of the material is based again on the premise that the tensile and compressive strengths are equal. Research on simple cast iron beams of uniform cross section reveals *the neutral axis shifts to the compressive side* and results in strengths 68% greater than calculated.

Due to these inconsistencies, another avenue of determining casting strengths was approached at Neenah.

## THE TEST PROGRAM

By now the level of research and technology had become so involved at Neenah a separate department of trained professional engineers was established to continue this important work. One of the first major projects was the Proof Load Test Program, based on AASHTO-M306, which prescribes loading a 9" x 9" contact area critically located on the casting to be tested. ASTM A48 describes test bars and the tensile strength of the iron specimen. To conduct the load tests, we acquired a 200,000-pound Baldwin compression testing machine constructed to our specifications.

Specifically, a casting is selected and then produced in the foundry under the watchful eye of a technician. As the casting progresses through the foundry, the variables that affect the casting load bearing qualities are observed and recorded. Those variables include the flask size, mold hardness, time of molding, metal temperature, duration of pouring, time of casting, carbon, carbon equivalent, chill from base and ladle, inoculant and shake out time and temperature. Although there are many factors affecting the strength during production, it was determined that these variables were most important.

While the casting production data is being gathered, ASTM "B" test bars are cast from the same ladle used to pour the casting. The test bar is then machined according to ASTM and pulled in a calibrated testing machine. The tensile strength is then recorded and the metallurgy samples are removed from the test bar.

One of our seven metallurgists examines the test bars for percent carbon, silicon, manganese, phosphorus and sulfur. These chemical ingredients most commonly effect the Gray Iron physically. After evaluating these results it can be noted, in general terms, the static load capacity of a Gray Iron casting is dependent upon the physical configuration of the casting, the load placement and area on the casting as tested on the Baldwin compression machine, and the tensile strength of the iron going into the casting.

The load bearing values for the castings are based on the tensile strength as described in ASTM A48 and the loading contact area, with the realization there is a linear relationship between the Gray Iron tensile strength and the load bearing capacity of the casting.

The data presented in this manual is a consolidation of the entire test program. The columns are as follows:

[1]American Society of Testing Material Specification A-48.

## EXPLANATION OF DATA

In the Neenah test program, the **ultimate load** when based on ASTM A48 Class 35B Gray Iron, the accompanying ASTM "B" test bar would have a tensile strength of 35,000 psi. For castings having ASTM "B" test bar strengths less than 35,000 psi, the ultimate load for that casting is the product of the ultimate load shown in this manual and the applicable conversion factor from the table below.

Although ASTM A48 does not have a classification for 15,000-psi or 10,000-psi tensile strength iron, we have tested the castings of domestic and foreign suppliers and find that 10,000-psi and 15,000-psi tensile strengths are commonplace. It follows that these low tensile strength castings would require much heavier metal sections to meet the ultimate load achieved by 35,000-psi tensile strength castings.

**Catalog Number:** Corresponds to listings in the Neenah Catalog. i.e. R-1642

**Casting Description**: Describes in one or two words the type of casting tested. This can include types not listed in the general catalog, yet available with the standard frame.

**Material:** When the material column value is blank and without M306 following the ultimate load value, the material is Gray Iron ASTM A48 Class 35B. If there is M306 following the ultimate load value, the material is a minimum of ASTM A48 Class 35B. If the material column states a DI 55+ KSI yield, it is Ductile Iron with a minimum yield strength of 55,000 pounds per square inch.

**Ultimate Load:** Load capacity based on Gray Iron ASTM A48 Class 35B tensile strength. If there is no designation after ultimate load, the material is Gray Iron with a minimum tensile strength of 35,000 psi as determined by ASTM A48 B bar size criteria. If there is a designation such as M306, the casting tested met AASHTO specification M306 but the more accurate relationship to class 35B or Ductile Iron A536 has not been established.

**Deflection**: Measured deflection at ultimate load in inches.

**Energy Absorption**: Foot pounds of energy capable of being absorbed before failure.

**Design Efficiency**: Pounds of load per pounds of casting.

**Deflection:** Cast Iron, like every other solid, has elastic properties. If cast iron was not elastic the material would shatter with the slightest impact. The greater the deflection the greater the ability to absorb energy. Occasionally specifications require deflections to be minimized by making them a function of the span length. With the casting sizes involved and accounting for what will cause deflections (be it a car, plane, semi-tractor trailer or other vehicle), most vehicles easily travel over the casting without problems.

| Tensile Strength | ASTM Class | Conversion Factor |
|---|---|---|
| 35,000 psi | 35 | 1.00 |
| 30,000 psi | 30 | 0.857 |
| 25,000 psi | 25 | 0.714 |
| 20,000 psi | 20 | 0.571 |
| 15,000 psi | n/a | 0.429 |
| 10,000 psi | n/a | 0.286 |

Knowing how increased deflection improves impact resistance, minimizing deflections in specifications can be counter-productive and detrimental because it increases the potential for impact failure.

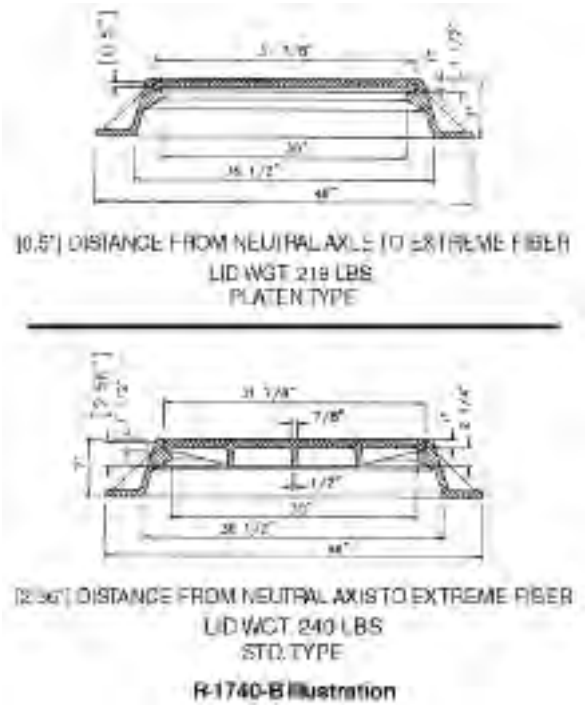
**Energy** values should give indications of how this casting will perform under field conditions. A casting with a low energy rating will be more prone to failure in duty. Energy is a combination of deflection and load capacity. If either of the values is low the result will be reflected in the energy value.

**Design Efficiency** is a rating of how effectively the material is being utilized.

## BREAKTHROUGHS IN CASTING DESIGN

One of the significant developments coming out of the load test program is the development of the Platen Lid. The Platen Lid is an improved manhole cover. The advantages include an increase in ultimate load, an increase in deflection, an increase in energy absorption, an increase in design efficiency and a decrease in the weight of the casting. Typically weight is a direct indicator of relative cost. The lighter the lid the *less expensive* it will be.

An example of the Platen Lid attributes can be illustrated thus:




**R-1740-B Illustration**

Through the strength of materials equations, one can determine that the moment of inertia for the ribbed lid is (13.9 inches$^4$) and for the platen lid is (2.64 inches$^4$). When determining the section modulus, which is accomplished by dividing the distance from the neutral axis to the extreme fiber in tension, one finds that the distance is much greater for the ribbed lid than for the platen lid. This results in a section modulus that's approximately the same for the platen lid (5.31 inches$^3$) as those of the ribbed lid (5.43 inches$^3$). Part of this analysis corresponds with the load test results, i.e. the deflection characteristic of the platen lid is considerably greater because it has a much lower moment of inertia. But, the load capacity of the platen is higher because shifting of the neutral axis has a more pronounced impact on its geometric configuration. The combination of these two characteristics provides the platen lid with its most significant advantage, **impact resistance**. Impact resistance is a function of both deflection and load capacity, and is one of the significant factors in construction casting design.

Actual tests indicate the R-1740-B Platen Lid has a load capacity 30% greater than the standard. The Platen Lid weighs approximately 90% of the standard and has an impact resistance 400% greater than the standard lid. It can be noted that the ribs on the underside of the R-1740-B make it weaker than if they were not there at all.

The Platen Lid is less expensive than the standard lid and is a superior casting design. Many municipalities and governmental bodies have adopted the Platen Lid design and now are specifying it on their plans.

## INTERPRETATION OF RESULTS

In the production of any ferrous material, there is some variance in the quality of the material produced. Statistical analysis of the tensile strengths of the iron produced daily at Neenah indicates one can expect a normal distribution to exist. We produce an average tensile strength of approximately 43,000-psi. Our iron exceeds ASTM A48 Class 35B 98.6% of the time (our advertised tensile strength). Neenah's Quality Assurance team does not allow material below Class 35 to leave the foundry. Because many foundries are less stringent in quality assurance, it's advisable to specify ASTM test bars of the proper size from them on any job regardless of size.

Neenah recommends a safety factor of at least 2-1/2 for all of our castings listed. The 2-1/2 takes into account fatigue loading of Gray Iron only. Other considerations that should be taken into account are impact loading and wheel contact area. When making comparisons of different castings for normal traffic, the energy absorption and load capacity figures should have nearly equal significance. If two castings have the same load capacity, choose the casting with the larger impact value – it's a superior casting.

The observant engineer will be able to utilize the design efficiency columns and determine which designs are superior. Special note on airport castings: for most airport work we recommend Ductile Iron castings. Ductile Iron can be supplied for most of the castings in our catalog. Check with Neenah for your airport requirements.

The Neenah Foundry Company invites you to use our test information to develop or improve the standards in your area. The professional engineers in our Product Engineering Department can help guide you in your design.

