Standard Specification for

Stainless Clad Deformed and Plain Round Steel Bars for Concrete Reinforcement

AASHTO Designation: MP 13M/MP 13-04 (2006)

American Association of State Highway and Transportation Officials
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1. SCOPE

1.1. This specification covers the stainless steel clad concrete reinforcement bars in cut lengths or coils, deformed and plain round. The standard sizes and dimensions of deformed bars and their number designations shall be those listed in Table 1 [Table 2].

Note 1—For coils of deformed bars, the capacity of industrial equipment limits the maximum bar size that can be straightened.

1.2. Bars are of three minimum yield levels: namely, 300 MPa [40000 psi], 420 MPa [60000 psi], and 520 MPa [75000 psi], designated as Grade 300 [40], Grade 420 [60], and Grade 520 [75], respectively.

1.3. Hot-rolled plain rounds, in sizes up to and including 50.8 mm [2 in.] in diameter in coils or cut lengths, when specified for dowels, spirals, and structural ties or supports shall be furnished under this specification in Grade 300 [40], Grade 420 [60], and Grade 520 [75] (Note 2).

For ductility properties (elongation and bending), test provisions of the nearest nominal diameter deformed bar size shall apply. Those requirements providing for deformations and marking shall not be applicable.

Note 2—The weight for plain rounds smaller than 9.5 mm [$^3/_8$ in.] in diameter shall be computed on the basis of the size in ASTM A 510.

1.4. Welding of the material in this specification should not be attempted since no experience has been demonstrated regarding weldability of this product. Mechanical coupling should be specified for bars requiring continuous longitudinal connection. Mechanical couplings must conform to ASTM A 276, UNS S31803.

1.5. This specification is applicable for orders in either SI units (MP 13M) or in inch-pound units (MP 13). SI units and inch-pound units are not necessarily equivalent. Inch-pound units are shown in brackets in the text for clarity, but they are the applicable values when the material is ordered to MP 13.

Table 1—Deformed Bar Designation Numbers, Nominal Masses, Nominal Dimensions, and Deformation Requirements, SI Units

		Nominal Dimensions[a]			Deformation Requirements, mm		
Bar Designation No.[b]	Nominal Mass, kg/m	Diameter, mm	Cross-Sectional Area, mm^2	Perimeter, mm	Maximum Average Spacing	Minimum Average Height	Maximum Gap (Chord of 12.5% of Nominal Perimeter)
10	0.560	9.5	71	29.9	6.7	0.38	3.6
13	0.994	12.7	129	39.9	8.9	0.51	4.9
16	1.552	15.9	199	49.9	11.1	0.71	6.1
19	2.235	19.1	284	59.8	13.3	0.97	7.3
22	3.042	22.2	387	69.8	15.5	1.12	8.5
25	3.973	25.4	510	79.8	17.8	1.27	9.7
29	5.060	28.7	645	90.0	20.1	1.42	10.9
32	6.404	32.3	819	101.3	22.6	1.63	12.4
36	7.907	35.8	1006	112.5	25.1	1.80	13.7
43	11.38	43.0	1452	135.1	30.1	2.16	16.5
57	20.24	57.3	2581	180.1	40.1	2.59	21.9

[a] The nominal dimensions of a deformed bar are equivalent to those of a plain round bar having the same mass per meter as the deformed bar.
[b] Bar designation numbers approximate the number of millimeters of the nominal diameter of the bar.

Table 2—Deformed Bar Designation Numbers, Nominal Weights, Nominal Dimensions, and Deformation Requirements, U.S. Customary Units

		Nominal Dimensions[a]			Deformation Requirements, in.		
Bar Designation No.[b]	Nominal Weight, lb/ft	Diameter, in.	Cross-Sectional Area, $in.^2$	Perimeter, in.	Maximum Average Spacing	Minimum Average Height	Maximum Gap (Chord of 12.5% of Nominal Perimeter)
3	0.376	0.375	0.11	1.178	0.262	0.015	0.143
4	0.668	0.500	0.20	1.571	0.350	0.020	0.191
5	1.043	0.625	0.31	1.963	0.437	0.028	0.239
6	1.502	0.750	0.44	2.356	0.525	0.038	0.286
7	2.044	0.875	0.60	2.749	0.612	0.044	0.334
8	2.670	1.000	0.79	3.142	0.700	0.050	0.383
9	3.400	1.128	1.00	3.544	0.790	0.056	0.431
10	4.303	1.270	1.27	3.990	0.889	0.064	0.487
11	5.313	1.410	1.56	4.430	0.987	0.071	0.540
14	7.65	1.693	2.25	5.32	1.185	0.085	0.648
18	13.60	2.257	4.00	7.09	1.58	0.102	0.864

[a] The nominal dimensions of a deformed bar are equivalent to those of a plain round bar having the same weight per foot as the deformed bar.
[b] Bar designation numbers are based on the number of eighth of an inch included in the nominal diameter of the bars.

