STEEL INDUSTRY EMBRACES A992

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By Jacques Cattan

For much of the past decade, ASTM A572 Gr. 50 has been the de facto standard in the structural steel industry. The advent of the mini-mills essentially eliminated the price premium for the material compared with A36 and many designers have long since made the switch.

Now, though, the next generation de facto standard is available. A992, with a minimum strength of 50ksi, is now available, has been incorporated into the 1999 LRFD Specification. For designers, the switch from A572 Gr. 50 to A992 should be seamless, and in fact, many designers have already been specifying the material, albeit as A572 Gr. 50 (with special requirements) as per AISC Technical Bulletin #3 March 1997. The new A992 Specification covers W shapes (rolled wide flange shapes) intended for use in building framing. For S, M, and HP shapes and channels, A36 or A572 Gr. 50 should still be specified. For angles and plates, A36 should still be specified (for more information, see the three-part series, "Are You Properly Specifying Materials," which appeared in the Jan.-March issues of MSC).

The major advantage of A992 is its better material definition. It has an upper limit on yield strength of 65 ksi, a minimum tensile strength of 65 ksi, a specified maximum yield to tensile ratio of 0.85 and a specified maximum carbon equivalent of 0.47%.

"All of our current wide flange shapes are available in A992 today," stated James L. Wroble, Vice President/Sales & Marketing at Chaparral Steel in Midlothian, TX. " And there's no premium compared with A36 for the material on the shapes that Chaparral currently produces."

Added Robert W. Johns, Sales Manager, Nucor Yamato Steel Company in Blytheville, AR: "We've been rolling the equivalent to A992 for three and a half years now, since before the release of AISC Technical Bulletin #3. All of Nucor-Yamato's wide flange shapes are available in A992, though there is currently a slight price premium compared with A36 once you get above about 150 lbs. Per foot."

Likewise wide flange sections produced by Northwestern Steel & Wire Co., as well the company's available inventory, meet the A992 Specification, according to Michael Venie, vice president of sales and marketing at Northwestern.

(Please check directly with other domestic and foreign wide flange mills concerning their policy on the new grade and its availability.)

"Also, during this transition period, there may be occasions where A922 is not readily available through service centers," explained Andy Johnson, Vice President of Marketing for AISC Marketing, Inc. "In these cases, we recommend that the engineer allow the substitution of A572 Gr. 50."

While mills and service centers are in the process of fully gearing up for A992, the steel specification has already adopted it. "The new material has already been incorporated into the latest set of revisions to the AISC specification," explained Stanley D. Lindsey, president of Stanley D. Lindsey & Assoc., Ltd., in Atlanta and chairman of the AISC Committee on Specifications.

As with A572 Gr. 50, A992 presents some attractive cost benefits over A36. Since there are often no grade extras for Gr. 50 steel, most buildings will achieve a greater economy by utilizing A992 instead of A36. However, even when extras do come into play, there are typically no overall cost penalties for the frame. "This is because the weight savings provide greater benefits than the premium for the grade extra," explained Johnson. "Studies have shown this to be true even when member sizes need to be increased to meet serviceability concerns." A copy of studies showing the cost savings of using Gr. 50 instead of Gr. 36 can be obtained by faxing a request to AISC Marketing at 312-670-5403.

In addition, the entire fabricated structural steel industry will ultimately benefit from economies of scale related to moving to a single grade of steel. "The use of a single high-strength grade is expected to simplify designs for buildings and produce economies of scale for service centers, mills and fabricators," explained H. Louis Gurthet, President of AISC.

The following page contains a brief comparison of ASTM A572 Grade 50 "Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel" and ASTM A992 "Standard Specification for Steel for Structural Shapes for Use in Building framing". The comparison focuses on the scope, chemical composition and tensile requirements.

Like any ASTM Specification, both A572 and A992 contain a reference section, a materials and manufacture section as well as optional supplementary requirements, which are not included in this comparison.

Scope:

A572 Grade 50	A992
Covers structural steel shapes, plates, piling and bars	Covers "W" shapes (rolled wide flange shapes) intended for use in building framing.
Intended for riveted, bolted or welded construction of bridges, buildings and other structures.	

Chemical Composition:

A572 Grade 50		A992	
Element	**Composition %**	**Element**	**Composition %**
Carbon, max	0.23	Carbon, max	0.23
Columbium, used alone	0.005 – 0.05	Columbium, max	0.05
		Copper, max	0.60
Manganese, max	1.35	Manganese	0.5 – 1.50
		Manganese, min. for group 1 shapes if Manganese to Sulfur ratio > 20 to 1	0.3
		Molybdenum, max	0.15
		Nickel, max	0.45
Phosphorus, max	0.04	Phosphorus, max	0.035
Silicon, max	0.40	Silicon, max	0.40
Sulfur, max	0.05	Sulfur, max	0.045
Vanadium, used alone	0.01-0.15	Vanadium, max	0.11
Vanadium + Columbium	0.02 – 0.15	Vanadium + Columbium, max	0.15
Vanadium alone and Nitrogen	Vanadium to nitrogen ratio 4 to 1 min Nitrogen 0.015% max	Vanadium alone and Nitrogen	Vanadium to nitrogen ratio 4 to 1 minimum if nitrogen is greater than 0.012%
		Carbon Equivalent, max	0.45% for groups 1,2 and 3 0.47% for groups 4 and 5

In addition A992 requires the reporting, for information, of the tin content. It also requires the reporting of the carbon equivalent using the following formula:

$$CE = C + (Mn)/6 + (Cr + Mo + V)/5 + (Ni + Cu)/15$$

Tensile Requirements:

A572 Grade 50		A992	
Tensile Strength, min	65 ksi	Tensile Strength, min	65 ksi
Yield Point, min	50 ksi	Yield Point	50 to 65 ksi
		Yield to tensile ratio, max	0.85
Elongation in 8 in., min	18%	Elongation in 8 in., min	18%

Elongation in 2 in., min 21%	Elongation in 2 in., min 21%