## FRAME TESTING

*see page 17*

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# PERFORMANCE DATA

| CATALOG NUMBER | CASTING DESCRIPTION | MATERIAL | ULTIMATE* LOAD LBS. | DEFLECTION INCHES | ENERGY FT LBS. | DESIGN EFFICIENCY |
|---|---|---|---|---|---|---|
| R-1500 | Grate Type A | | 56,000 | 0.140 | 330 | 540 |
| R-1500 | Grate Type C | | 50,600 | 0.166 | 350 | 620 |
| R-1500 | Solid Lid | | 46,000 | 0.132 | 250 | 430 |
| R-1510-A | Grate Type A | | 56,000 | 0.140 | 330 | 540 |
| R-1510-A | Grate Type C | | 50,600 | 0.166 | 350 | 620 |
| R-1510-A | Solid Lid | | 46,000 | 0.177 | 410 | 570 |
| R-1530 | Grate Type C | | 49,900 | 0.130 | 270 | 530 |
| R-1530 | Solid Lid | | 89,500 | 0.151 | 560 | 580 |
| R-1534-A | Solid Platen Lid | | 67,800 | 0.361 | 1,020 | 560 |
| R-1536 | Solid Platen Lid | | 60,600 | 0.350 | 880 | 600 |
| R-1550 | Solid Platen Lid | | 40,000 M306 | NA | NA | NA |
| R-1550-A | Grate Type C | | 49,900 | 0.130 | 270 | 530 |
| R-1550-A | Grate Type G | | 48,900 | 0.181 | 370 | 540 |
| R-1550-A | Solid Platen Lid | | 52,200 | 0.149 | 320 | 510 |
| R-1556 | Solid Platen Lid | | 40,000 M306 | NA | NA | NA |
| R-1556-A | Solid Platen Lid | | 40,000 M306 | NA | NA | NA |
| R-1572 | Solid Lid | | 99,100 | 0.093 | 380 | 460 |
| R-1573 | Solid Lid | | 92,300 | 0.170 | 650 | 460 |
| R-1574 | Solid Lid | | 61,400 | 0.105 | 270 | 310 |
| R-1575 | Solid Lid | | 67,100 | 0.217 | 606 | 380 |
| R-1576 | Solid Lid | | 62,000 | 0.221 | 570 | 270 |
| R-1579 | Solid Lid | | 43,700 | 0.200 | 360 | 440 |
| R-1580 | Solid Platen Lid | | 46,200 | 0.135 | 260 | 430 |
| R-1581 | Solid Platen Lid | DI KI 55+ ksi yield | 50,000 M306 | NA | NA | NA |
| R-1586 | Grate Type G | | 58,800 | 0.101 | 250 | 320 |
| R-1590 | Grate Type C | | 41,400 | 0.210 | 360 | 420 |
| R-1593-A | Solid Lid | | 32,500 | 0.175 | 240 | 220 |
| R-1596 | Grate Type D | | 73,200 | 0.148 | 450 | 600 |
| R-1596 | Solid Lid | | 93,600 | 0.098 | 380 | 600 |
| R-1596 | Solid Platen Lid | | 94,500 | 0.213 | 840 | 940 |
| R-1597 | Solid Lid | | 33,800 | 0.315 | 440 | 340 |
| R-1599-A | Solid Platen Lid | | 80,400 | 0.201 | 675 | 520 |
| R-1600 | Solid Platen Lid | DI KI 55+ ksi yield | 50,000 M306 | NA | NA | NA |
| R-1640-A | Grate Type G | | 49,200 | 0.194 | 400 | 350 |
| R-1640-C | Solid Lid | | 69,200 | 0.181 | 550 | 210 |
| R-1640-C | Solid Platen Lid | | 100,700 | 0.391 | 1,640 | 400 |
| R-1640-C1 | Solid Lid | | 69,200 | 0.181 | 550 | 210 |
| R-1640-C1 | Solid Platen Lid | | 100,700 | 0.391 | 1,640 | 400 |
| R-1640-D | Grate Type G | | 55,700 | 0.266 | 620 | 140 |
| R-1642 | Grate Type G | | 49,200 | 0.194 | 400 | 350 |
| R-1642 | Solid Lid | | 52,700 | 0.160 | 350 | 300 |
| R-1642 | Solid Platen Lid | | 84,600 | 0.545 | 1,920 | 670 |
| R-1642-A | Solid Platen Lid | | 84,600 | 0.545 | 1,920 | 670 |
| R-1643 | Grate Type G | | 49,200 | 0.194 | 400 | 350 |
| R-1643 | Solid Lid | | 80,100 | 0.240 | 800 | 470 |
| R-1645 | Grate Type D | | 73,200 | 0.148 | 450 | 600 |
| R-1645 | Solid Lid | | 93,600 | 0.098 | 380 | 600 |
| R-1645 | Solid Platen Lid | | 94,500 | 0.213 | 840 | 940 |
| R-1646 | Solid Platen Lid | | 94,500 | 0.213 | 840 | 940 |
| R-1647-A | Grate Type D | | 73,200 | 0.148 | 450 | 600 |
| R-1647-A | Solid Platen Lid | | 94,500 | 0.213 | 840 | 940 |
| R-1650-LM | Solid Platen Lid | | 40,000 M306 | NA | NA | NA |
| R-1653-A | Vented Lid | | 78,600 | 0.255 | 840 | 480 |
| R-1653-E | Vented Lid | | 104,800 | 0.206 | 900 | 500 |
| R-1653-F | Vented Lid | | 104,800 | 0.206 | 900 | 500 |
| R-1661 | Grate Type C | | 49,900 | 0.130 | 270 | 530 |
| R-1661 | Grate Type D | | 73,200 | 0.148 | 450 | 600 |
| R-1661 | Solid Lid | | 82,500 | 0.144 | 500 | 540 |
| R-1661 | Solid Platen Lid | | 109,600 | 0.296 | 1,350 | 870 |
| R-1661 | Vented Lid | | 82,500 | 0.144 | 500 | 540 |
| R-1668 | Vented Lid | | 48,200 | 0.133 | 270 | 390 |
| R-1670-A | Grate Type G | | 31,300 | 0.116 | 150 | 280 |
| R-1670-A | Solid Lid | | 51,800 | 0.196 | 420 | 360 |
| R-1670-A | Solid Platen Lid | | 66,000 | 0.426 | 1,170 | 540 |

* These values contain no safety factor. If you are unsure of what safety factor to use, phone Neenah (920) 725-7000 and ask for our Product Engineer.

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# PERFORMANCE DATA

| CATALOG NUMBER | CASTING DESCRIPTION | MATERIAL | ULTIMATE* LOAD LBS. | DEFLECTION INCHES | ENERGY FT LBS. | DESIGN EFFICIENCY |
|---|---|---|---|---|---|---|
| R-1671 | Solid Lid | | 89,300 | 0.067 | 250 | 480 |
| R-1672 | Grate Type D | | 73,200 | 0.148 | 450 | 600 |
| R-1672 | Solid Lid | | 93,600 | 0.098 | 380 | 600 |
| R-1672 | Solid Platen Lid | | 94,500 | 0.213 | 840 | 940 |
| R-1677-A | Solid Platen Lid | | 94,500 | 0.213 | 840 | 940 |
| R-1677-A | Grate Type D | | 73,200 | 0.148 | 450 | 650 |
| R-1677-A | Solid Lid | | 93,800 | 0.154 | 600 | 650 |
| R-1678-A | Grate Type C | | 49,900 | 0.130 | 270 | 530 |
| R-1680 | Solid Lid | | 32,000 | 0.100 | 130 | 260 |
| R-1682 | Grate Type A | | 45,400 | 0.203 | 380 | 320 |
| R-1682 | Solid Lid | | 59,300 | 0.182 | 450 | 300 |
| R-1682 | Solid Platen Lid | | 72,300 | 0.423 | 1,270 | 520 |
| R-1682-1 | Grate Type A | | 45,400 | 0.203 | 380 | 320 |
| R-1682-1 | Solid Lid | | 59,300 | 0.182 | 450 | 300 |
| R-1682-1 | Solid Platen Lid | | 72,300 | 0.423 | 1,270 | 520 |
| R-1687 | Solid Lid | | 95,600 | 0.177 | 710 | 540 |
| R-1688 | Vented Lid | | 39,500 | 0.182 | 300 | 300 |
| R-1689 | Grate Type C | | 48,900 | 0.181 | 370 | 540 |
| R-1689 | Grate Type G | | 49,900 | 0.130 | 270 | 530 |
| R-1690 | Grate Type A | | 56,000 | 0.100 | 330 | 540 |
| R-1690 | Grate Type C | | 50,600 | 0.166 | 350 | 620 |
| R-1690 | Solid Lid | | 24,800 | 0.238 | 240 | 400 |
| R-1690-A | Grate Type A | | 56,000 | 0.100 | 330 | 540 |
| R-1690-A | Grate Type C | | 50,600 | 0.166 | 350 | 620 |
| R-1690-A | Solid Lid | | 46,000 | 0.132 | 250 | 470 |
| R-1695 | Solid Platen Lid | | 64,200 | 0.294 | 790 | 460 |
| R-1700-A | Grate Type A | | 56,000 | 0.140 | 330 | 540 |
| R-1700-A | Grate Type C | | 50,600 | 0.166 | 350 | 620 |
| R-1700-A | Solid Lid | | 46,000 | 0.132 | 250 | 470 |
| R-1705 | Solid Platen Lid | | 78,500 | 0.364 | 1,190 | 850 |
| R-1706 | Solid Lid | | 73,000 | 0.145 | 440 | 450 |
| R-1706 | Solid Platen Lid | | 79,500 | 0.352 | 1,170 | 640 |
| R-1710 | Grate Type A | | 56,000 | 0.140 | 330 | 540 |
| R-1710 | Grate Type C | | 50,600 | 0.166 | 350 | 620 |
| R-1710 | Solid Lid | | 46,000 | 0.132 | 250 | 470 |
| R-1711-A | Grate Type A | | 56,000 | 0.140 | 330 | 540 |
| R-1711-A | Grate Type C | | 50,600 | 0.166 | 350 | 620 |
| R-1711-A | Solid Lid | | 46,000 | 0.132 | 250 | 470 |
| R-1711-B | Grate Type A | | 56,000 | 0.140 | 330 | 540 |
| R-1711-B | Grate Type C | | 50,600 | 0.166 | 350 | 620 |
| R-1711-B | Solid Lid | | 24,800 | 0.238 | 250 | 400 |
| R-1712 | Grate Type C | | 49,900 | 0.130 | 270 | 530 |
| R-1712 | Grate Type D | | 73,200 | 0.148 | 450 | 600 |
| R-1712 | Grate Type G | | 48,900 | 0.181 | 370 | 540 |
| R-1712 | Solid Lid | | 93,600 | 0.098 | 380 | 600 |
| R-1712 | Solid Platen Lid | | 94,500 | 0.213 | 840 | 940 |
| R-1713 | Grate Type C | | 49,900 | 0.130 | 270 | 530 |
| R-1713 | Grate Type D | | 73,200 | 0.148 | 450 | 600 |
| R-1713 | Grate Type G | | 48,900 | 0.181 | 370 | 540 |
| R-1713 | Solid Lid | | 93,600 | 0.098 | 380 | 600 |
| R-1713 | Solid Platen Lid | | 94,500 | 0.213 | 840 | 940 |
| R-1726-A | Grate Type G | | 31,300 | 0.116 | 150 | 280 |
| R-1726-A | Solid Lid | | 51,800 | 0.196 | 420 | 360 |
| R-1726-A | Solid Platen Lid | | 66,000 | 0.426 | 1,170 | 540 |
| R-1728 | Grate Type V | | 55,400 | 0.190 | 440 | 430 |
| R-1733 | Grate Type C | | 41,400 | 0.210 | 360 | 420 |
| R-1733 | Solid Platen Lid | | 66,200 | 0.624 | 1,720 | 620 |
| R-1733-A | Grate Type C | | 41,400 | 0.210 | 360 | 420 |
| R-1733-A | Solid Platen Lid | | 66,200 | 0.624 | 1,720 | 620 |
| R-1733-B | Grate Type C | | 41,400 | 0.210 | 360 | 420 |
| R-1733-B | Solid Platen Lid | | 66,200 | 0.624 | 1,720 | 620 |
| R-1733-C | Grate Type C | | 41,400 | 0.210 | 360 | 420 |
| R-1733-C | Solid Platen Lid | | 66,200 | 0.624 | 1,720 | 620 |
| R-1733-1 | Grate Type C | | 41,400 | 0.210 | 360 | 420 |

* These values contain no safety factor. If you are unsure of what safety factor to use, phone Neenah (920) 725-7000 and ask for our Product Engineer.

