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New Issue

****THIS IS A NEW IM. – PLEASE READ CAREFULLY.****

DEFORMED AND PLAIN STAINLESS STEEL BARS FOR CONCRETE REINFORCEMENT

GENERAL

This IM covers deformed stainless-steel bars for concrete reinforcement in cut lengths or coils.

Acceptance of stainless steel reinforcement shall be on the basis of certification from an approved steel manufacturer, fabricators, and / or distributors. Stainless steel reinforcement shall meet the specified contract requirements for the type and grade.

Approval to furnish stainless steel reinforcement on a certification basis may be withdrawn for the following reasons:

a. Deficient test results on test samples
b. Inadequate documentation
c. Improper identification such as mill test reports, certificate of compliance
d. Corrosion test resistance report.

Approved fabricators, suppliers, and distributors are listed in Appendix A of this IM.

Stainless steel bars shall be deformed and shall meet the requirements of ASTM A 955/ A 955 M, Type XM-28, 304, 316L or 316 LN, Grade 40 (280), Grade 60 (420), Grade 75 (520) and / or as specified in the contract document. All stainless steel reinforcement shall be pickled after rolling to remove mill scale and surface oxidation.

Manufacture's Mill Approval

Prior to furnishing stainless steel reinforcement on a certification basis, the manufacturer shall request approval by submitting the following documents:

1. A letter of request shall be submitted to the Central Materials Office detailing the location of the manufacturing mill and distribution centers (if applicable).

2. A certification statement that the stainless steel reinforcement is of a domestic origin (melted and manufactured in the USA).

3. Quality control plan / procedures that the company has established to ensure material quality and identity (heat #) control through the manufacturing and quality control testing.

4. A typical example of certification document that the producing mill will furnish for Iowa DOT projects.

5. A black and white picture showing the permanent mill imprint marking symbols (grade marks, bar designation #, size, etc.)

6. Submit three (5-6 foot) sample bars for testing representing the range of small, medium, and large diameter bars rolled by the producing mill.

   Upon satisfactory review of the application and the submitted documents and satisfactory test results, and inspection of the facility, the producing mill will be placed on the approved list (Appendix A)

DISTRIBUTOR'S / SUPPLIER'S APPROVAL

Prior to furnishing stainless steel reinforcement on a certification basis, the distributor and / or supplier shall request approval by submitting the following documents:

1. A letter of request shall be submitted to the Central Materials Office in Ames, Iowa.

2. The request shall contain the following items:

   a. Sources of the stainless-steel reinforcement that would be handled by the supplier or distributor.
   b. Quality control procedures that the distributor / supplier has established to ensure the material identity as to heat number, source, size, grade, and origin from the time the material is received from the mill through the fabrication process and shipment.
   c. Typical example of certification documents and certification statement.
   d. Copy of an identification list, invoice, or bill of lading. The documents shall show the project number, design number, grade, size, length, heat number, weight, and ASTM designation. Additionally, the bill of lading shall have the mill test report identifying the same materials that has the same heat number.

Upon satisfactory review of the application and satisfactory inspection of the facility for compliance with the above state requirements, the distributor / supplier will be placed on the approve list (Appendix B).

Unidentified Stainless Steel Reinforcement

Any shipments of stainless steel reinforcement not from unapproved source and not identifiable by heat number, proper required markings and does not have and / or accompanied by a certified mill test report, corrosion test results and certificate of compliance shall not be accepted.

Verification Sampling and Testing

Verification samples shall be secured from the project site. Acceptance shall be based on certification and mill test report of each heat number. Materials acceptance shall be from approved sources.

1. Project quantity between 10 and 45 tons, one sample per project of the largest size.

2. Project quantity over 45 tons, one sample per project of the smallest, medium, and largest size.

3. Sample size shall be 5-6 ft long.

Weldability

If welding and / or tack welding is employed in the placement of the stainless-steel reinforcement then the following requirements must be implemented and followed prior to any welding:

1. Welding cannot be performed without prior approval of the engineer.

2. A welding procedure suitable for the chemical composition and for the intended use shall be submitted for approval prior to any welding.

3. Welding shall be performed by a state certified welder.

4. Welding and / or tack welding shall be performed in accordance with the requirements of the contract documents, IM requirements, and the latest requirements of the latest edition of the American Welding Society, AWS D1.6 including all of the requirements for the minimum preheat and interpass temperature.

GENERAL REQUIRMENTS

Certificate of compliance shall be required and the following additional requirements:

1. The minimum tensile yield strength and elongation shall meet the following requirements:

	Grade 40 (280) PSI (MPa)	Grade 60 (420) PSI (MPa)	Grade 75 (520) PSI (MPa)
Tensile Strength	70,000 (500)	90,000 (620)	100,000 (690)
Yield Strength	40,000 (280)	60,000 (420)	75,000 (520)
% Elongation in 8 inches For any bar size Designation	20	20	20

Note: When the actual percentage of elongation meets or exceeds 25%, the bending test requirements can be waived.

