Designation: A 420/A 420M – 07

Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Low-Temperature Service[1]

This standard is issued under the fixed designation A 420/A 420M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope*

1.1 This specification[2] covers wrought carbon steel and alloy steel fittings of seamless and welded construction, covered by the latest revision of ASME B 16.9, ASME B 16.11, MSS-SP-79, MSS-SP-83, and MSS-SP-95. Fittings differing from these ASME and MSS standards shall be furnished in accordance with Supplementary Requirement S58 of Specification A 960/A 960M. These fittings are for use in pressure piping and pressure vessel service at low temperatures.

1.2 Optional supplementary requirements are provided for fittings where a greater degree of examination is desired. When desired, one or more of these supplementary requirements shall be specified in the order.

1.3 This specification is expressed in both inch-pound units and in SI units. However, unless the order specifies the applicable "M" specification designation (SI units), the material shall be furnished to inch-pound units.

1.4 The values stated in either inch-pound units or SI units are to be regarded separately as standard. Within the text, the SI units are shown in brackets. The values stated in each system are not exact equivalents; therefore, each system must be used independently of the other.

2. Referenced Documents

2.1 In addition to those Referenced Documents listed in Specification A 960/A 960M, the following list of standards apply to this specification.

2.2 *ASTM Standards:* [3]

A 370 Test Methods and Definitions for Mechanical Testing of Steel Products

A 960/A 960M Specification for Common Requirements for Wrought Steel Piping Fittings

2.3 *ASME Standards:*

B 16.9 Factory-Made Wrought Steel Butt-Welding Fittings[4]

B 16.11 Forged Steel Fittings, Socket-Welding Threaded[4]

Section VIII Division 1, Pressure Vessels[4]

Section IX Welding Qualifications

2.4 *MSS Standards:*

MSS-SP-25 Standard Marking System for Valves, Fittings, Flanges, and Unions[5]

MSS-SP-79 Socket Welding Reducer Inserts[5]

MSS-SP-83 Steel Pipe Unions, Socket-Welding and Threaded[5]

MSS-SP-95 Swage(d) Nipples and Bull Plugs[5]

2.5 *ASNT Standards:*

SNT-TC-1A Recommended Practice for Nondestructive Testing Personnel Qualification and Certification[6]

3. Ordering Information

3.1 See Specification A 960/A 960M.

4. General Requirements

4.1 Product furnished to this specification shall conform to the requirements of Specification A 960/A 960M, including any supplementary requirements that are indicated in the purchase order. Failure to comply with the general requirements of Specification A 960/A 960M constitutes nonconformance with this specification. In case of conflict between the requirements of this specification and Specification A 960/A 960M, this specification shall prevail.

5. Material

5.1 The material for fittings shall consist of forgings, bars, plates, seamless or fusion welded tubular products with filler metal added. It shall conform to the chemical requirements in Table 1, and be made by one of the following processes:

[1] This specification is under the jurisdiction of ASTM Committee A01 on Steel, Stainless Steel and Related Alloys and is the direct responsibility of Subcommittee A01.22 on Steel Forgings and Wrought Fittings for Piping Applications and Bolting Materials for Piping and Special Purpose Applications.

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[2] For ASME Boiler and Pressure Vessel Code applications see related Specification SA-420 in Section II of that Code.

[3] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[4] Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Three Park Ave., New York, NY 10016-5990.

[5] Available from Manufacturers Standardization Society of the Valve and Fittings Industry (MSS), 127 Park St., NE, Vienna, VA 22180-4602.

[6] Available from American Society for Nondestructive Testing (ASNT), P.O. Box 28518, 1711 Arlingate Ln., Columbus, OH 43228-0518.

***A Summary of Changes section appears at the end of this standard.**

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TABLE 1 Chemical Requirements

NOTE 1—All requirements are maximum unless otherwise indicated.
NOTE 2—Where an ellipsis (...) appears in this table, there is no requirement.

Grade[A]	Composition, %										
	C	Mn	P	S	Si	Ni	Cr	Mo	Cu	Cb	V
WPL6	0.30	0.50–1.35	0.035	0.040	0.15–0.40	0.40	0.30	0.12	0.40	0.02[B]	0.08
WPL9	0.20	0.40–1.06	0.030	0.030	. . .	1.60–2.24			0.75–1.25		
WPL3[C]	0.20	0.31–0.64	0.05	0.05	0.13–0.37	3.2–3.8			. . .		
WPL8[D]	0.13	0.90	0.030	0.030	0.13–0.37	8.4–9.6			. . .		