2. REFERENCED DOCUMENTS

2.1. *AASHTO Standards*:

- R 11, Indicating Which Places of Figures Are to Be Considered Significant in Specified Limiting Values
- T 244, Mechanical Testing of Steel Products
- T 285, Bend Test for Bars for Concrete Reinforcement

2.2. *ASTM Standards*:

- A 6/A 6M, General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling
- A 264, Specification for Stainless Chromium-Nickel Steel-Clad Plate
- A 276, Specification for Stainless Steel Bars and Shapes
- A 510, Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel
- A 510M, Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel [Metric]
- A 700, Standard Practices for Packaging, Marking, and Loading Methods for Steel Products for Shipment
- A 959, Standard Guide for Specifying Harmonized Standard Grade Compositions for Wrought Stainless Steels
- E 190, Test Method for Guided Bend Test for Ductility of Welds
- G 12, Test Method for Nondestructive Measurement of Film Thickness of Pipeline Coatings on Steel

2.3. *Military Standards*:

- MIL-STD-129, Marking for Shipment and Storage
- MIL-STD-163, Steel Mill Products Preparation for Shipment and Storage

2.4. *Federal Standard*:

- Fed. Std. No. 123, Marking for Shipment (Civil Agencies)

3. TERMINOLOGY

3.1. *Definition of Terms Specific to This Standard*:

3.1.1. *completed bar*—steel bar with stainless cladding and deformations (if deformed).

3.1.2. *deformed bar*—steel bar with protrusions; a bar that is intended for use as reinforcement in reinforced concrete construction.

3.1.2.1. *Discussion*—The surface of the bar is provided with lugs or protrusions that inhibit longitudinal movement of the bar relative to the concrete surrounding the bar in such construction. The lugs or protrusions conform to the provisions of this specification.

3.1.3. *deformations*—protrusions on a deformed bar.

3.1.4. *metallurgical bonding*—the joining of metals so as to form a permanent joint between the mating surfaces. The principal requirements of joining two metals to achieve a metallurgical bond are thoroughly clean surfaces, heat energy, and mechanical pressure.

3.1.5. *plain bar*—a round, square, or hexagonal steel bar without protrusions.

3.1.6. *rib*—longitudinal protrusion on a deformed bar.

3.1.7. *stainless clad bar*—steel bar with stainless cladding for corrosion protection.

3.1.7.1. *Discussion*—The stainless cladding on the surface of the bar is provided by means of metallurgical bonding with the base steel. The stainless cladding offers corrosion protection to the level provided by the thickness of the alloy furnished. The stainless steel cladded reinforcement shall conform to the provisions of this specification.

4. ORDERING INFORMATION

4.1. *Orders for material under this specification should include the following information*:

4.1.1. Quantity (mass) [weight],

4.1.2. Name of material (stainless clad deformed and plain round steel bars for concrete reinforcement),

4.1.3. Size,

4.1.4. Cut length or coils,

4.1.5. Deformed or plain round,

4.1.6. Grade,

4.1.7. Packaging (see Section 19),

4.1.8. AASHTO designation and year of issue,

4.1.9. Certified mill test reports (if desired), and

4.1.10. Country of origin, which identifies producer and where material was produced.

Note 3—A typical ordering description is as follows: 10 000 kg , stainless clad deformed and plain round steel bars for concrete reinforcement, No. 25, 18 m long, deformed, Grade 420, in secured lifts, to MP 13M/MP 13-__. Certified mill test reports are required. Metric: Bundles shall have tags identifying producer, heat/lot number, and where material was manufactured. [10 tons, stainless clad deformed and plain round steel bars for concrete reinforcement, No. 8, 60 ft 0 in. long, deformed, Grade 60, in secured lifts, to MP 13M/MP 13-__. Certified mill test reports are required.] Customary: Bundles shall have tags identifying producer, heat/lot number, and where material was manufactured.