Bend Test Requirements

The bend test specimen shall withstand being bent around a pin diameter without cracking on the outside radius of the bent portion. The requirements for the degree of bending and sizes of the pins are as follows:

Bend Test Requirements

Bar Size Designation Number	Pin Diameter		
	Grade 40 (280)	Grade 60 (420)	Grade 75 (520)
Bar # 3, 4, 5 (10, 13, 16)	3 ½"	3 ½"	3 ½"
Bar # 6, 7, 8 (19, 22, 25)	5.0"	5.0"	5.0"
Bar # 9, 10, 11 (29, 32, 36)	5.0"	7.0"	7.0"
Bar # 14, 18 (90º) (43, 57)	5.0"	9.0"	9.0"

Hardness Requirements

There is no hardness requirements for the approved austentic grades and types. The approved grades and types are as follows:

UNS Designation	**Type**
S24100	XM-28
S30400	304
S31603	316L
S31653	316LN

Corrosion Resistance Requirements

Corrosion resistance and performance test shall be required and shall be performed by the manufacturer one time for each stainless-steel alloy processed as reinforcement. Macrocell test

methods and / or cracked beam test methods (including methods of removing the mill scale) can be acceptable.

Heat Treatment

Bars may be furnished in any one of the heat treatment conditions listed in ASTM A 955 / A 955M.

Finish

Stainless-steel bars shall be free of surface imperfection, seams, surface irregularities or mill oxidation. After rolling all stainless-steel bars shall be pickled to remove mill scale and surface oxidation. Deformations shall be uniform and shall be similar in size, shape, and pattern. The average spacing between deformations on each side of the bar shall not exceed seven tenths of the nominal diameter of the bar.

Markings

Each manufacturer shall have a special symbol identifying their marking system, distinguishing marks legibly rolled on one side of the bar to denote the following:

A. Letter or symbol for the producing mill.
B. Bar size designation
C. Steel type (stainless-steel alloy)
D. Grade mark and / or type

CONSTRUCTION REQUIREMENTS AND LABORATORY TESTING

1. **Bending and Cutting**

   A. Bending: Bend stainless-steel bars in accordance with the requirements of this IM and ASTM A 955 / A 955M

   B. Use fabrication equipment and tools that will not contaminate the stainless-steel with black iron particles.

      In order to prevent such contamination, equipment and tools used in the fabrication, including bending and cutting, shall be solely used for working with stainless steel. Carbon steel tools, chains, slings, etc. shall not be used when fabricating and / or handing stainless steel reinforcement bars.

1. **Shipping, Handling, and Storing**

   A. Chains, steel band, and wire rope shall not be used in lifting or handling the stainless steel reinforcement. Use nylon or polypropylene slings.

B. Prior to shipping, ensure that all chains, wire ropes, and / or steel bands will not come into direct contact with the stainless steel reinforcement bars.

C. Padding shall be used to separate carbon steel bundling bands or lifting devices from the stainless –steel bars.

D. Stainless-steel reinforcement supplied to a project shall be free of dirt, mill scale, oil, debris, detrimental surface imperfection or any other contaminants. Protect the stainless-steel from contamination during construction operations including any cutting, grinding, or welding in the vicinity of stainless-steel. Bars displaying rust or oxidation, questionable blemishes or that deviates from round shape, shall be subject to rejection.

E. Use wooden spacers to separate bundles of stainless-steel bars from other types of bars (epoxy coated and / or carbon steel bars)

F. Use wooden supports to store stainless steel rebar off the ground or shop floor shall be required.

G. Outside storage of stainless-steel reinforcement is acceptable provided that the . Outside storage shall require the stainless-steel reinforcement to be fully protected and be covered with tarpaulins.

H. Tie-wire used to tie stainless-steel reinforcements, shall be 16-guage or heavier tie wire either (1) fabricated from stainless-steel conforming to the same requirements, grade, type, and UNS designations as stainless-steel bar reinforcement as specified in contract document or as required by this IM or (2) tie wire shall meet the requirements of ASTM A 493 (latest) for stainless-steel wire and wire rods.

I. Bar supports – All stainless-steel bars shall be placed on bar supports (chairs) that are solid plastic, or stainless-steel supports (chairs) shall be fabricated from stainless-steel conforming to the same requirements, grade, type, and UNS designations as the stainless-steel bar reinforcement specified in the contract documents.

J. Stainless-steel reinforcement shall not be allowed to be in contact with the uncoated reinforcement, bare metal forming hardware, or to galvanized attachments or galvanized conduit.

To prevent any potential corrosion issues related to the use of dissimilar metals, consideration shall be given to isolating bare metal hardware or galvanized steel or conduits from the stainless-steel reinforcement.