[A] When fittings are of welded construction, the symbols above shall be supplemented by the letter "W".
[B] By agreement, the limit for Columbium may be increased up to 0.05 % on heat analysis and 0.06 % on product analysis.
[C] Fittings made from plate or forgings may have 0.90 % max manganese.
[D] Fittings made from plate may have 0.98 % max manganese.

open-hearth, basic-oxygen, or electric-furnace. The steels shall be made using recognized melting practices necessary to produce steels that shall meet the impact requirements of this specification.

6. Manufacture

6.1 Forging or forming operations shall be performed by hammering, pressing, piercing, extruding, upsetting, working, bending, fusion-welding, or machining, or by a combination of two or more of these operations. The forming procedure shall be so applied that it will not produce injurious defects in the fittings.

6.2 All welds, including welds in tubular products from which fittings are made, shall be (*1*) made by welders, welding operators and welding procedures qualified under the provisions of ASME Section IX, (*2*) heat treated in accordance with Section 7 of this specification, and (*3*) nondestructively examined throughout the entire length of each weld in accordance with Section 14 of this specification. The radiography of welds shall be done either prior to or after forming at option of manufacturer. Personnel performing NDE examinations shall be qualified in accordance with SNT-TC-1A.

6.3 The welded joints of the fittings shall be finished in accordance with the requirements of Paragraph UW-35 (a) of Section VIII, Division 1 of ASME Boiler and Pressure Vessel Code.

6.4 All butt-weld tees manufactured by cold-forming methods shall be liquid penetrant or magnetic particle examined by one of the methods specified in Supplementary Requirement S52 or S53 of Specification A 960/A 960M. This examination shall be performed after final heat treatment by NDE personnel qualified under the provisions of SNT-TC-1A. Only the sidewall areas of the tee need be examined. This area is defined by a circle that covers the area from the weld bevel of the branch outlet to the centerline of the body or run. Internal and external surfaces shall be examined when size permits accessibility. After the removal of any cracks, the tees shall be re-examined by the original method. Acceptable tees shall be marked with the symbol PT or MT, as applicable, to indicate compliance.

6.5 Stubends may be produced with the entire lap added by the welding of a ring, made from plate or bar of the same alloy grade and composition, to the outside of a straight section of pipe, provided the weld is double welded, is a full penetration joint, satisfies the requirements of 6.2 for qualifications and radiography and 7.1 for post weld heat treatment.

7. Heat Treatment

7.1 All fittings shall be furnished in the normalized, normalized and tempered, annealed, or quenched and tempered condition. All welding shall be completed prior to the austenitizing heat treatment.

7.2 The full thickness of the material from which impact test specimens are to be obtained shall be heat treated with a furnace charge as specified in 10.4.2 or 10.4.3.

7.3 After forming, the fittings shall be allowed to cool below the lower critical before applying one of the heat treatments listed in 7.1.

7.4 When the fittings are to be post-weld heat treated after being welded by the purchaser and when so specified in the order, the test specimens shall be subjected to the same post-weld heat treatment. The purchaser shall use the post-weld heat treatment shown in Table 2, unless otherwise specified in the order.

8. Chemical Composition

8.1 The steel shall conform to requirements of chemical composition for the respective material prescribed in Table 1.

8.2 The steel shall not contain any unspecified elements for the ordered grade to the extent that it then conforms to the requirements of another grade for which that element is a specified element having a required minimum content.

8.3 The chemical composition of weld metal is not required to meet the same limits of the base materials however, the composition of the weld deposit shall be such that it meets the minimum mechanical and impact requirements of this specification. In general, the alloy content shall be similar to that of the base metal but shall not exceed 6 % except in the case of fittings of 9 % nickel steel.