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# PERFORMANCE DATA

| CATALOG NUMBER | CASTING DESCRIPTION | MATERIAL | ULTIMATE* LOAD LBS. | DEFLECTION INCHES | ENERGY FT LBS. | DESIGN EFFICIENCY |
|---|---|---|---|---|---|---|
| R-1733-1 | Solid Platen Lid | | 66,200 | 0.624 | 1,720 | 620 |
| R-1736 | Solid Lid | | 70,000 | 0.142 | 410 | 440 |
| R-1737 | Solid Platen Lid | | 30,600 | 0.250 | 320 | 460 |
| R-1740 | Solid Platen Lid | | 50,300 | 0.175 | 370 | 200 |
| R-1740-B | Solid Lid | | 50,300 | 0.175 | 370 | 200 |
| R-1740-B | Solid Platen Lid | | 66,600 | 0.552 | 1,530 | 300 |
| R-1740-D | Grate Type G | | 55,700 | 0.266 | 620 | 140 |
| R-1740-E | Grate Type A | | 56,000 | 0.140 | 330 | 540 |
| R-1740-E | Grate Type C | | 50,600 | 0.166 | 350 | 620 |
| R-1740-E | Solid Lid | | 46,000 | 0.132 | 250 | 470 |
| R-1740-F | Grate Type A | | 56,000 | 0.140 | 330 | 540 |
| R-1740-F | Grate Type C | | 50,600 | 0.166 | 350 | 620 |
| R-1740-F | Solid Lid | | 46,000 | 0.132 | 250 | 470 |
| R-1743-LM | Solid Platen Lid | | 50,000 M306 | NA | NA | NA |
| R-1750-A | Grate Type G | | 49,200 | 0.194 | 400 | 350 |
| R-1750-B | Solid Lid | | 58,000 | 0.148 | 360 | 240 |
| R-1750-B | Solid Platen Lid | | 97,500 | 0.583 | 2,370 | 460 |
| R-1750-B1 | Solid Lid | | 58,000 | 0.148 | 360 | 240 |
| R-1750-B1 | Solid Platen Lid | | 97,500 | 0.583 | 2,370 | 460 |
| R-1750-C | Solid Lid | | 69,200 | 0.181 | 550 | 210 |
| R-1750-C | Solid Platen Lid | | 100,700 | 0.391 | 1,640 | 400 |
| R-1750-C1 | Solid Lid | | 69,200 | 0.181 | 550 | 210 |
| R-1750-C1 | Solid Platen Lid | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-1750-C1 | Solid Platen Lid | | 100,700 | 0.391 | 1,640 | 400 |
| R-1757-G | Solid Lid | | 80,100 | 0.123 | 410 | 410 |
| R-1761 | Grate Type A | | 56,000 | 0.140 | 330 | 540 |
| R-1761 | Grate Type C | | 50,600 | 0.166 | 350 | 620 |
| R-1761 | Solid Lid | | 46,000 | 0.132 | 250 | 470 |
| R-1762 | Solid Lid | | 99,800 | 0.290 | 1,210 | 810 |
| R-1762-A | Solid Lid | | 99,800 | 0.290 | 1,210 | 810 |
| R-1767 | Solid Platen Lid | | 40,000 M306 | NA | NA | NA |
| R-1767-4 | Solid Platen Lid | | 40,000 M306 | NA | NA | NA |
| R-1771 | Solid Lid | | 104,100 | 0.187 | 810 | 700 |
| R-1772 | Grate Type C | | 49,900 | 0.130 | 270 | 530 |
| R-1772 | Grate Type D | | 73,200 | 0.148 | 450 | 600 |
| R-1772 | Grate Type G | | 48,900 | 0.181 | 370 | 540 |
| R-1772 | Solid Platen Lid | | 94,500 | 0.213 | 840 | 940 |
| R-1773-A | Grate Type G | | 44,300 | 0.132 | 240 | 450 |
| R-1774 | Solid Platen Lid | | 76,500 | 0.352 | 1,120 | 450 |
| R-1775 | Solid Platen Lid | | 122,200 | 0.327 | 1,670 | 940 |
| R-1779 | Solid Lid | | 72,700 | 0.122 | 370 | 640 |
| R-1781 | Vented Lid | | 90,300 | 0.174 | 660 | 640 |
| R-1782 | Grate Type G | | 48,900 | 0.181 | 370 | 540 |
| R-1782 | Vented Lid | | 90,300 | 0.174 | 660 | 640 |
| R-1784 | Grate Type A | | 56,000 | 0.140 | 330 | 540 |
| R-1784 | Grate Type C | | 50,600 | 0.166 | 350 | 620 |
| R-1784 | Vented Lid | | 58,600 | 0.142 | 350 | 500 |
| R-1788-A | Solid Lid | | 108,800 | 0.218 | 990 | 480 |
| R-1788-B | Vented Lid | | 108,800 | 0.218 | 990 | 480 |
| R-1789-B | Vented Lid | | 107,300 | 0.232 | 1,040 | 900 |
| R-1791-A | Solid Lid | | 21,700 | 0.148 | 130 | 990 |
| R-1791-F | Grate Type G | | 1,100 | 0.122 | 10 | 30 |
| R-1792-CL | Solid Platen Lid | | 77,700 | 0.237 | 770 | 1,810 |
| R-1792-DL | Solid Platen Lid | | 47,200 | 0.206 | 410 | 830 |
| R-1792-EL | Solid Platen Lid | | 42,500 | 0.362 | 640 | 570 |
| R-1792-FL | Solid Platen Lid | | 50,300 | 0.421 | 880 | 460 |
| R-1792-GG | Grate Type G | | 32,700 | 0.248 | 340 | 280 |
| R-1792-GL | Solid Platen Lid | | 82,600 | 0.896 | 3,080 | 560 |
| R-1792-HG | Grate Type G | | 37,100 | 0.324 | 500 | 180 |
| R-1792-HL | Solid Platen Lid | | 75,300 | 0.672 | 2,110 | 310 |
| R-1792-JG | Grate Type G | | 38,300 | 0.210 | 340 | 120 |
| R-1792-JL | Solid Platen Lid | | 62,600 | 0.719 | 1,880 | 190 |
| R-1792-KL | Solid Platen Lid | | 73,100 | 0.810 | 2,470 | 170 |
| R-1795-A | Solid Lid | | 21,700 | 0.148 | 130 | 990 |

* These values contain no safety factor. If you are unsure of what safety factor to use, phone Neenah (920) 725-7000 and ask for our Product Engineer.

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# PERFORMANCE DATA

| CATALOG NUMBER | CASTING DESCRIPTION | MATERIAL | ULTIMATE* LOAD LBS. | DEFLECTION INCHES | ENERGY FT LBS. | DESIGN EFFICIENCY |
|---|---|---|---|---|---|---|
| R-1795-D | Grate Type A | | 56,000 | 0.140 | 330 | 540 |
| R-1795-D | Grate Type C | | 50,600 | 0.166 | 350 | 620 |
| R-1795-D | Solid Lid | | 46,000 | 0.132 | 250 | 470 |
| R-1795-E | Grate Type A | | 56,000 | 0.140 | 330 | 540 |
| R-1795-E | Grate Type C | | 50,600 | 0.166 | 350 | 620 |
| R-1795-E | Solid Lid | | 46,000 | 0.132 | 250 | 470 |
| R-1795-F | Grate Type G | | 31,300 | 0.116 | 150 | 280 |
| R-1795-F | Solid Lid | | 51,800 | 0.196 | 420 | 360 |
| R-1795-F | Solid Platen Lid | | 66,000 | 0.426 | 1,170 | 540 |
| R-1795-K | Solid Lid | | 50,300 | 0.175 | 370 | 220 |
| R-1795-K | Solid Platen Lid | | 66,600 | 0.552 | 1,530 | 300 |
| R-1796-F | Solid Lid (Fill) | | 79,600 | 0.367 | 1,220 | 310 |
| R-1797 | Solid Platen Lid | | 59,700 | 0.363 | 900 | 570 |
| R-1798 | Solid Platen Lid | | 103,200 | 0.378 | 1,630 | 550 |
| R-1798-1 | Solid Platen Lid | | 103,200 | 0.378 | 1,630 | 550 |
| R-1799-G | Solid Platen Lid | | 42,500 | 0.362 | 640 | 570 |
| R-1799-H | Grate Type D | | 73,200 | 0.148 | 450 | 600 |
| R-1799-H | Solid Lid | | 93,600 | 0.098 | 380 | 600 |
| R-1799-H | Solid Platen Lid | | 94,500 | 0.213 | 840 | 940 |
| R-1799-K | Solid Lid | | 20,300 | 0.244 | 210 | 290 |
| R-1799-P | Grate Type G | | 55,700 | 0.266 | 620 | 140 |
| R-1799-P | Solid Lid | | 79,500 | 0.328 | 1,090 | 200 |
| R-1800 | Grate Type C | | 57,500 | 0.132 | 320 | 540 |
| R-1800-C | Solid Lid | | 40,000 | M306 | NA | NA |
| R-1810 | Grate Type L | | 78,400 | 0.363 | 1,190 | 450 |
| R-1828 | Solid Platen Lid | | 44,700 | 0.619 | 1,150 | 210 |
| R-1830 | Grate Type A | | 143,800 | 0.253 | 1,520 | 550 |
| R-1844-A | Grate Type A | | 39,600 | 0.338 | 560 | 110 |
| R-1848-A2 | Grate Type B | | 102,200 | 0.243 | 1,030 | 400 |
| R-1860-A | Grate Type A | | 39,600 | 0.338 | 560 | 110 |
| R-1870 | Solid Lid | | 91,000 | 0.356 | 1,350 | 340 |
| R-1878-A10L | Solid Lid | | 49,600 | 0.154 | 320 | 190 |
| R-1878-A2G | Grate Type A | | 44,900 | 0.115 | 220 | 660 |
| R-1878-A2L | Solid Platen Lid | | 40,000 | M306 | NA | NA |
| R-1878-A3G | Grate Type A | | 48,500 | 0.168 | 340 | 560 |
| R-1878-A3L | Solid Lid | | 28,300 | 0.122 | 140 | 330 |
| R-1878-A5L | Solid Platen Lid | | 36,800 | 0.429 | 660 | 300 |
| R-1878-A6L | Solid Platen Lid | | 43,700 | 0.476 | 870 | 320 |
| R-1878-B2G | Grate Type A | | 40,000 | M306 | NA | NA |
| R-1878-B6G | Grate Type G | | 40,000 | M306 | NA | NA |
| R-1878-B7L | Solid Platen Lid | | 38,300 | 0.593 | 950 | 180 |
| R-1878-B9L | Solid Lid | | 29,900 | 0.216 | 270 | 190 |
| R-1878-B10L | Solid Lid | | 35,700 | 0.149 | 220 | 140 |
| R-1879-A5L | Solid Lid | | 19,000 | M306 | 0.142 | 110 | 180 |
| R-1883-D | Solid Platen Lid | | 40,000 | M306 | NA | NA | NA |
| R-1883-H1 | Solid Lid | | 63,700 | 0.165 | 440 | 250 |
| R-1889 | Vented Lid | | 163,100 | 0.229 | 1,560 | 820 |
| R-1900-B1 | Vented Lid | | 60,500 | 0.144 | 360 | 470 |
| R-1912-B | Solid Lid | | 21,900 | 0.244 | 220 | 140 |
| R-1912-D | Solid Lid | | 14,300 | 0.156 | 90 | 150 |
| R-1915-H | Solid Lid | | 111,500 | 0.157 | 730 | 780 |
| R-1915-H2 | Solid Lid | | 111,500 | 0.157 | 730 | 780 |
| R-1915-J | Solid Lid | | 80,100 | 0.123 | 410 | 410 |
| R-1915-J2 | Solid Lid | | 80,100 | 0.123 | 410 | 410 |
| R-1916-C | Solid Lid | | 48,800 | 0.143 | 290 | 420 |
| R-1916-D | Solid Lid | | 53,400 | 0.121 | 270 | 380 |
| R-1916-F | Solid Platen Lid | | 68,600 | 0.611 | 1,750 | 510 |
| R-1916-T | Solid Platen Lid | | 68,600 | 0.611 | 1,750 | 510 |
| R-1920 | Grate Type A | | 56,800 | 0.140 | 330 | 540 |
| R-1920 | Vented Lid | | 59,200 | 0.137 | 340 | 570 |
| R-1922 | Grate Type C | | 41,400 | 0.210 | 360 | 420 |
| R-1922 | Solid Lid | | 49,500 | 0.126 | 260 | 290 |
| R-1927 | Grate Type D | | 73,200 | 0.148 | 450 | 600 |
| R-1927 | Solid Lid | | 43,000 | 0.065 | 120 | 330 |