5. MATERIALS AND MANUFACTURE

5.1. The bars shall be rolled from properly identified heats/lots of stainless clad and core steel billets.

6. CHEMICAL REQUIREMENTS OF BAR

6.1. The manufacturer shall make an analysis of each heat/lot of steel from test samples taken preferably on the finished product. The percentages of required elements identified in Table 3 shall be determined along with identification of stainless alloy cladding, and conformance of its analysis with ASTM A 276, Type 316 or Type 316L.

6.2. The purchaser may make an analysis from finished bars. The product analysis of the core steel of the finished bars may vary from the heat analysis requirements of Table 3 by the percentages listed for each element as per Table B of ASTM A 6/A 6M.

Table 3—Chemical Requirements of Core Steels

Element	% of Element by Weight
Carbon	0.45 max
Manganese	1.40 max
Phosphorus	0.040 max
Sulfur	0.050 max
Silicon	0.04–0.40
Chromium	—
Nickel	—
Copper	—
Molybdenum	—
Vanadium	—

Note: Where a dash appears, there is no requirement.

7. REQUIREMENTS FOR STAINLESS STEEL CLADDING

7.1. Stainless steel cladding shall meet the requirements of ASTM A 959 [A 276], UNS S31600, or UNS S31603. These are austenitic, nonmagnetic stainless steels and will allow for the use of magnetic thickness gauges in determining coating thickness.

7.2. Stainless steel cladding shall be applied prior to the rolling of the completed bar.

7.3. *Cladding Thickness*:

7.3.1. For acceptance purpose, at least 90 percent of all recorded thickness measurements of the cladding on the completed bar shall be a minimum of 175 μm [0.007 in.] on the completed bar. Thickness measurements below 125 μm [0.005 in.] shall be considered cause for rejection.

7.3.2. A single recorded thickness measurement is the average of three individual readings obtained between three consecutive deformations (or within a 50-mm [2-in.] section for smooth bar). A minimum of five recorded measurements evenly spaced along each side of the test bar (a minimum of ten recorded measurements per bar) shall be obtained.

7.3.3. The cladding thickness shall be measured on the body of a straight length of bar between the deformations (or within a 50-mm [2-in.] section for smooth bar).

7.3.4. Cladding thickness measurements shall be taken on the full section of the bar as rolled.

7.3.4.1. Measurements shall be made in accordance with ASTM G 12, following the instructions for calibration and use recommended by the thickness gauge manufacturer. Pull-off or fixed probe gauges shall be used. "Pencil-type" pull-off gauges that require instantaneous readings (i.e., do not record the reading) shall not be used.

7.3.4.2. If a specimen for cladding thickness fails to meet the specified requirements, two retests shall be permitted on two random specimens from the same heat/lot for each failed test. If the results of both test specimens meet the specified requirements, the heat/lot shall be accepted.

7.4. *Bond Strength*—The cladding/core shall have minimum bond strength of 20 ksi per ASTM A 264.

8. REQUIREMENTS FOR DEFORMATIONS

8.1. Deformations shall be spaced along the bar at substantially uniform distances. The deformations on opposite sides of the bar shall be similar in size, shape, and pattern.

8.2. The deformations shall be placed with respect to the axis of the bar so that the included angle is not less than 45 degrees. Where the line of deformations forms an included angle with the axis of the bar from 45 degrees to 70 degrees inclusive, the deformations shall alternately reverse in direction on each side, or those on one side shall be reversed in direction from those on the opposite side. Where the line of deformation is over 70 degrees, a reversal in direction is not required.

8.3. The average spacing or distance between deformations on each side of the bar shall not exceed seven-tenths of the nominal diameter of the bar.

8.4. The overall length of deformations shall be such that the gap between the ends of the deformations on opposite sides of the bar shall not exceed 12.5 percent of the nominal perimeter of the bar. Where the ends terminate in a longitudinal rib, the width of the longitudinal rib shall be considered the gap. Where more than two longitudinal ribs are involved, the total width of all longitudinal ribs shall not exceed 25 percent of the nominal perimeter of the bar; furthermore, the summation of gaps shall not exceed 25 percent of the nominal perimeter of the bar. The nominal perimeter of the bar shall be 3.14 times the nominal diameter.

8.5. The spacing, height, and gap of deformations shall conform to the requirements prescribed in Table 1 [Table 2].

9. MEASUREMENTS OF DEFORMATIONS

9.1. The average spacing of deformations shall be determined by measuring the length of a minimum of 10 spaces and dividing that length by the number of spaces included in the measurement. The measurement shall begin from a point on a deformation at the beginning of the first space to a corresponding point on a deformation after the last included space. Spacing measurements shall not be made over a bar area containing bar-marking symbols involving letters or numbers.