8.4 A product analysis is optional.

TABLE 2 Post-Weld Heat Treatment

Grade	Metal Temperature		Minimum Holding Time
	°F	°C	
WPL6	1100–1200	595–650	1 h/in. [25 mm] ¾ h min
WPL3	1100–1150	540–620	¼ h/in. [25 mm] 1 h min
WPL8	1050–1100	565–595	½ h/in. [25 mm] 1 h min
WPL9[A]	1025–1085	550–585	1 h/in. [25 mm] 2 h min

[A] 2 in. [51 mm] thickness and over. The cooling rate shall not be less than 300 °F [150 °C] per hour down to a temperature of 600 °F [315 °C].

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9. Tensile Properties

9.1 The tensile properties of the fittings material shall conform to the requirements for the applicable grade of material as listed in Table 3.

9.2 At least one tension test shall be made on each heat of material and in the same condition of heat treatment as the finished fittings it represents provided that the wall thickness of the fitting and the representative sample thickness do not vary more than ¼ in. [6 mm]. At least one tension test per heat of weld metal shall be made after heat treatment in the same manner as the base metal. Results need not be reported unless Supplementary Requirement S51 of Specification A 960/A 960M is specified.

9.3 Records of the tension tests shall be certification that the material of the fitting meets the tensile requirements of this specification.

10. Impact Test Properties

10.1 *Properties*:

10.1.1 The notched bar impact properties of the base metal and weld metal shall conform to the requirements of Table 4 or Table 5 for the applicable grade of material.

10.1.2 *Retest*—When the average value of the three specimens equals or exceeds the minimum value permitted for a single specimen and the value for more than one specimen is below the required average value, or when the value for one specimen is below the minimum value permitted for a single specimen, a retest of three additional specimens shall be made. The value for each of these retest specimens shall equal or exceed the required average value. When an erratic result is caused by a defective specimen, or there is uncertainty in test procedure, a retest shall be allowed.

10.2 *Procedures*:

TABLE 3 Tensile Requirements

NOTE 1—Where an ellipsis (. . .) appears in this table, there is no requirement.

Requirement	Grade			
	WPL6	WPL9	WPL3	WPL8
Tensile strength, min ksi [MPa]	60 [415] – 95 [655]	63 [435] – 88 [610]	65 [450] – 90 [620]	100 [690] – 125 [865]
Yield strength, min ksi [MPa]	35 [240]	46 [315]	35 [240]	75 [515]

Elongation Requirements	Grades							
	WPL6		WPL9		WPL3		WPL8	
	Longi-tudinal	Trans-verse	Longi-tudinal	Trans-verse	Longi-tudinal	Trans-verse	Longi-tudinal	Trans-verse
Standard round specimen, or small proportional specimen, min % in 4 D	22	12	20	. . .	22	14	16	. . .
Rectangular specimen for wall thickness 5/16 in. [7.94 mm] and over, and for all small sizes tested in full section; min % in 2 in. or 50 mm	30	16.5	28	18	30	20	22	. . .
Rectangular specimen for wall thickness less than 5/16 in [7.94 mm]; min % in 2 in. or 50 mm (½-in. [12.7- mm] wide specimen)	[A]	[A]	[A]	[A]	[A]	[A]	[A]	. . .

[A] For each 1/32 in. [0.79 mm] decrease in wall thickness below 5/16 in. [7.94 mm], a deduction of 1.5 % (grades WPL6, WPL9, and WPL3) or 1.25 % (WPL8) for longitudinal and 1.0 % (grades WPL6, WPL9 and WPL3) for transverse from the values shown above is permitted. The following table gives the minimum value for various wall thicknesses:

Wall Thickness		Grades							
		WPL6		WPL9		WPL3		WPL8	
in	[mm]	Longi-tudinal	Trans-verse	Longi-tudinal	Trans-verse	Longi-tudinal	Trans-verse	Longi-tudinal	Trans-verse
5/16 (0.312)	[7.94]	30.0	16.5	28.0	18.0	30.0	20.0	22.0	. . .
9/32 (0.281)	[7.14]	28.5	15.5	26.5	17.0	28.5	19.0	20.75	. . .
¼ (0.250)	[6.35]	27.0	14.5	25.0	16.0	27.0	18.0	19.5	. . .
7/32 (0.219)	[5.56]	25.5	. . .	23.5	. . .	25.5	. . .	18.25	. . .
3/16 (0.188)	[4.76]	24.0	. . .	22.0	. . .	24.0	. . .	17.0	. . .
5/32 (0.156)	[3.97]	22.5	. . .	20.5	. . .	22.5	. . .	15.75	. . .
⅛ (0.125)	[3.17]	21.0	. . .	19.0	. . .	21.0	. . .	14.5	. . .
3/32 (0.094)	[2.38]	19.5	. . .	17.5	. . .	19.5	. . .	13.25	. . .
1/16 (0.062)	[1.59]	18.0	. . .	16.0	. . .	18.0	. . .	12.0	. . .

