

API SC5 Ballot Submission

Task Group on OCTG

Work Item Number	2407
Title of Work Item	PMI
Ballot Revision Level	1
Type of Distribution [Voting and Comment, Comment-only, Recirculation (comment resolution), Re-ballot]	Re-ballot (vote and comment); includes comment resolution from the initial ballot
API Document Modified	API Spec 5CRA
Revision Key	Identify how deletions, additions, and changes to previous ballots, as applicable, are marked (e.g., Current changes to the API document in: red

Work Item Charge: Add PMI requirements for material verification to API Spec 5CRA (Groups 2, 3, and 4).

Ballot Rationale:

1. Require mill PMI for verification (of the product marking in most cases),
2. Allow additional field PMI per API 5CRA Annex D for Purchaser Inspection, to address both verification and mixing or sorting concerns.

Ballot Text: below

NOTE See the ballot email notification for additional information regarding this ballot.

API Specification 5CRA changes

3 Normative References

Add:

API Recommended Practice 578, *Guidelines for a Material Verification Program (MVP) for New and Existing Assets*

ASTM E1476, *Standard Guide for Metals Identification, Grade Verification, and Sorting*

4 Terms, abbreviated terms, symbols and definitions

4.3 Abbreviated terms

Add: PMI Positive Material Identification

5 Information to be supplied by the purchaser

For 5.2, insert new row r): In requirement column add **Positive Material Identification for Group 1**; in reference column add 7.1.

6 Manufacturing process

6.6 Traceability

(no change required)

7 Material requirements

7.1 Chemical composition

Add 5th paragraph: For Groups 2, 3 and 4, each length of all products shall receive PMI testing in accordance with 9.17. **The purpose of PMI is the verification of the Material Category**

9 Inspection and testing

9.1 Test Equipment

(no change required)

9.2 Type and frequency of tests

No change to text. Add PMI to Tables A.20/C.20 (see below).

9.3 Testing of chemical composition

9.3.1 Chemical analysis

(no change required)

Add new sub-section, 9.17:

9.17 Positive Material Identification (PMI) testing for material verification program for Groups 2, 3 and 4

9.17.1 General (revised 9.16.1 NDE text)

The PMI requirements are specified in **7.1 and the test method in 9.17.2 to 9.17.3**. The test frequency for PMI is given in Table A.20 or Table C.20. The purchaser may conduct additional PMI tests to ensure compliance with this standard (see D.3). In case of dispute, an additional product chemical analysis in accordance with 7.1 shall be used as the referee method.

9.17.2 Products (revised 9.16.3 text)

All products shall be tested in accordance with API 578 or ASTM E1476.

All methods shall have validated and documented capability to detect at a minimum the following elements in the tolerance range for the applicable material category: Cr, Ni, Mo. **The allowable range for the accuracy of each element shall be documented by the manufacturer.**

PMI testing shall be carried out after final marking, or prior to final marking provided a validated and documented procedure that demonstrates traceability shall be maintained between PMI testing through final marking.

If testing produces an arc burn; the arc burn shall be treated as a defect as defined in 7.11.

9.17.3 Reference standards

Reference standards traceability to international or national measurement standards shall be documented. Where no such standards exist, the basis used for calibration or verification shall be documented.

A documented procedure to identify and record the serial number of each standard is required. A documented standardization procedure which includes a requirement to average two or more readings shall be used. **The PMI equipment calibration shall be verified to a reference standard once every lot and at least once every shift.**

9.17.4 Personnel qualifications

All personnel performing PMI testing by the manufacturer shall be qualified by the manufacturer to each applicable test method and material category. A record of training shall be made available to the purchaser upon request.

11 Marking

No change required. Marking is not needed since PMI test required for all products and PSLs.

13 Documents

13.3 Test certificates

Move current m) to n) and add new m):

m) Statement of compliance to the PMI requirements and the method used.