9.2. The average height of deformations shall be determined from measurements made on not less than two typical deformations. Determinations shall be based on three measurements, per deformation, one at the center of the overall length and the other two at the quarter points of the overall length.

9.3. Insufficient height, insufficient circumferential coverage, or excessive spacing of deformations shall not constitute cause for rejection unless it has been established by determinations on each heat/lot tested that typical deformation height, gap, or spacing do not conform to the minimum requirements prescribed in Section 8. No rejection may be made on the basis of measurements if fewer than 10 adjacent deformations on each side of the bar are measured.

10. TENSILE REQUIREMENTS

10.1. The material, as represented by the test specimens, shall conform to the requirements for tensile properties prescribed in Table 4 [Table 5].

Table 4—Tensile Requirements, SI Units

	Grade 300[a]	Grade 420	Grade 520[b]
Tensile strength, min MPa	500	620	690
Yield strength, min MPa	300	420	520
Elongation in 203.2 mm, min %			
Bar Designation No.:			
10	11	9	—
13, 16	12	9	—
19	12	9	7
22, 25	—	8	7
29, 32, 38	—	7	6
43, 57	—	7	6

[a] Grade 300 bars are furnished only in sizes 10 through 19.
[b] Grade 520 bar are furnished only in sizes 19 through 57.

Table 5—Tensile Requirements, U.S. Customary Units

	Grade 40[a]	Grade 60	Grade 75[b]
Tensile strength, min psi	70000	90000	100000
Yield strength, min psi	40000	60000	75000
Elongation in 8 in., min %			
Bar Designation No.:			
3	11	9	—
4, 5, 6	12	9	—
7, 8	—	8	—
9, 10	—	7	—
11, 14, 18	—	7	6

[a] Grade 40 bars are furnished only in sizes 3 through 6.
[b] Grade 75 are furnished only in sizes 11, 14, and 18.

10.2. The yield point or yield strength shall be determined by one of the following methods:

10.2.1. The yield point shall be determined by arrest of the digital load readout, or marked change in the linearity of the elastic stress-strain line, or halt of the pointer, or drop of the beam, as described in Section 13.1.1 of T 244.

10.2.2. Where the steel tested does not exhibit a well-defined yield point, the yield point shall be determined at extension under load using an autographic diagram method or an extensometer as described in Sections 13.1.2 and 13.1.3 of T 244.

10.2.3. The extension under load shall be 0.005 mm/mm [0.005 in./in.] of gauge length (0.5 percent) for Grade 300 [40] and Grade 420 [60] and shall be 0.0035 mm/mm [0.0035 in./in.] of gauge length (0.35 percent) for Grade 520 [75]. When material is furnished in coils, the test sample must be straightened prior to placing it in the jaws of the tensile machine. Straightening shall be done carefully to avoid the formation of local sharp bends and to minimize cold work. Insufficient straightening before attaching the extensometer can result in lower-than-actual yield strength readings.

10.2.4. The percentage of elongation shall be as prescribed in Table 4 (Table 5) when tested in accordance with Section 13.4 of T 244.

10.2.5. Tension test specimens shall be the full section of the bar as rolled. The unit stress determinations on full-sized specimens shall be based on the nominal bar area. If any tensile property of any

tension test specimen is less than that specified, and any part of the fracture is outside the middle third of the gauge length, as indicated by scribe scratches marked on the specimen before testing, a retest shall be allowed.

10.2.6. If the results of an original tension specimen fail to meet the specified minimum requirements and are within 14 MPa [2000 psi] of the required tensile strength, within 7 MPa [1000 psi] of the required yield point, or within two percentage units of the required elongation, a retest shall be permitted on two random specimens for each original tension specimen failure from the heat/lot. If all results of these retest specimens meet the specified requirements, the heat/lot shall be accepted.

11. BENDING REQUIREMENTS

11.1. The bend-test specimen shall withstand being bent around a pin without cracking, wrinkling, or splitting of the cladding when tested in accordance with T 285. The requirements for angle of bending and sizes of pins are prescribed in Table 6 [Table 7]. When material is furnished in coils, the test sample must be straightened prior to placing it in the bend tester. The bend-test specimens shall be the full section of the bar as rolled.