Note—The preceding table gives the computed minimum elongation value for each 1/32 in. [0.79 mm] decrease in wall thickness. Where the wall thickness lies between two values above, the minimum elongation value is determined by the following equations:

Direction of Test	Equations			
	WPL6	WPL9	WPL3	WPL8
Longitudinal	$E = 48t + 15.00$	48t + 13.00	E = 48t + 15.00	40t + 9.50
Transverse	$t = 32t + 6.50$	32t + 8.00	E = 32t + 10.00	. . .

where:

E = elongation in 2 in. or 50 mm, %, and

t = actual thickness of specimen, in.

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TABLE 4 Charpy Impact Requirements for WPL6, WPL9, and WPL3[A]

Size of Specimen, mm	Charpy V-Notch Impact Value Required for Acceptance (Average of Three Specimens)		Minimum Charpy V-Notch Impact Value Without Requiring Retest (One Specimen Only of a Set)	
	ft·lbf	J	ft·lbf	J
10 by 10.0	13	17.6	10	13.6
10 by 7.5	10	13.6	8	10.8
10 by 5.0	7	9.5	5	7.0
10 by 2.5	4	5.4	3	4.1

[A] Straight-line interpolation for intermediate values is permitted.

TABLE 5 Charpy Impact Requirements for WPL8

Size of Specimen, mm	Charpy V-Notch Impact Value Required for Acceptance (Average of Specimens)		Minimum Charpy V-Notch Impact Value Without Requiring Retest (One Specimen Only of a Set)	
	ft·lbf	J	ft·lbf	J
10 by 10.0	25.0	33.9	20.0	27.1
10 by 7.5	21.0	28.5	17.0	23.1
10 by 5.0	17.0	23.1	14.0	19.0
10 by 2.5	8.0	10.8	6.0	8.1

10.2.1 All material furnished under this specification shall be tested for impact resistance at the temperature for the respective grade in Table 6. Exceptions to these requirements are permissible when agreed upon between the purchaser and producer and specified in the order, in that the impact test is acceptable when made at temperatures different from those shown in Table 6, provided the test temperature is at least as low as the intended service temperature, and fittings are suitably marked in accordance with Section 18 to identify the reported test temperature.

10.2.2 The notched-bar impact test shall be made in accordance with the procedure for the simple-beam, Charpy-type test of Test Methods and Definitions A 370. Each impact test shall consist of breaking three specimens.

10.3 *Specimens*:

10.3.1 Notched-bar impact specimens shall be simple-beam, Charpy-type A with a V-notch in accordance with Test Methods and Definitions A 370. Standard specimens 10 by 10 mm in cross section shall be used unless the material to be tested is of insufficient thickness, in which case the largest obtainable standard subsize impact specimens shall be used. When the size or shape of the finished fittings is insufficient to permit obtaining the smallest standard subsize impact specimens, an impact test by the fitting manufacturer will not be required. The material from which the specimens are taken shall be heat treated with a furnace charge in accordance with 10.4.2 or 10.4.3. Impact tests shall be made from either the raw material from which the fittings are made or from a finished fitting at the option of the manufacturer.

TABLE 6 Impact Test Temperature

Grade	Impact Test Temperature, °F [°C]
WPL6	−50 [−45]
WPL9	−100 [−75]
WPL3	−150 [−100]
WPL8	−320 [−195]

10.3.2 Test specimens shall be obtained so that the longitudinal axis of the specimen is parallel to the longitudinal axis of the fitting while the axis of the "V" shall be perpendicular to the surface. On wall thickness over 1 in. [25 mm] the specimens shall be obtained with their longitudinal axis located ½ in. [13 mm] from the outer surface.