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# PERFORMANCE DATA

| CATALOG NUMBER | CASTING DESCRIPTION | MATERIAL | ULTIMATE* LOAD LBS. | DEFLECTION INCHES | ENERGY FT LBS. | DESIGN EFFICIENCY |
|---|---|---|---|---|---|---|
| R-1927 | Solid Platen Lid | | 94,500 | 0.213 | 840 | 940 |
| R-1940-A | Solid Lid | | 51,800 | 0.196 | 420 | 360 |
| R-1940-A | Solid Platen Lid | | 66,000 | 0.426 | 1,170 | 540 |
| R-1955 | Grate Type C | | 49,900 | 0.130 | 270 | 530 |
| R-1955 | Solid Lid | | 82,500 | 0.144 | 500 | 540 |
| R-1955 | Solid Platen Lid | | 109,600 | 0.296 | 1,350 | 870 |
| R-1960 | Grate Type C | | 49,900 | 0.130 | 270 | 530 |
| R-1960 | Grate Type D | | 73,200 | 0.148 | 450 | 600 |
| R-1960 | Solid Platen Lid | | 94,500 | 0.213 | 840 | 940 |
| R-1960-A | Grate Type G | | 49,200 | 0.194 | 400 | 350 |
| R-1960-A | Solid Lid | | 52,700 | 0.160 | 350 | 300 |
| R-1960-A | Solid Platen Lid | | 84,600 | 0.545 | 1,920 | 670 |
| R-2014 | Grate Type D | | 73,200 | 0.148 | 450 | 600 |
| R-2014 | Solid Lid | | 93,600 | 0.098 | 380 | 600 |
| R-2014 | Solid Platen Lid | | 94,500 | 0.213 | 840 | 940 |
| R-2030 | Grate Type C | | 49,900 | 0.130 | 270 | 530 |
| R-2030 | Solid Lid | | 89,500 | 0.151 | 560 | 580 |
| R-2050 | Grate Type C | | 49,900 | 0.130 | 270 | 530 |
| R-2050 | Grate Type G | | 48,900 | 0.181 | 370 | 540 |
| R-2050 | Solid Lid | | 52,200 | 0.149 | 320 | 510 |
| R-2060 | Grate Type A | | 56,000 | 0.140 | 310 | 540 |
| R-2060 | Grate Type C | | 50,600 | 0.166 | 350 | 620 |
| R-2060 | Solid Lid | | 46,000 | 0.132 | 250 | 470 |
| R-2070 | Grate Type C | | 49,900 | 0.130 | 270 | 530 |
| R-2070 | Grate Type G | | 48,900 | 0.181 | 370 | 540 |
| R-2070 | Solid Lid | | 52,200 | 0.149 | 320 | 510 |
| R-2090 | Grate Type A | | 56,000 | 0.140 | 330 | 540 |
| R-2090 | Grate Type C | | 50,600 | 0.166 | 350 | 620 |
| R-2090 | Solid Lid | | 46,000 | 0.132 | 250 | 470 |
| R-2100 | Grate Type A | | 56,000 | 0.140 | 330 | 540 |
| R-2100 | Grate Type C | | 50,600 | 0.166 | 350 | 620 |
| R-2100 | Solid Lid | | 46,000 | 0.132 | 250 | 470 |
| R-2110 | Grate Type A | | 56,000 | 0.140 | 330 | 540 |
| R-2110 | Grate Type C | | 50,600 | 0.166 | 350 | 620 |
| R-2110 | Solid Lid | | 46,000 | 0.132 | 250 | 470 |
| R-2112 | Grate Type A | | 56,000 | 0.140 | 330 | 540 |
| R-2112 | Grate Type C | | 50,600 | 0.166 | 350 | 620 |
| R-2112 | Solid Lid | | 46,000 | 0.132 | 250 | 470 |
| R-2120 | Grate Type A | | 56,000 | 0.140 | 330 | 540 |
| R-2120 | Grate Type C | | 50,600 | 0.166 | 350 | 620 |
| R-2120 | Solid Lid | | 46,000 | 0.132 | 250 | 470 |
| R-2250 | Grate Type G | | 55,700 | 0.266 | 620 | 140 |
| R-2255 | Solid Lid | | 69,200 | 0.181 | 550 | 210 |
| R-2255 | Solid Platen Lid | | 100,700 | 0.391 | 1,640 | 400 |
| R-2275 | Solid Lid | | 69,200 | 0.181 | 550 | 210 |
| R-2275 | Solid Platen Lid | | 100,700 | 0.391 | 1,640 | 400 |
| R-2293 | Grate Type G | | 44,300 | 0.132 | 240 | 450 |
| R-2296 | Solid Platen Lid | | 66,200 | 0.624 | 1,720 | 620 |
| R-2297 | Solid Platen Lid | | 66,200 | 0.624 | 1,720 | 620 |
| R-2298 | Solid Platen Lid | | 66,200 | 0.624 | 1,720 | 620 |
| R-2299 | Grate Type C | | 41,400 | 0.210 | 360 | 420 |
| R-2299 | Solid Platen Lid | | 66,200 | 0.624 | 1,720 | 620 |
| R-2300 | Grate Type G | | 49,200 | 0.194 | 400 | 350 |
| R-2370 | Grate Type G | | 49,200 | 0.194 | 400 | 350 |
| R-2370 | Solid Lid | | 52,700 | 0.160 | 350 | 300 |
| R-2370 | Solid Platen Lid | | 84,600 | 0.545 | 1,920 | 670 |
| R-2371 | Grate Type G | | 49,200 | 0.194 | 400 | 350 |
| R-2371 | Solid Lid | | 80,100 | 0.240 | 800 | 470 |
| R-2390 | Grate Type C | | 41,400 | 0.210 | 360 | 420 |
| R-2410 | Grate Type G | | 31,300 | 0.116 | 150 | 280 |
| R-2410 | Solid Lid | | 51,800 | 0.196 | 420 | 360 |
| R-2410 | Solid Platen Lid | | 66,000 | 0.426 | 1,170 | 540 |
| R-2412-A2 | Solid Lid | | 89,300 | 0.067 | 250 | 480 |
| R-2412-A4 | Vented Lid | | 48,200 | 0.133 | 270 | 390 |

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# PERFORMANCE DATA

| CATALOG NUMBER | CASTING DESCRIPTION | MATERIAL | ULTIMATE* LOAD LBS. | DEFLECTION INCHES | ENERGY FT LBS. | DESIGN EFFICIENCY |
|---|---|---|---|---|---|---|
| R-2412-A6 | Grate Type G | | 48,900 | 0.181 | 370 | 540 |
| R-2418 | Solid Lid | | 104,100 | 0.187 | 810 | 700 |
| R-2421-A | Solid Lid | | 70,000 | 0.142 | 410 | 440 |
| R-2422-A1 | Grate Type C | | 49,900 | 0.130 | 270 | 530 |
| R-2427 | Grate Type D | | 73,200 | 0.148 | 450 | 600 |
| R-2427-A | Solid Platen Lid | | 122,200 | 0.352 | 1,120 | 450 |
| R-2428 | Grate Type C | | 49,900 | 0.130 | 270 | 530 |
| R-2428 | Grate Type G | | 48,900 | 0.181 | 370 | 540 |
| R-2428 | Solid Lid | | 52,200 | 0.149 | 320 | 510 |
| R-2429 | Grate Type C | | 49,900 | 0.130 | 270 | 530 |
| R-2429 | Grate Type D | | 73,200 | 0.148 | 450 | 600 |
| R-2429 | Solid Lid | | 93,600 | 0.098 | 380 | 600 |
| R-2429 | Solid Platen Lid | | 94,500 | 0.213 | 840 | 940 |
| R-2435 | Solid Lid | | 99,800 | 0.290 | 1,210 | 810 |
| R-2437 | Grate Type C | | 49,900 | 0.130 | 270 | 530 |
| R-2437 | Grate Type D | | 73,200 | 0.148 | 450 | 600 |
| R-2437 | Solid Platen Lid | | 94,500 | 0.213 | 840 | 600 |
| R-2438 | Grate Type C | | 49,900 | 0.130 | 270 | 530 |
| R-2438 | Grate Type D | | 73,200 | 0.148 | 450 | 600 |
| R-2438 | Solid Platen Lid | | 94,500 | 0.213 | 840 | 600 |
| R-2461-A | Grate Type A | | 56,000 | 0.140 | 330 | 540 |
| R-2461-A | Grate Type C | | 50,600 | 0.166 | 350 | 620 |
| R-2461-A | Solid Lid | | 46,000 | 0.132 | 250 | 470 |
| R-2467 | Grate Type C | | 49,900 | 0.130 | 270 | 530 |
| R-2467 | Solid Lid | | 82,500 | 0.144 | 500 | 540 |
| R-2467 | Solid Platen Lid | | 109,600 | 0.296 | 1,350 | 870 |
| R-2471 | Grate Type C | | 49,900 | 0.130 | 270 | 530 |
| R-2471 | Grate Type D | | 73,200 | 0.148 | 450 | 600 |
| R-2471 | Solid Lid | | 82,500 | 0.144 | 500 | 540 |
| R-2471 | Solid Platen Lid | | 109,600 | 0.296 | 1,350 | 870 |
| R-2471-B | Grate Type D | | 73,200 | 0.148 | 450 | 600 |
| R-2474 | Grate Type A | | 56,000 | 0.140 | 330 | 540 |
| R-2474 | Grate Type C | | 50,600 | 0.166 | 350 | 620 |
| R-2474 | Vented Lid | | 58,600 | 0.142 | 350 | 500 |
| R-2475 | Grate Type A | | 56,000 | 0.140 | 330 | 540 |
| R-2475 | Grate Type C | | 50,600 | 0.166 | 350 | 620 |
| R-2475 | Solid Lid | | 46,000 | 0.132 | 250 | 430 |
| R-2481 | Grate Type A | | 56,000 | 0.140 | 330 | 540 |
| R-2499 | Solid Lid | | 21,700 | 0.148 | 130 | 990 |
| R-2500 | Grate Type G | | 31,300 | 0.116 | 150 | 280 |
| R-2500 | Solid Lid | | 51,800 | 0.196 | 420 | 360 |
| R-2500 | Solid Platen Lid | | 66,000 | 0.426 | 1,170 | 540 |
| R-2501 | Grate Type G | | 49,200 | 0.194 | 400 | 350 |
| R-2501 | Solid Lid | | 52,700 | 0.160 | 350 | 300 |
| R-2501 | Solid Platen Lid | | 84,600 | 0.545 | 1,920 | 670 |
| R-2502 | Grate Type C | | 49,900 | 0.130 | 270 | 530 |
| R-2502 | Grate Type D | | 73,200 | 0.148 | 450 | 600 |
| R-2502 | Grate Type G | | 48,900 | 0.181 | 370 | 540 |
| R-2502 | Solid Lid | | 93,600 | 0.098 | 380 | 600 |
| R-2502 | Solid Platen Lid | | 94,500 | 0.213 | 840 | 940 |
| R-2504 | Grate Type C | | 49,900 | 0.130 | 270 | 530 |
| R-2504 | Grate Type D | | 73,200 | 0.148 | 450 | 600 |
| R-2504 | Grate Type G | | 48,900 | 0.181 | 370 | 540 |
| R-2504 | Solid Lid | | 93,600 | 0.098 | 380 | 600 |
| R-2504 | Solid Platen Lid | | 94,500 | 0.213 | 840 | 940 |
| R-2510 | Grate Type A | | 56,000 | 0.140 | 330 | 540 |
| R-2510 | Grate Type C | | 50,600 | 0.166 | 350 | 620 |
| R-2510 | Solid Lid | | 46,000 | 0.132 | 250 | 470 |
| R-2510-2 | Grate Type G | | 44,300 | 0.132 | 240 | 450 |
| R-2525-A | Solid Lid | | 21,700 | 0.148 | 130 | 990 |
| R-2525-F | Grate Type G | | 1,100 | 0.122 | 10 | 30 |
| R-2533 | Grate Type A | | 56,000 | 0.140 | 330 | 540 |
| R-2533 | Grate Type C | | 50,600 | 0.166 | 350 | 620 |
| R-2533 | Solid Lid | | 46,000 | 0.132 | 250 | 470 |