11.2. The bend test shall be made on specimens of sufficient length to ensure free bending and with apparatus which provides:

11.2.1. Continuous and uniform application of force throughout the duration of the bending operation.

11.2.2. Unrestricted movement of the specimen at points of contact with the apparatus and bending around a pin free to rotate.

11.2.3. Close wrapping of the specimen around the pin during the bending operation.

11.3. Other acceptable methods of bend testing may be used such as:

11.3.1. Placing the bar specimen into a lubricated guided bend fixture, as defined by ASTM E 190.

11.3.2. Placing the bar specimen across two pins free to rotate, and applying the bending force with a central rotating pin, and adhering to the size and clearance requirements of Figure 1 of ASTM E 190.

11.3.3. If a bend test fails for reasons other than mechanical reasons or flaws in the specimen as described in Section 13.3.1, a retest shall be permitted on two random specimens from the same heat/lot. If the results of both test specimens meet the specified requirements, the heat/lot shall be accepted. The retest shall be performed on test specimens that are at air temperature, but not less than 16°C [60°F].

11.4. When failures occur under more severe methods, retests shall be permitted under the bend test method prescribed in Section 11.2.

Table 6—Bend Test Requirements, SI Units

Bar Designation No.	Pin Diameter for Bend Test[a]		
	Grade 300	Grade 420	Grade 520
10, 13, 16	$3^1/_2\ d$[b]	$3^1/_2\ d$	—
19	5 *d*	5 *d*	5 *d*
22, 25	—	5 *d*	5 *d*
29, 32, 36	—	7 *d*	7 *d*
43, 57, (90°)	—	9 *d*	9 *d*

[a] Test bends 180° unless noted otherwise.
[b] *d* = nominal diameter of specimen.

Table 7—Bend Test Requirements

Bar Designation No.	Pin Diameter for Bend Test[a]		
	Grade 40	Grade 60	Grade 75
3, 4, 5	$3^1/_2\ d$[b]	$3^1/_2\ d$	—
6	5 *d*[b]	5 *d*	—
7, 8	—	5 *d*	—
9, 10	—	7 *d*	—
11	—	7 *d*	7 *d*
14, 18, (90°)	—	9 *d*	9 *d*

[a] Test bends 180° unless noted otherwise.
[b] *d* = nominal diameter of specimen.

12. PERMISSIBLE VARIATION IN MASS [WEIGHT]

12.1. The permissible variation shall not exceed six percent under nominal mass [weight]; except for bars smaller than 9.5 mm [$^3/_8$ in.] plain round, the permissible variation in mass [weight] shall be computed upon the basis of the permissible variation in diameter in ASTM A 510M [ASTM A 510]. Reinforcing bars are evaluated on the basis of nominal mass [weights]. In no case shall the overmass [overweight] of any bar be the cause for rejection.

12.2. The specified limit of variation shall be evaluated in accordance with Recommended Practice R 11 (rounding method).

13. FINISH

13.1. The bar shall be free of detrimental surface imperfections.

13.2. Seams, surface irregularities, or mill scale shall not be cause for rejection, provided they are not signs of improper cladding operations.

13.3. Weight, dimensions, cross-sectional area, and tensile properties of a hand wire-brushed test specimen shall not be less than the requirements of this specification (Note 4).

Note 4—Deformed bars destined to be mechanically spliced may require a certain degree of roundness in order for the splices to adequately achieve strength requirements.

13.3.1. Surface imperfections other than those specified in Section 13.2 shall be considered detrimental when specimens containing such imperfections fail to conform to either tensile or bending

requirements. Examples include, but are not limited to, laps, seams, scabs, slivers, cooling or casting cracks, and mill or guide marks.

14. NUMBER OF TESTS

14.1. For bar sizes No. 10 to 57 [3 to 18], inclusive, one tension test and one bend test shall be made of each size rolled from each heat/lot.

14.2. Tests for cladding thickness shall be made on a minimum of three bars of each size from each heat/lot unless otherwise specified by the purchaser.

15. INSPECTION

15.1. The inspector representing the purchaser shall have free entry, at all times while work on the contract of the purchaser is being performed, to all parts of the manufacturer's works that concern the manufacture of the material ordered. The manufacturer shall afford the inspector all reasonable facilities to satisfy him that the material is being furnished in accordance with this specification. All tests (except product analysis) and inspection shall be made at the place of manufacture prior to shipment, unless otherwise specified, and shall be so conducted as not to interfere unnecessarily with the operation of the works.