Edit Tables A.20 and C.20 (below):

Tables A.20 — Type and frequency of tests for non-upset and upset products

Type of test or requirements		Test requirements ^a	Frequency of testing ^b	Test methods	Requirements
1		2	3	4	5
Cast analysis		m ^d	1 per cast	9.3.2	7.1
Product analysis	Non-remelted alloy	m ^d	2 per cast	9.3.2	7.1
	Remelted alloy	m ^d	1 per ingot	9.3.2	7.1
Room-temperature tensile test		m ^d	1 per test lot ^c	9.5.2	7.2
Elevated-temperature tensile test		o ^d	1 per test lot ^c	9.5.2	7.2
Hardness test		m ^d	1 series/ test lot ^c	9.6.2	7.3
Impact or flattening test		m ^d	9.7.2	9.7.3 or 9.7.4.1	7.4, 7.5, 7.6, 7.7
Microstructure examination		m ^d	1 per test lot ^c	9.8.2	7.9
Visual inspection		m	Each product	9.15	7.10, 7.11, 8.4
Hydrostatic test		m ^d (o ^h) ^d	Each pipe	9.14	7.12
Dimensional testing:					
— Outside diameter		m	Each end	9.9.2	Table A.15 and Table A.17
— Wall thickness		m	Each end	9.9.3	Table A.15 and Table A.17
— Drift test ^e		m	Each pipe	9.10	Table A.15 and Table A.18 or Table A.19
— Length		m	Each product	9.11	Table A.16
— Straightness		m	Each pipe	9.12	8.3.3
— Mass		m	Each product	9.13	Table A.15 and Table A.17
Non-destructive examination:					
— UT for longitudinal defects		m ^d	Each product	9.16	7.11
— UT for transverse defects		m ^d	Each product	9.16	7.11
— UT for laminar defects		m ^d	Each product	9.16	7.11
— UT for wall thickness ^e		m ^d	Each product	9.16	7.11
— UT manual on upset L+T ^e		m ^d (o ^f) ^d	Each product	9.16	7.11
— EMI ^e		o ^{d,f}	Each product	9.16	7.11
— Liquid penetrant inspection		m (o ^f)	Only ground or machined area	9.16	7.11
— MT		o ^f (m ^g)	Only ground or machined area	9.16	7.11
— PMI		m	Each product for Groups 2, 3, and 4	9.17	7.1
<div><div>^a “m” signifies mandatory; “o” signifies optional (an agreement is required).</div><div>^b For definition of “test lot”, see 4.1.19. See Table A.21 for the maximum number of product in a test lot.</div><div>^c Minimum 1 per cast.</div><div>^d It is required that records be retained.</div><div>^e Not applicable to coupling stock.</div><div>^f Option for group 1 only.</div><div>^g Mandatory for upset ends of group 1.</div><div>^h Option for CH only.</div></div>					