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# PERFORMANCE DATA

| CATALOG NUMBER | CASTING DESCRIPTION | MATERIAL | ULTIMATE* LOAD LBS. | DEFLECTION INCHES | ENERGY FT LBS. | DESIGN EFFICIENCY |
|---|---|---|---|---|---|---|
| R-2535 | Grate Type A | | 56,000 | 0.140 | 330 | 540 |
| R-2535 | Grate Type C | | 50,600 | 0.166 | 350 | 620 |
| R-2535 | Solid Lid | | 46,000 | 0.132 | 250 | 470 |
| R-2535-A | Grate Type A | | 56,000 | 0.140 | 330 | 540 |
| R-2535-A | Grate Type C | | 50,600 | 0.166 | 350 | 620 |
| R-2535-A | Solid Lid | | 46,000 | 0.132 | 250 | 470 |
| R-2540 | Solid Lid | | 46,200 | 0.135 | 260 | 430 |
| R-2548 | Grate Type V | | 55,400 | 0.190 | 440 | 430 |
| R-2549 | Grate Type C | | 49,900 | 0.130 | 270 | 530 |
| R-2549 | Grate Type D | | 73,200 | 0.148 | 450 | 600 |
| R-2549 | Solid Lid | | 93,600 | 0.098 | 380 | 600 |
| R-2549 | Solid Platen Lid | | 94,500 | 0.213 | 840 | 940 |
| R-2565-A | Grate Type G | | 169,100 | 0.146 | 1,030 | 1,110 |
| R-2565-A | Solid Lid | | 96,600 | 0.085 | 340 | 740 |
| R-2565-C | Grate Type G | | 48,900 | 0.181 | 370 | 540 |
| R-2565-C | Solid Lid | | 114,700 | 0.152 | 730 | 750 |
| R-2565-F | Grate Type G | | 68,700 | 0.182 | 520 | 400 |
| R-2565-F | Solid Lid | | 103,600 | 0.137 | 590 | 490 |
| R-2565-G | Grate Type G | | 145,900 | 0.157 | 960 | 630 |
| R-2565-G | Solid Lid | | 158,300 | 0.145 | 960 | 550 |
| R-2565-H | Grate Type G | | 58,800 | 0.101 | 250 | 320 |
| R-2565-H | Solid Lid | | 80,100 | 0.123 | 410 | 410 |
| R-2565-J | Grate Type G | | 100,700 | 0.158 | 660 | 370 |
| R-2565-J | Solid Lid | | 77,300 | 0.132 | 430 | 270 |
| R-2570 | Grate Type G | | 1,100 | 0.122 | 10 | 30 |
| R-2571-A | Grate Type A | | 56,000 | 0.140 | 330 | 540 |
| R-2571-A | Grate Type C | | 56,000 | 0.166 | 350 | 620 |
| R-2571-A | Solid Lid | | 46,000 | 0.132 | 250 | 470 |
| R-2571-B | Grate Type C | | 56,000 | 0.166 | 350 | 620 |
| R-2571-B | Solid Lid | | 46,000 | 0.132 | 250 | 470 |
| R-2580-C | Grate Type G | | 55,700 | 0.266 | 620 | 140 |
| R-2595-A | Grate Type D | | 73,200 | 0.148 | 450 | 600 |
| R-2595-A | Solid Platen Lid | | 94,500 | 0.213 | 840 | 940 |
| R-3010 | Grate Type A | | 50,000 | M306 | NA | NA |
| R-3010 | Grate Type L | | 32,400 | 0.191 | 260 | 300 |
| R-3015 | Grate Type A | | 50,000 | M306 | NA | NA |
| R-3030 | Grate Type A | | 50,000 | M306 | NA | NA |
| R-3030 | Grate Type L | | 32,400 | 0.191 | 260 | 300 |
| R-3065 | Grate Type C | | 40,000 | M306 | NA | NA |
| R-3067 | Grate Type L | | 40,000 | M306 | NA | NA |
| R-3067-C | Grate Type L | | 40,000 | M306 | NA | NA |
| R-3067-L | Grate Type L | | 40,000 | M306 | NA | NA |
| R-3067-VB | Grate Type V | | 40,000 | M306 | NA | NA |
| R-3076 | Grate Type L | | 55,300 | 0.255 | 590 | 360 |
| R-3076 | Grate Type V | | 47,800 | 0.237 | 470 | 330 |
| R-3078 | Grate Type V | | 47,800 | 0.237 | 470 | 330 |
| R-3079 | Grate Type L | | 55,300 | 0.255 | 590 | 360 |
| R-3157-A | Grate Type V | | 31,000 | 0.136 | 180 | 440 |
| R-3210-L | Grate Type L | | 78,400 | 0.363 | 1,190 | 450 |
| R-3220-L | Grate Type L | | 78,400 | 0.363 | 1,190 | 450 |
| R-3222-LA | Grate Type L | | 55,500 | 0.152 | 350 | 380 |
| R-3222-1A | Grate Type L | | 55,500 | 0.152 | 350 | 380 |
| R-3227-C | Grate Type C | | 100,000 | M306 | NA | NA |
| R-3228-BC | Grate Type C | | 100,000 | M306 | NA | NA |
| R-3228-H | Grate Type C | | 100,000 | M306 | NA | NA |
| R-3228-K | Grate Type C | | 100,000 | M306 | NA | NA |
| R-3229-L | Grate Type L | | 78,400 | 0.363 | 1,190 | 440 |
| R-3235 | Grate Type C | | 40,000 | M306 | NA | NA |
| R-3246 | Grate Type L | | 40,000 | M306 | NA | NA |
| R-3256 | Solid Platen Lid | | 26,900 | 0.282 | 320 | 520 |
| R-3260 | Grate Type C | | 50,000 | M306 | NA | NA |
| R-3273-A | Grate Type C | | 40,000 | M306 | NA | NA |
| R-3275 | Grate Type A | | 40,000 | M306 | NA | NA |
| R-3278-AL | Grate Type L | | 23,600 | 0.156 | 150 | 200 |

* These values contain no safety factor. If you are unsure of what safety factor to use, phone Neenah (920) 725-7000 and ask for our Product Engineer.

NEENAH FOUNDRY

# PERFORMANCE DATA

| CATALOG NUMBER | CASTING DESCRIPTION | MATERIAL | ULTIMATE* LOAD LBS. | DEFLECTION INCHES | ENERGY FT LBS. | DESIGN EFFICIENCY |
|---|---|---|---|---|---|---|
| R-3287-5 | Grate Type V | | 40,000 M306 | NA | NA | NA |
| R-3288-E2 | Grate Type R | | 66,900 | 0.174 | 490 | 450 |
| R-3289-C | Grate Type R | | 66,900 | 0.174 | 490 | 450 |
| R-3290 | Grate Type L | | 40,000 M306 | NA | NA | NA |
| R-3290-VB | Grate Type V | | 40,000 M306 | NA | NA | NA |
| R-3294 | Grate Type L | | 40,000 M306 | NA | NA | NA |
| R-3295 | Grate Type L | | 40,000 M306 | NA | NA | NA |
| R-3295-2 | Grate Type L | | 40,000 M306 | NA | NA | NA |
| R-3295-3 | Grate Type L | | 40,000 M306 | NA | NA | NA |
| R-3295-4 | Grate Type L | | 40,000 M306 | NA | NA | NA |
| R-3295-5 | Grate Type L | | 40,000 M306 | NA | NA | NA |
| R-3297-1 | Grate Type C | | 50,200 | 0.214 | 450 | 290 |
| R-3305 | Solid Platen Lid | | 53,800 | 0.269 | 600 | 590 |
| R-3318 | Solid Lid | | 15,600 | 0.182 | 120 | 180 |
| R-3335-B | Solid Lid | | 20,300 | 0.244 | 20 | 290 |
| R-3339-A | Grate Type C | | 40,000 M306 | NA | NA | NA |
| R-3393-A | Grate Type C | | 100,000 M306 | NA | NA | NA |
| R-3404 | Grate Type H | | 50,000 M306 | NA | NA | NA |
| R-3405 | Grate Type H | | 40,000 M306 | NA | NA | NA |
| R-3405-A | Grate Type H | | 50,000 M306 | NA | NA | NA |
| R-3405-B | Grate Type H | | 50,000 M306 | NA | NA | NA |
| R-3416 | Grate Type A | | 143,800 | 0.253 | 1,520 | 550 |
| R-3425-A | Grate Type V | | 31,000 | 0.136 | 180 | 440 |
| R-3425-B | Grate Type V | | 31,000 | 0.136 | 180 | 440 |
| R-3430 | Grate Type C | | 57,500 | 0.132 | 320 | 540 |
| R-3433 | Grate Type L | | 78,400 | 0.363 | 1,190 | 440 |
| R-3438-A | Grate Type A | | 39,600 | 0.338 | 560 | 110 |
| R-3455-A | Grate Type A | | 143,800 | 0.253 | 1,520 | 550 |
| R-3457-C2 | Grate Type B | | 102,200 | 0.243 | 1,030 | 400 |
| R-3462-B | Grate Type R | | 66,900 | 0.174 | 490 | 450 |
| R-3463-B | Grate Type R | | 66,900 | 0.174 | 490 | 450 |
| R-3472 | Grate Type C | | 40,000 M306 | NA | NA | NA |
| R-3475 | Grate Type A | | 143,800 | 0.253 | 1,520 | 550 |
| R-3475-1 | Grate Type A | | 102,700 | 0.179 | 770 | 360 |
| R-3475-3 | Grate Type A | | 131,300 | 0.183 | 1,000 | 420 |
| R-3475-E | Grate | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-3475-E | Solid Lid | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-3475-F | Grate | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-3475-F | Solid Lid | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-3475-G | Grate | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-3475-G | Solid Lid | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-3475-H | Grate | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-3475-H | Solid Lid | DI 55+ ksi yield | 200,000 M306 | NA | NA | N/A |
| R-3480 | Grate Type A | | 200,000 | 0.260 | 2,170 | 530 |
| R-3480-A | Grate Type A | | 200,000 | 0.260 | 2,170 | 530 |
| R-3490-A | Mooring Eye | | 14,200 | 0.044 | 30 | 1,190 |
| R-3490-B | Mooring Eye | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-3491-AG | Grate Type G | | 169,100 | 0.146 | 1,030 | 1,110 |
| R-3491-GG | Grate Type G | | 145,900 | 0.157 | 960 | 630 |
| R-3491-GG | Grate Type G | DI 55+ ksi yield | 200,000 M306 | NA | NA | N/A |
| R-3491-GG | Grate Type G | | 145,900 | 0.157 | 960 | 630 |
| R-3491-GL | Solid Lid | | 150,000 M306 | NA | NA | NA |
| R-3491-HL | Solid Lid | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-3491-JL | Solid Lid | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-3492-1 | Grate Type G | | 145,900 | 0.157 | 960 | 630 |
| R-3492 | Solid Lid | | 150,000 M306 | NA | NA | NA |
| R-3492 | Solid Lid | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-3492-A | Solid Lid | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-3492-B | Solid Lid | DI 55+ ksi yield | 150,000 M306 | NA | NA | NA |
| R-3492-C | Solid Lid | DI 55+ ksi yield | 150,000 M306 | NA | NA | NA |
| R-3494 | Solid Lid | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-3495 | Solid Lid | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-3498-K2GS | Grate Type A | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-3498-K2S | Solid Lid | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |

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# PERFORMANCE DATA

| CATALOG NUMBER | CASTING DESCRIPTION | MATERIAL | ULTIMATE* LOAD LBS. | DEFLECTION INCHES | ENERGY FT LBS. | DESIGN EFFICIENCY |
|---|---|---|---|---|---|---|
| R-3498-P2GS | Grate Type A | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-3498-P2S | Solid Lid | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-3498-R2GS | Grate Type A | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-3498-R2S | Solid Lid | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-3498-R3GS | Grate Type A | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-3498-R3S | Solid Lid | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-3499-G | Grate Type A | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-3499 | Solid Lid | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-3499 | Grate Type A | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-3501-L1A | Grate Type C | | 40,000 M306 | NA | NA | NA |
| R-3501-PL | Grate Type L | | 50,000 M306 | NA | NA | NA |
| R-3501-PR | Grate Type L | | 50,000 M306 | NA | NA | NA |
| R-3501-TL | Grate Type L | | 40,000 M306 | NA | NA | NA |
| R-3501-TR | Grate Type L | | 40,000 M306 | NA | NA | NA |
| R-3501-TL | Grate Type L | | 32,400 | 0.490 | 660 | 210 |
| R-3501-TR | Grate Type L | | 32,400 | 0.490 | 660 | 210 |
| R-3526-L | Grate Type L | | 39,000 | 0.221 | 360 | 320 |
| R-3527-V | Grate Type V | | 40,000 M306 | NA | NA | NA |
| R-3528-V | Grate Type V | | 40,000 M306 | NA | NA | NA |
| R-3529-V | Grate Type V | | 40,000 M306 | NA | NA | NA |
| R-3531-E | Grate Type C | | 100,000 M306 | NA | NA | NA |
| R-3570 | Grate Type A | | 37,300 | 0.171 | 270 | 420 |
| R-3570-A | Grate Type A | | 37,300 | 0.171 | 270 | 420 |
| R-3571 | Grate Type A | | 37,300 | 0.171 | 270 | 420 |
| R-3571-A | Grate Type A | | 37,300 | 0.171 | 270 | 420 |
| R-3578 | Grate Type L | | 38,110 | 0.436 | 690 | 100 |
| R-3580 | Grate Type L | | 55,300 | 0.255 | 590 | 360 |
| R-3580-1 | Grate Type L | | 55,300 | 0.255 | 590 | 360 |
| R-3589-A | Grate Type A | | 50,000 M306 | NA | NA | NA |
| R-3949-A | Grate Type L | | 50,000 M306 | NA | NA | NA |
| R-3949-B | Grate Type L | | 50,000 M306 | NA | NA | NA |
| R-4014-B1 | Grate Type C | | 40,000 M306 | NA | NA | NA |
| R-4015-A | Grate Type B | | 18,400 | 0.159 | 120 | 1,230 |
| R-4015-A1 | Grate Type B | | 18,400 | 0.159 | 120 | 1,230 |
| R-4015-C | Grate Type B | | 18,400 | 0.159 | 120 | 1,230 |
| R-4015-D | Grate Type B | | 18,400 | 0.159 | 120 | 1,230 |
| R-4040-21 | Grate Type G | | 9,200 | 0.109 | 40 | 90 |
| R-4370-9 | Grate Type A | | 56,000 | 0.140 | 330 | 540 |
| R-4370-9 | Grate Type C | | 50,600 | 0.166 | 350 | 620 |
| R-4370-9 | Solid Lid | | 46,000 | 0.132 | 250 | 470 |
| R-4370-10 | Grate Type A | | 56,000 | 0.140 | 330 | 540 |
| R-4370-17 | Grate Type D | | 73,200 | 0.148 | 450 | 600 |
| R-4370-23 | Grate Type G | | 31,300 | 0.116 | 150 | 280 |
| R-4317-27-A | Grate Type G | | 55,700 | 0.266 | 620 | 140 |
| R-4380-26 | Grate Type G | | 6,500 | 0.054 | 20 | 50 |
| R-4406-2 | Grate Type C | | 25,600 | 0.070 | 70 | 540 |
| R-4409-A | Grate Type C | | 31,100 | 0.077 | 100 | 590 |
| R-4450 | Grate Type A | | 48,800 | 0.209 | 430 | 720 |
| R-4525 | Grate Type A | | 82,900 | 0.082 | 280 | 890 |
| R-4573 | Grate Type A | | 50,200 | 0.214 | 450 | 290 |
| R-4575-A | Grate Type A | | 40,000 M306 | NA | NA | NA |
| R-4641 | Grate Type A | | 40,000 M306 | NA | NA | NA |
| R-4711 | Grate Type C | | 105,700 | 0.155 | 680 | 390 |
| R-4720 | Grate Type C | | 57,500 | 0.132 | 320 | 540 |
| R-4735 | Grate Type A | | 40,000 M306 | NA | NA | NA |
| R-4755-B | Grate Type A | | 40,000 M306 | NA | NA | NA |
| R-4840 | Grate Type C | | 36,400 | 0.214 | 330 | 170 |
| R-4847 | Grate Type A | | 40,000 M306 | NA | NA | NA |
| R-4853-B1 | Grate Type C | | 46,500 | 0.407 | 790 | 90 |
| R-4856 | Grate Type C | | 95,000 | 0.156 | 620 | 300 |
| R-4859-C | Grate Type A | | 31,500 | 0.330 | 430 | 240 |
| R-4882 | Grate Type A | | 23,700 | 0.165 | 160 | 80 |
| R-4975 | Grate | | 1,100 | 0.122 | 10 | 30 |
| R-4990-AA | Grate Type A | | 200,000 M306 | NA | NA | NA |

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# PERFORMANCE DATA

| CATALOG NUMBER | CASTING DESCRIPTION | MATERIAL | ULTIMATE* LOAD LBS. | DEFLECTION INCHES | ENERGY FT LBS. | DESIGN EFFICIENCY |
|---|---|---|---|---|---|---|
| R-4990-AX | Grate Type A | | 57,500 | 0.079 | 190 | 1,200 |
| R-4990-AX | Grate Type C | | 51,200 | 0.070 | 140 | 1,080 |
| R-4990-AX | Grate Type P | | 40,000 M306 | NA | NA | NA |
| R-4990-BA | Grate Type A | | 200,000 M306 | NA | NA | NA |
| R-4990-BX | Grate Type A | | 68,700 | 0.084 | 240 | 1,200 |
| R-4990-CA | Grate Type A | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-4990-CX | Grate Type A | | 41,100 | 0.171 | 290 | 670 |
| R-4990-DA | Grate Type A | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-4990-DA | Grate Type C | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-4990-DA | Solid Lid | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-4990-DX | Grate Type A | | 41,600 | 0.120 | 200 | 590 |
| R-4990-DX | Solid Lid | | 67,100 | 0.077 | 220 | 630 |
| R-4990-EA | Grate Type A | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-4990-EA | Solid Lid | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-4990-EX | Grate Type A | | 57,000 | 0.181 | 430 | 640 |
| R-4990-EX | Solid Platen Lid | | 60,000 | 0.229 | 570 | 550 |
| R-4990-FA | Grate Type A | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-4990-FA | Solid Lid | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-4990-FX | Grate Type A | | 43,300 | 0.251 | 450 | 310 |
| R-4990-GX | Grate Type A | | 51,800 | 0.213 | 460 | 390 |
| R-4990-GX | Solid Lid | | 45,100 | 0.124 | 230 | 270 |
| R-4990-HA | Grate Type A | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-4990-HA | Solid Lid | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-4990-HX | Grate Type A | | 40,700 | 0.250 | 420 | 290 |
| R-4990-HX | Solid Platen Lid | | 40,000 M306 | NA | NA | NA |
| R-4990-JX | Grate Type A | | 42,900 | 0.253 | 450 | 210 |
| R-4990-KA2 | Grate Type A | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-4990-KA2 | Solid Lid | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-4990-KX | Grate Type A | | 42,800 | 0.314 | 560 | 190 |
| R-4990-LX | Grate Type A | | 41,500 | 0.376 | 650 | 170 |
| R-4990-LX | Solid Lid | | 93,600 | 0.179 | 700 | 260 |
| R-4990-MX | Grate Type A | | 40,100 | 0.376 | 630 | 120 |
| R-4990-MX | Solid Lid | | 116,900 | 0.243 | 1,180 | 300 |
| R-4990-NX | Grate Type A | | 57,000 | 0.624 | 1,480 | 180 |
| R-4990-OA | Grate Type A | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-4990-OA | Solid Lid | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-4990-OX | Grate Type A | | 55,500 | 0.389 | 900 | 140 |
| R-4994-HALM | Grate Type A | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-4996-CA | Grate Type A | DI 55+ ksi yield | 200,000 M306 | NA | NA | NA |
| R-4999-AX | Grate Type A | | 57,500 | 0.079 | 190 | 1,200 |
| R-4999-AX | Grate Type P | | 40,000 M306 | NA | NA | NA |
| R-4999-BX | Grate Type A | | 68,700 | 0.084 | 240 | 1,200 |
| R-4999-CX | Grate Type A | | 41,100 | 0.171 | 290 | 670 |
| R-4999-DX | Grate Type A | | 41,600 | 0.120 | 200 | 590 |
| R-4999-DX | Solid Lid | | 67,100 | 0.077 | 220 | 630 |
| R-4999-EX | Grate Type A | | 57,000 | 0.181 | 430 | 640 |
| R-4999-EX | Solid Platen Lid | | 60,000 | 0.229 | 570 | 550 |
| R-4999-FX | Grate Type A | | 43,300 | 0.251 | 450 | 310 |
| R-4999-GX | Grate Type A | | 51,800 | 0.213 | 460 | 390 |
| R-4999-GX | Solid Lid | | 45,100 | 0.124 | 230 | 270 |
| R-4999-HX | Grate Type A | | 40,700 | 0.250 | 420 | 290 |
| R-4999-HX | Solid Lid | | 48,300 | 0.242 | 490 | 280 |
| R-4999-JX | Grate Type A | | 42,900 | 0.253 | 450 | 210 |
| R-4999-L3 | Grate Type L | | 41,200 | 0.126 | 140 | 320 |
| R-4999-L6 | Grate Type L | | 46,200 | 0.194 | 370 | 250 |
| R-4999-MX | Grate Type A | | 40,100 | 0.376 | 630 | 120 |
| R-4999-MX | Solid Lid | | 116,900 | 0.243 | 1,180 | 300 |
| R-4999-NX | Grate Type A | | 57,000 | 0.624 | 1,480 | 180 |
| R-4999-OX | Grate Type A | | 55,500 | 0.389 | 900 | 140 |
| R-5050-CF15 | Drainage Gate | | 23,900 | 0.332 | 330 | 1,040 |
| R-5050-CF18 | Drainage Gate | | 34,700 | 0.680 | 980 | 990 |
| R-5050-CF20 | Drainage Gate | | 28,900 | 0.596 | 720 | 580 |
| R-5050-CF21 | Drainage Gate | | 28,900 | 0.596 | 720 | 580 |
| R-5050-CF24 | Drainage Gate | | 28,700 | 0.759 | 910 | 540 |