10.3.3 When testing welds, the notch of the specimen shall be in the welded joint and, where the diameter and wall thickness permit, the longitudinal axis of the specimen shall be transverse to the longitudinal axis of the weld. The axis of the notch shall be perpendicular to the surface.

10.4 *Number of Tests*:

10.4.1 A notched-bar impact test, consisting of breaking three specimens shall be made. Each test shall represent only such fittings from a heat that do not vary from the thickness of the material from which the test specimens are taken by more than ¼ in. [6 mm].

10.4.2 When heat treatment is performed in furnaces not equipped with calibrated recording pyrometers, one impact test shall be made for each heat in each heat-treatment load. Test specimens shall be included with each furnace charge. If this heat treatment is conducted in continuous-type furnaces not equipped with calibrated recording pyrometers, then one test per heat shall be conducted for each 5000 lb or 2550 kg (or less) of product.

10.4.3 When heat treatment is performed in furnaces controlled within a 50 °F [28 °C] range and equipped with calibrated recording pyrometers so that records of heat treatment are available, then one impact test from each heat is required, provided that all other heat treatments are conducted at the same temperatures and within the same 50 °F [28 °C] range as the furnace charge that contained the test specimens.

10.4.4 On fittings of welded construction, additional impact tests of the same number as required in 10.4.1 or 10.4.2 shall be made to test the weld metal.

10.4.5 Specimens showing defects while being machined or prior to testing shall be discarded, and replacements shall be considered as original specimens.

10.5 *Retreatment*:

10.5.1 If the results of impact tests conducted in accordance with 10.4.2 and 10.4.3 fail to conform to the test requirements specified in 10.1, that group of fittings shall be retreated and submitted for test. No group of fittings shall be retreated more than twice.

11. Hydrostatic Tests

11.1 Hydrostatic testing of fittings is not required by this specification.

11.2 All fittings shall be capable of withstanding without failure, leakage, or impairment of their serviceability, a hydrostatic test pressure equal to that prescribed for the specified matching pipe of equivalent material.

12. Dimensions

12.1 Butt-welding fittings and butt-welding short-radius elbows and returns purchased in accordance with this specification shall conform to the dimensions and tolerances given in

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the latest revision of ASME B 16.9 or MSS-SP-95. Steel socket-welding and threaded fittings purchased in accordance with this specification shall conform to the sizes, shapes, dimensions, and tolerances specified in the latest revision of ASME B 16.11, MSS-SP-79, or MSS-SP-83.

12.2 Fittings of size or shape differing from these standards, but meeting all other requirements of the specification, shall be furnished in accordance with Supplementary Requirement S58 of Specification A 960/A 960M only by agreement with the purchaser.

13. Surface Quality

13.1 See Specification A 960/A 960M.

13.2 *Repair by Welding (Base Metal)*:

13.2.1 Repair welding, by the manufacturer, is permissible for parts made to dimensional standards such as those of ASME or equivalent standards.

13.2.2 Prior approval of the purchaser shall be required to weld repair special parts made to the purchaser's dimensional requirements.

13.2.3 Welding shall be accomplished with a weld procedure designed to produce low hydrogen in the weldment. Short circuit gas metal arc welding is permissible only with the approval of the purchaser.

13.2.4 The weld repair shall be permanently identified with the welder's stamp or symbol in accordance with Section IX of the ASME Boiler and Pressure Vessel Code.

13.2.5 After weld repair, material shall be heat treated in accordance with 7.1.

13.2.6 Tension and impact testing of representative deposited weld metal for each heat shall meet the requirements of 9.2 and 10.1.

14. Radiographic Examination

14.1 All fusion-welded butt joints shall be radiographically examined throughout the entire length in accordance with Paragraph UW-51 of Section VIII, Division 1, of the ASME Boiler and Pressure Vessel Code. Instead of radiographic examination, welds made by the manufacturer may be ultrasonically examined in accordance with Appendix 12 of Section VIII, Division 1, of the ASME Boiler and Pressure Vessel Code. In general, radiography or ultrasonic examination shall be performed after all forming operations have been completed. Fittings made from fusion-welded pipe need not be radiographed if the pipe has been radiographed, provided the fitting forming process does not materially affect the weld.