Tables C.20 — Type and frequency of tests for non-upset and upset products

Type of test or requirements		Test requirements ^a	Frequency of testing ^b	Test methods	Requirements
1		2	3	4	5
Cast analysis		m ^d	1 per cast	9.3.2	7.1
Product analysis	Non-remelted alloy	m ^d	2 per cast	9.3.2	7.1
	Remelted alloy	m ^d	1 per ingot	9.3.2	7.1
Room-temperature tensile test		m ^d	1 per test lot ^c	9.5.2	7.2
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Hardness test		m ^d	1 series/ test lot ^c	9.6.2	7.3
Impact or flattening test		m ^d	9.7.2	9.7.3 or 9.7.4.1	7.4, 7.5, 7.6, 7.7
Microstructure examination		m ^d	1 per test lot ^c	9.8.2	7.9
Visual inspection		m	Each product	9.15	7.10, 7.11, 8.4
Hydrostatic test		m ^d (o ^h) ^d	Each pipe	9.14	7.12
Dimensional testing:					
— Outside diameter		m	Each end	9.9.2	Table C.15 and Table C.17
— Wall thickness		m	Each end	9.9.3	Table C.15 and Table C.17
— Drift test ^e		m	Each pipe	9.10	Tables C15 and Table C.18 or Table C.19
— Length		m	Each product	9.11	Table C.16
— Straightness		m	Each pipe	9.12	8.3.3
— Mass		m	Each product	9.13	Table C.15 and Table C.17
Non-destructive examination:					
— UT for longitudinal defects		m ^d	Each product	9.16	7.11
— UT for transverse defects		m ^d	Each product	9.16	7.11
— UT for laminar defects		m ^d	Each product	9.16	7.11
— UT for wall thickness ^e		m ^d	Each product	9.16	7.11
— UT manual on upset L+T ^e		m ^d (o ^f) ^d	Each product	9.16	7.11
— EMI ^e		o ^{d,f}	Each product	9.16	7.11
— Liquid-penetrant inspection		m (o ^f)	Only ground or machined area	9.16	7.11
— MT		o ^f (m ^g)	Only ground or machined area	9.16	7.11
— PMI		m	Each product for Groups 2, 3, and 4	9.17	7.1
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Ballot: 4438		WI 2407 (5CRA), Positive Material Identification		Report Date: 4/16/2018	Closing Date: 4/13/2018
Sort Key	Clause Subclause Number	Paragraph	Comment	Proposed Change	Comment Resolution
1	13.3	m	The measuring equipment including reference standards are handled by the Supplier company's internal procedures according to quality standards requirements. Remove the requirement of reference standard serial number to be included in the certificate.	Remove the requirement of reference standard serial number to be included in the certificate for consistency with other testing equipments in the standard. Remove point m.	Removal of serial number from test certificate is persuasive. The rest of m) remains.
2	3	n a	API RP 578 title not consistent with published API RP 578 title (e.g. guidelines, plural)	Change title of API Recommended Practice 578 to "Guidelines for a Material Verification Program (MVP) for New and Existing Assets"	persuasive - editorial
3	5	5.2	Discrepancy to include PMI in section 5.2 as section 5.2 is for purchaser's "options." Witin the ballot, PMI is "mandatory" for Groups 2, 3 and 4 in the ballot.	Delete: "Insert new row r): In requirement column add Positive Material Identification; in reference column add 7.1."	persuasive - editorial. To include for Group 1 by agreement between purchaser and manufacturer.
4	7.1	Paragraph 7	We kindly propose to substitute the wording for "when agreed between the Manufacturer and the Customer", since mandatory PMI of each joint leads to the increase of production costs (additional equipment shall be purchased). Traceability system should generally ensure that the materials are not mixed together during production.		non persuasive - previously discussed. No proposed change.
5	9	9.17.1	Add reference to clause 9.3 for testing of chemical composition. Clause 7.1 is for the chemical requirements only, not the testing.	Change to "...in accordance with 7.1 and 9.3 shall be used as the referee method....."	persuasive - editorial. Make it clear section 7 includes the requirements and section 9.17 is for the inspection method.
6	9.17.1	1	Second sentence is redundant with D.3 and D.4 which describes the overall process without being prescriptive on the treatment of rejected products that shall be by agreement. The agreement may include or not re-doing the chemical analysis as in 9.3.2 (not 7.1)	Delete second and third sentences	non persuasive - intended to be prescriptive in this case.
7	9.17.1	1	The purpose of PMI testing is to verify that the Material Grade is correct according to the PO and no mix of material has occurred during manufacture. The PMI is not a verification of the actual material composition.	Add a sentence: The purpose of PMI is the verification of Grade as per the Purchase Agreement. The PMI is not a verification of the actual material composition of the product.	first sentence is persuasive: The purpose of PMI is the verification of the Material Category. Second sentence is non-persuasive.
8	9.17.2	1	allowable range	Analysed elements and allowable range should be specified because handheld analyzer does not have so high accuracy. For example, "Basically, Ni, Cr, Mo and W shall be analysed by PMI. It is allowed that analysis results show between 90% of lower limit and 110% of upper limit. Lower limit and upper limit is specified in Table A.28 or C.28. When analysis of other elemens is required by purchaser, the values, the range and the analysis procedure shall be agreed between purchaser and manufacturer."	persuasive - add to second paragraph: The allowable range for the accuracy of each element shall be documented by the manufacturer.
9	9.17.3	1	Add reference to equipment calibration	Add a sentence: The PMI equipment shall be calibrated to a reference standard once every lot and at least once every shift.	Persuasive. Change to: The PMI equipment calibration shall be verified to a reference standard once every lot and at least once every shift.
Endof Comm ents					