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# PERFORMANCE DATA

| CATALOG NUMBER | CASTING DESCRIPTION | MATERIAL | ULTIMATE* LOAD LBS. | DEFLECTION INCHES | ENERGY FT LBS. | DESIGN EFFICIENCY |
|---|---|---|---|---|---|---|
| R-5050-CF30 | Drainage Gate | | 33,700 | 0.830 | 1,160 | 310 |
| R-5050-CF36 | Drainage Gate | | 58,900 | 1.188 | 2,920 | 340 |
| R-5050-CF42 | Drainage Gate | | 66,000 | 1.066 | 2,770 | 230 |
| R-5050-FF18 | Drainage Gate | | 34,700 | 0.680 | 980 | 990 |
| R-5050-FF20 | Drainage Gate | | 28,900 | 0.596 | 720 | 580 |
| R-5050-FF24 | Drainage Gate | | 28,700 | 0.759 | 910 | 540 |
| R-5050-FF30 | Drainage Gate | | 33,700 | 0.830 | 1,160 | 310 |
| R-5050-SF15 | Drainage Gate | | 23,900 | 0.322 | 330 | 1,040 |
| R-5050-SF18 | Drainage Gate | | 34,700 | 0.680 | 980 | 990 |
| R-5050-SF20 | Drainage Gate | | 28,900 | 0.596 | 720 | 580 |
| R-5050-SF21 | Drainage Gate | | 28,900 | 0.596 | 720 | 580 |
| R-5050-SF24 | Drainage Gate | | 28,700 | 0.759 | 910 | 540 |
| R-5050-SF27 | Drainage Gate | | 54,400 | 0.448 | 1,020 | 610 |
| R-5050-SF30 | Drainage Gate | | 33,700 | 0.830 | 1,160 | 310 |
| R-5050-SF36 | Drainage Gate | | 58,900 | 1.188 | 2,920 | 340 |
| R-5050-SF42 | Drainage Gate | | 66,000 | 1.006 | 2,770 | 230 |
| R-5900-C | Solid Platen Lid | | 77,700 | 0.237 | 770 | 1,810 |
| R-5900-D | Solid Platen Lid | | 47,200 | 0.206 | 410 | 830 |
| R-5900-E | Solid Platen Lid | | 42,500 | 0.362 | 640 | 570 |
| R-5900-F | Solid Platen Lid | | 50,300 | 0.421 | 880 | 460 |
| R-5900-G | Solid Platen Lid | | 82,600 | 0.896 | 3,080 | 560 |
| R-5900-H | Solid Platen Lid | | 75,300 | 0.672 | 2,110 | 310 |
| R-5900-J | Solid Platen Lid | | 62,600 | 0.719 | 1,880 | 190 |
| R-5900-K | Solid Platen Lid | | 73,100 | 0.810 | 2,470 | 170 |
| R-5901-G | Grate Type G | | 32,700 | 0.248 | 340 | 280 |
| R-5901-H | Grate Type G | | 37,100 | 0.324 | 500 | 180 |
| R-5901-J | Grate Type G | | 38,300 | 0.210 | 340 | 120 |
| R-6018 | Grate Type G | | 169,100 | 0.146 | 1,030 | 1,110 |
| R-6018 | Vented Lid | | 96,600 | 0.085 | 340 | 740 |
| R-6019 | Grate Type C | | 49,900 | 0.130 | 270 | 530 |
| R-6019 | Grate Type D | | 73,200 | 0.148 | 450 | 600 |
| R-6019 | Grate Type G | | 48,900 | 0.181 | 370 | 540 |
| R-6019 | Solid Lid | | 93,600 | 0.098 | 380 | 600 |
| R-6019 | Solid Platen Lid | | 94,500 | 0.213 | 840 | 940 |
| R-6020 | Solid Platen Lid | | 49,500 | 0.339 | 700 | 710 |
| R-6021 | Grate Type G | | 48,900 | 0.181 | 370 | 540 |
| R-6021 | Vented Lid | | 114,700 | 0.152 | 730 | 750 |
| R-6030 | Grate Type C | | 49,900 | 0.130 | 270 | 530 |
| R-6030 | Solid Lid | | 89,500 | 0.151 | 560 | 580 |
| R-6033 | Grate Type C | | 49,900 | 0.130 | 270 | 530 |
| R-6033 | Grate Type D | | 73,200 | 0.148 | 450 | 600 |
| R-6033 | Grate Type G | | 48,900 | 0.181 | 370 | 540 |
| R-6033 | Solid Lid | | 43,000 | 0.065 | 120 | 330 |
| R-6035 | Grate Type C | | 49,900 | 0.130 | 270 | 530 |
| R-6035 | Grate Type D | | 73,200 | 0.148 | 450 | 600 |
| R-6035 | Solid Lid | | 93,600 | 0.098 | 380 | 600 |
| R-6035 | Solid Platen Lid | | 94,500 | 0.213 | 840 | 940 |
| R-6040 | Solid Lid | | 20,300 | 0.244 | 210 | 290 |
| R-6041 | Solid Lid | | 49,500 | 0.126 | 260 | 290 |
| R-6041-A | Solid Lid | | 49,500 | 0.126 | 260 | 290 |
| R-6041-B | Solid Lid | | 49,500 | 0.126 | 260 | 290 |
| R-6044-A | Solid Lid | | 15,600 | 0.182 | 120 | 180 |
| R-6050 | Solid Lid | | 83,200 | 0.148 | 510 | 470 |
| R-6052-A | Grate Type G | | 169,100 | 0.146 | 1,030 | 1,100 |
| R-6052-A | Vented Lid | | 96,600 | 0.085 | 340 | 740 |
| R-6052-C | Grate Type C | | 48,900 | 0.181 | 370 | 540 |
| R-6052-C | Vented Lid | | 114,700 | 0.152 | 730 | 750 |
| R-6052-D | Solid Lid | | 83,200 | 0.148 | 510 | 470 |
| R-6052-F | Grate Type G | | 68,700 | 0.182 | 520 | 400 |
| R-6052-F | Vented Lid | | 103,600 | 0.137 | 590 | 490 |
| R-6052-G | Grate Type G | | 145,900 | 0.157 | 960 | 630 |
| R-6052-H | Grate Type G | | 58,800 | 0.101 | 250 | 320 |
| R-6052-H | Solid Lid | | 80,100 | 0.123 | 410 | 410 |
| R-6052-J | Grate Type G | | 100,700 | 0.158 | 660 | 370 |

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# PERFORMANCE DATA

| CATALOG NUMBER | CASTING DESCRIPTION | MATERIAL | ULTIMATE* LOAD LBS. | DEFLECTION INCHES | ENERGY FT LBS. | DESIGN EFFICIENCY |
|---|---|---|---|---|---|---|
| R-6052-J | Solid Lid | | 77,300 | 0.132 | 430 | 270 |
| R-6060 | Solid Lid | | 40,000 M306 | NA | NA | NA |
| R-6060 | Grate Type G | | 49,200 | 0.194 | 400 | 350 |
| R-6066 | Grate Type G | | 68,700 | 0.182 | 520 | 400 |
| R-6066 | Vented Lid | | 103,600 | 0.137 | 590 | 490 |
| R-6067 | Grate Type G | | 145,900 | 0.157 | 960 | 630 |
| R-6074 | Grate Type G | | 58,800 | 0.101 | 250 | 320 |
| R-6075 | Grate Type G | | 58,800 | 0.101 | 250 | 320 |
| R-6075 | Solid Lid | | 80,100 | 0.123 | 410 | 410 |
| R-6077 | Solid Lid | | 16,100 | 0.101 | 70 | 110 |
| R-6077-A | Solid Lid | | 16,100 | 0.101 | 70 | 110 |
| R-6078 | Grate Type G | | 100,700 | 0.158 | 660 | 370 |
| R-6078 | Solid Lid | | 77,300 | 0.132 | 430 | 270 |
| R-6080 | Grate Type G | | 6,500 | 0.054 | 20 | 50 |
| R-6095 | Grate Type G | | 55,700 | 0.266 | 620 | 140 |
| R-6110 | Grate Type G | | 169,100 | 0.146 | 1,030 | 1,110 |
| R-6110 | Solid Lid | | 96,600 | 0.085 | 340 | 740 |
| R-6111 | Grate Type G | | 48,900 | 0.181 | 370 | 540 |
| R-6111 | Solid Lid | | 114,700 | 0.152 | 730 | 750 |
| R-6114 | Solid Lid | | 83,200 | 0.148 | 510 | 470 |
| R-6115 | Grate Type G | | 145,900 | 0.157 | 960 | 630 |
| R-6116 | Grate Type G | | 58,800 | 0.101 | 250 | 320 |
| R-6116 | Solid Lid | | 80,100 | 0.123 | 410 | 410 |
| R-6117 | Grate Type G | | 100,700 | 0.158 | 660 | 370 |
| R-6117 | Solid Lid | | 77,300 | 0.132 | 430 | 270 |
| R-6118 | Grate Type G | | 55,700 | 0.266 | 620 | 140 |
| R-6130 | Grate Type G | | 1,100 | 0.122 | 10 | 30 |
| R-6136 | Solid Lid | | 16,100 | 0.101 | 70 | 110 |
| R-6137 | Grate Type G | | 6,500 | 0.054 | 20 | 50 |
| R-6140 | Solid Lid | | 49,500 | 0.126 | 260 | 290 |
| R-6142 | Solid Lid | | 95,600 | 0.177 | 710 | 540 |
| R-6146 | Solid Platen Lid | | 63,900 | 0.435 | 1,160 | 800 |
| R-6147 | Solid Lid | | 72,700 | 0.122 | 370 | 640 |
| R-6148 | Vented Lid | | 107,300 | 0.232 | 1,040 | 900 |
| R-6310-F | Solid Lid | | 20,300 | 0.244 | 210 | 290 |
| R-6310-H | Solid Lid | | 16,100 | 0.101 | 70 | 110 |
| R-6310-H1 | Solid Lid | | 16,100 | 0.101 | 70 | 110 |
| R-6400-CS | Solid Lid | | 83,200 | 0.148 | 510 | 470 |
| R-6400-DO | Grate Type G | | 58,800 | 0.101 | 250 | 320 |
| R-6400-DS | Solid Lid | | 80,100 | 0.123 | 410 | 410 |
| R-6450-EG | Grate Type G | | 1,100 | 0.122 | 10 | 30 |
| R-6450-FL | Solid Platen Lid | | 49,500 | 0.339 | 700 | 710 |
| R-6450-GL | Solid Lid | | 20,300 | 0.244 | 210 | 290 |
| R-6450-JL | Solid Lid | | 16,100 | 0.101 | 70 | 110 |
| R-6450-KG | Grate Type G | | 6,500 | 0.054 | 20 | 50 |
| R-6460-C | Solid Lid | | 83,200 | 0.148 | 510 | 470 |
| R-6461-CH | Solid Platen Lid | | 77,700 | 0.237 | 770 | 1,810 |
| R-6461-DH | Solid Platen Lid | | 47,200 | 0.206 | 410 | 830 |
| R-6461-EH | Solid Platen Lid | | 42,500 | 0.362 | 640 | 570 |
| R-6461-FH | Solid Platen Lid | | 50,300 | 0.421 | 880 | 460 |
| R-6461-GH | Solid Platen Lid | | 82,600 | 0.896 | 3,080 | 560 |
| R-6461-HH | Solid Platen Lid | | 75,300 | 0.672 | 2,110 | 310 |
| R-6461-JH | Solid Platen Lid | | 62,600 | 0.719 | 1,880 | 190 |
| R-6461-KH | Solid Platen Lid | | 73,100 | 0.810 | 2,470 | 170 |
| R-6462-CH | Solid Platen Lid | | 77,700 | 0.237 | 770 | 1,810 |
| R-6462-DH | Solid Platen Lid | | 47,200 | 0.206 | 410 | 830 |
| R-6462-EH | Solid Platen Lid | | 42,500 | 0.362 | 640 | 570 |
| R-6462-FH | Solid Platen Lid | | 50,300 | 0.421 | 880 | 460 |
| R-6462-GH | Solid Platen Lid | | 82,600 | 0.896 | 3,080 | 560 |
| R-6462-HH | Solid Platen Lid | | 75,300 | 0.672 | 2,110 | 310 |
| R-6462-JH | Solid Platen Lid | | 62,600 | 0.719 | 1,880 | 190 |
| R-6462-KH | Solid Platen Lid | | 73,100 | 0.810 | 2,470 | 170 |
| R-6464-F | Solid Lid | | 111,500 | 0.157 | 730 | 780 |
| R-6660-KH | Solid Lid | | 14,300 | 0.156 | 90 | 150 |