15.2. *For Government Procurement Only*—Except as otherwise specified in the contract, the contractor is responsible for the performance of all inspection and test requirements specified herein and may use his own or any other suitable facilities for the performance of the inspection and test requirements specified herein, unless disapproved by the purchaser at the time of purchase. The purchaser shall have the right to perform any of the inspections and tests at the same frequency as set forth in this specification, where such inspections are deemed necessary to assure that material conforms to prescribed requirements.

16. REJECTION

16.1. Unless otherwise specified, any rejection based on tests made in accordance with Section 6.2 shall be reported to the manufacturer within twenty working days from the day the samples were tested by the purchaser.

17. TEST REPORTS

17.1. When specified in the purchase order, report the following information, on a per heat/lot basis. Additional items may be reported as requested or desired.

17.2. Chemical analysis shall include the composition of the stainless alloy cladding, and the elements carbon, manganese, silicon, phosphorus, and sulfur for core steel.

17.3. Tensile properties.

17.4. Bend test results.

17.5. Cladding thickness results.

17.6. Origin of materials and manufacturing processes for verification of "Domestic Origin" requirements.

18. MARKING

18.1. When loaded for mill shipment, bars shall be properly separated and tagged with the manufacturer's heat/lot or test identification number.

18.2. Each producer shall identify the symbols of his marking system.

18.3. All bars produced to this specification, except plain round bars which shall be tagged for grade, shall be identified by a distinguishing set of marks legibly rolled into the surface of one side of the bar to denote in the following order:

18.3.1. *Point of Origin*—Letter or symbol established as the producer's mill designation.

18.3.2. *Size Designation*—Arabic number corresponding to bar designation number of Table 1 [Table 2].

18.3.3. *Type of Steel*—Letter C indicates that the bar was produced to this specification.

18.3.4. *Minimum Yield Designation*—For Grade 420 [60] bars, either the number 4 [60] or a single continuous longitudinal line through at least five spaces offset from the center of the bar side. For Grade 520 [75] bars, either the number 5 [75] or two continuous longitudinal lines through at least five spaces offset each direction from the center of the bar. (No marking designation for Grade 300 [40] bars.)

19. PACKAGING

19.1. When specified in the purchase order, packaging shall be in accordance with the procedures in ASTM A 700.

19.2. The stainless steel clad bar shall be handled and shipped such that carbon steel bars, lifting straps, tiedown cables, or chains do not come in contact with clad bars.

19.3. *For Government Procurement Only*—When specified in the contract or order, and for direct procurement by or direct shipment to the U.S. Government, material shall be preserved, packaged, and packed in accordance with the requirements of MIL-STD-163. The applicable levels shall be as specified in the contract. Marking for shipment of such material shall be in accordance with Fed. Std. No. 123 for civil agencies and MIL-STD-129 for military agencies.

20. KEYWORDS

20.1. Concrete reinforcement; deformations (protrusions); steel bars.

ANNEX

(Mandatory Information)

A1. GUIDELINES FOR JOB-SITE PRACTICES

A1.1. When handling stainless steel clad bars, care shall be exercised to avoid damage to the bundles.

A1.2. Equipment for handling stainless steel clad bar shall have protected contact areas.

A1.3. Stainless steel clad bar shall be off-loaded as close as possible to their points of placement or under the crane so that the bars can be hoisted to the areas of placement to minimize rehandling.

A1.4. When handling stainless steel clad bars, care shall be exercised to avoid damage to the bundles.

A1.5. Stainless steel clad bar shall be stored off the ground on protective cribbing, and timbers placed between the bundles when stacking is necessary. Space supports sufficiently close to prevent sags in the bundles.

A1.6. Stainless steel clad bar shall be stored separately from regular steel.

A1.7. Long-term outside job-site storage shall be minimized or the material shall be stored indoors.

A1.8. Stainless steel clad bar shall not be flame cut.

A1.9. Placed stainless steel clad bars shall be inspected for damage prior to placing concrete. Damage to bars, which exhibit active corrosion (red-rust), shall be evaluated. Bars, which have damage exceeding two percent of the surface area in any 0.3-m [1-ft] length, shall be replaced.

A1.10. When placing stainless steel clad bar, all wire supports, spacers, and tying wire shall be plastic, plastic coated, or Type 316 stainless steel.

A1.11. Stainless steel clad bar in contact with black steel shall be minimized or eliminated where possible.

A1.12. Cut ends of stainless clad bars shall be epoxied and capped according to manufacturer's recommendations with either stainless steel caps or plastic caps. Caps shall be sealed to prevent the intrusion of moisture.