15. Inspection

15.1 All tests and inspections shall be made at the place of manufacture, unless otherwise agreed to.

15.2 Other tests, when required by agreement shall be made from materials of the lots covered in the order.

16. Rejection and Rehearing

16.1 Material that fails to conform to the requirements of this specification shall be rejected. Rejection should be reported to the producer or supplier promptly and in writing. In case of dissatisfaction with the results of the test, the producer or supplier shall make claim for a rehearing.

16.2 Fittings that develop defects in shop working or application operations shall be rejected. Upon rejection, the manufacturer shall be notified promptly in writing.

17. Certification

17.1 Test reports are required for all fittings covered by this specification. Each test report shall include the following information:

17.1.1 Chemical analysis results, Section 8 (Table 1),

17.1.2 Tensile property results, Section 9 (Table 3) report yield strength and ultimate strength in ksi [MPa] and elongation in percent,

17.1.3 Impact test results, Section 10 (Table 4 and Table 5),

17.1.4 Type heat treatment, Section 7,

17.1.5 Radiographic examination statement, Section 14,

17.1.6 Any supplemental testing required by the purchase order, and

17.1.7 Statement that the fitting was manufactured, sampled, tested, and inspected in accordance with the specification and was found to meet the requirements.

17.2 Certification shall state whether welds have been examined radiographically or ultrasonically.

17.3 Letters of compliance and test results shall state the specification number, year of issue, revision letter (if any), grade and class of the fittings.

18. Product Marking

18.1 All fittings shall have the prescribed information marked on each fitting in accordance with MSS-SP-25, latest revision.

18.1.1 Fittings shall be marked by any method which will permanently identify the fittings and not result in sharp discontinuities. Stamping, when used, shall be done with blunt-nosed continuous or blunt-nosed interrupted dot stamps.

18.1.2 When agreed upon between the purchaser and producer, and specified in the order, the markings shall be painted or stenciled on the fitting or stamped on a metal or plastic tag which shall be securely attached to the fitting.

18.2 The prescribed information for butt-welding fittings shall be: the manufacturer's name or trademark (see Note 1), material designation or grade, schedule number or nominal wall thickness designation, and the heat number or manufacturer's heat identification. Fittings containing welds that have been ultrasonically examined instead of radiography shall be marked U after heat identity.

NOTE 1—For purposes of identification marking, the manufacturer is considered the organization that certifies the piping component complies with this specification.

18.3 The prescribed information for threaded or socket welding fittings shall be: the manufacturer's name or trademark, material designation or grade, pressure class or schedule number, and size.

18.4 When size does not permit complete marking, identification marks shall be omitted in the reverse order of those listed above and in accordance with MSS-SP-25.

18.5 The impact test temperature shall also be shown if it is different from the standard test temperature specified in Table 6, for example: WPL-6-60 or WPL3-176.

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18.6 *Bar Coding*—In addition to the requirements in 18.1, 18.2, 18.3, 18.4, and 18.5, bar coding is acceptable as a supplemental identification method. The purchaser may specify in the order a specific bar coding system to be used. The bar coding system, if applied at the discretion of the supplier, should be consistent with one of the published industry standards for bar coding. If used on small fittings, the bar code may be applied to the box or a substantially applied tag.

19. Keywords

19.1 pipe fittings; piping applications; pressure containing parts; pressure vessel service; temperature service applications, low

SUPPLEMENTARY REQUIREMENTS

One or more of the supplementary requirements appearing in Specification A 960/A 960M may be included in the order or contract. When so included, a supplementary requirement shall have the same force as if it were in the body of the specification. Supplementary requirement details not fully described shall be agreed upon between the purchaser and the supplier.

SUMMARY OF CHANGES

Committee A01 has identified the location of selected changes to this specification since the last issue, A 420/A 420M – 06, that may impact the use of this specification. (Approved March 1, 2007)

(*1*) Added MSS-SP-83 to 1.1 and 12.1.
(*2*) Revised 2.5 to delete the year date of SNT-TC-1A.
(*3*) Revised17.1.7 to clarify that a certificate of compliance is required to be part of the MTR.

Committee A01 has identified the location of selected changes to this specification since the last issue, A 420/A 420M – 05, that may impact the use of this specification. (Approved March 1, 2006)

(*1*) Revised the wording in paragraph 17.1 and added paragraph 17.1.7 to add mandatory reporting requirements.

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