* These values contain no safety factor. If you are unsure of what safety factor to use, phone Neenah (920) 725-7000 and ask for our Product Engineer.

NEENAH FOUNDRY

# PERFORMANCE DATA

| CATALOG NUMBER | CASTING DESCRIPTION | MATERIAL | ULTIMATE* LOAD LBS. | DEFLECTION INCHES | ENERGY FT LBS. | DESIGN EFFICIENCY |
|---|---|---|---|---|---|---|
| R-6660-KP | Solid Lid | | 14,300 | 0.156 | 90 | 150 |
| R-6660-NH | Solid Lid | | 21,900 | 0.244 | 220 | 140 |
| R-6660-NP | Solid Lid | | 21,900 | 0.244 | 220 | 140 |
| R-6660-RH | Solid Lid | | 9,900 | 0.445 | 180 | 50 |
| R-6660-RP | Solid Lid | | 9,900 | 0.445 | 180 | 50 |
| R-6661-VH | Solid Lid | | 9,800 | 0.301 | 120 | 60 |
| R-6661-VP | Solid Lid | | 9,800 | 0.301 | 120 | 60 |
| R-6662-C | Grate Type A | | 44,900 | 0.154 | 320 | 190 |
| R-6662-CH | Solid Lid | | 71,900 | 0.208 | 620 | 680 |
| R-6662-CP | Solid Lid | | 71,900 | 0.208 | 620 | 680 |
| R-6662-E | Grate Type A | | 48,500 | 0.168 | 340 | 560 |
| R-6662-HH | Solid Platen Lid | | 36,800 | 0.429 | 660 | 300 |
| R-6662-JP | Solid Platen Lid | | 36,300 | 0.410 | 620 | 270 |
| R-6662-KH | Solid Platen Lid | | 43,700 | 0.476 | 870 | 320 |
| R-6662-KP | Solid Platen Lid | | 43,700 | 0.476 | 870 | 320 |
| R-6662-LP | Solid Lid | | 63,700 | 0.165 | 440 | 250 |
| R-6662-PH | Solid Platen Lid | | 44,700 | 0.619 | 1,150 | 210 |
| R-6662-PP | Solid Platen Lid | | 44,700 | 0.619 | 1,150 | 210 |
| R-6662-TH | Solid Platen Lid | | 40,000 M306 | NA | NA | NA |
| R-6663-HH | Solid Platen Lid | | 41,300 | 0.502 | 860 | 230 |
| R-6663-HP | Solid Platen Lid | | 41,300 | 0.502 | 860 | 230 |
| R-6663-NH | Solid Lid | | 35,700 | 0.149 | 220 | 140 |
| R-6663-NP | Solid Lid | | 35,700 | 0.149 | 220 | 140 |
| R-6665-0KH | Solid Lid | | 14,300 | 0.156 | 90 | 150 |
| R-6665-0KP | Solid Lid | | 14,300 | 0.156 | 90 | 150 |
| R-6665-0NH | Solid Lid | | 21,900 | 0.244 | 220 | 140 |
| R-6665-0NP | Solid Lid | | 21,900 | 0.244 | 220 | 140 |
| R-6665-2CH | Solid Lid | | 71,900 | 0.208 | 620 | 680 |
| R-6665-2CP | Solid Lid | | 71,900 | 0.208 | 620 | 680 |
| R-6665-2EH | Solid Lid | | 28,300 | 0.122 | 140 | 330 |
| R-6665-2EP | Solid Lid | | 28,300 | 0.122 | 140 | 330 |
| R-6665-2KH | Solid Platen Lid | | 43,700 | 0.476 | 870 | 320 |
| R-6665-2KP | Solid Platen Lid | | 43,700 | 0.476 | 870 | 320 |
| R-6665-2LH | Solid Lid | | 63,700 | 0.165 | 440 | 250 |
| R-6665-2LP | Solid Lid | | 63,700 | 0.165 | 440 | 250 |
| R-6665-2PH | Solid Platen Lid | | 43,700 | 0.476 | 870 | 320 |
| R-6672-C | Grate Type A | | 44,900 | 0.115 | 220 | 660 |
| R-6672-C | Solid Lid | | 71,900 | 0.208 | 620 | 680 |
| R-6672-F | Solid Platen Lid | | 43,700 | 0.476 | 870 | 320 |
| R-6673-C | Grate Type C | | 40,000 M306 | NA | NA | NA |
| R-6673-B | Grate Type A | | 40,000 M306 | NA | NA | NA |
| R-6673-N | Solid Lid | | 29,900 | 0.216 | 270 | 190 |
| R-6690-FA | Solid Lid | | 21,900 | 0.244 | 220 | 140 |
| R-6690-FB | Solid Lid | | 21,900 | 0.244 | 220 | 140 |

* These values contain no safety factor. If you are unsure of what safety factor to use, phone Neenah (920) 725-7000 and ask for our Product Engineer.

NEENAH FOUNDRY

# FRAME TESTING

Some of the frames that Neenah Foundry produces have been tested at the University of Wisconsin using their 1,000,000 Pound Capacity Universal Testing Machine (UTM). The load on the frame was applied by using a number of machined ductile iron lids stacked on one another and the bottom one bearing on the seat of the frame. Loading was to failure or the capacity of the UTM.

The frames tested represent the modernized product offerings. There are many frames that have not been modernized and have load bearing capacities significantly greater than 1 million pounds. The testing results are listed below.

| CATALOG # NUMBER | FAILED AT (LBS) |
|---|---|
| R-1550 | 476,200 |
| R-1550-A | 476,200 |
| R-1554 | 631,800 |
| R-1556 | 818,000 |
| R-1557 | 910,000 |
| R-1559 | 502,000 |
| R-1560 | 920,000 |
| R-1565 | 702,000 |
| R-1642 | 475,000 |
| R-1661 | 623,100 |
| R-1664-A | 616,000 |
| R-1669-A1 | 478,600 |
| R-1670-A | 507,600 |
| R-1713 | 590,000 |
| R-1726-A | 507,600 |
| R-1728 | 803,400 |
| R-1728-A | 803,400 |
| R-1733 | 453,800 |
| R-1733-1 | 896,800 |
| R-1743 | 1,000,000 No Failure |
| R-1753-A | 956,800 |
| R-1760 | 637,000 |
| R-1760-A | 637,000 |
| R-1762 | 1,000,000 No Failure |
| R-1785 | 905,800 |
| R-1788-B | 529,100 |
| R-1796-D | 507,600 |
| R-1796-E | 475,000 |
| R-1900-B1 | 507,600 |
| R-1900-C | 475,000 |
| R-1927 | 590,000 |
| R-2014 | 590,000 |
| R-2015 | 590,000 |
| R-2050 | 476,200 |
| R-2070 | 476,200 |
| R-2290-B | 956,800 |
| R-2296 | 453,800 |
| R-2370 | 475,000 |
| R-2398 | 803,400 |
| R-2410 | 507,600 |
| R-2422-C | 616,000 |
| R-2428 | 476,200 |
| R-2435 | 1,000,000 No Failure |
| R-2467 | 623,100 |
| R-2471 | 623,100 |
| R-2500 | 507,600 |
| R-2501 | 475,000 |
| R-2504 | 590,000 |
| R-2504-C | 590,000 |
| R-2548 | 803,400 |
| R-2559 | 502,000 |
| R-2560-D2 | 590,000 |
| R-2560-D8 | 590,000 |
| R-2560-E | 476,200 |
| R-2560-E1 | 453,800 |
| R-2560-E2 | 453,800 |
| R-2560-E4 | 803,400 |
| R-2560-EA | 896,800 |
| R-2560-EB | 896,800 |
| R-2561 | 453,800 |
| R-2561-A | 453,800 |
| R-2571-D | 476,200 |
| R-2571-D1 | 453,800 |
| R-2571-E | 475,000 |
| R-2572 | 803,400 |
| R-2573 | 453,800 |
| R-2573-1 | 896,800 |
| R-2577 | 453,800 |
| R-2577-1 | 896,800 |
| R-2578 | 476,200 |
| R-2680 | 616,000 |

# NOTES

Spring Assist

**Neenah Foundry**
*"Word on the Street is Neenah"*

Since 1872, Neenah Foundry has been known for consistent quality, functional performance and design aesthetics. We're also proud of a reputation for responsive support and service. When you choose Neenah Foundry, you've chosen the best.

Neenah offers an extensive selection of castings for construction and municipal use including manhole covers and frames, catch basins and curb inlets, cast iron downspouts, tree grates, bridge scuppers, detectable warning plates, airport and port castings and many other specialty products.

Contact any Neenah Foundry office for more information. Visit www.neenahfoundry.com to order our catalogs and brochures or to locate your local Neenah Foundry representative.

LiftMate ™

Camlift ™

Downspouts

In support of the Green Initiative, Neenah Foundry is pleased to report that our products contain a minimum of 85% recycled content in the form of a minimum of 35% consumer-generated scrap metal and a minimum of 50% industrial-generated scrap metal.

NEENAH FOUNDRY

Neenah Foundry Company
Box 729, Neenah, Wisconsin 54957-0729
800-558-5075 | www.neenahfoundry.com
920-725-7000 | Fax: 920-729-3661

These products are to be specified and used under the guidance of qualified design professionals.

Neenah Foundry Co. is a subsidiary of

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