Task Group for Table 1 in API 1104
Report to Main Committee
Wednesday, January 28, 2015
Outline

- Background
- Task group members
- Recommendations to address electrode suffix designator issue
  - Suffix designator issue in general
  - “G only” suffix designator issue
- Letter ballot options
- Recommendations for updates and improvements to Table 1
The inadvertent use of E8018 electrodes with “B” class suffix designators has resulted in a number of incidents – e.g., E8018-B9 electrodes (intended for welding 9% Cr-1% Mo steels) for welding Type B full-encirclement sleeves to an in-service pipeline.

There is currently no requirement in API 1104 to specify electrode suffix designators for AWS A5.5 specification electrodes, some of which can be very highly alloyed.

Other than “notes” in 5.4.2.2 and 5.4.2.6 (essential variables for base material and filler metal, respectively), there is currently nothing in API 1104 that prevents substituting E8018 electrodes with suffix designators commonly used for pipeline applications with those that are not appropriate – e.g., B9.

Electrodes with G suffix designator only can also be very highly alloyed (e.g., B9 “modified” sold as E8018-G).

Primary purpose of the task group is to develop recommendations to address this issue, which will be included in an upcoming advisory bulletin from PHMSA.

Task group will also develop recommendations to incorporate other needed updates and improvements to Table 1 and related text.
Task group charge:

- “To update Table 1 and related text in API 1104 to address the issue of electrode suffixes for AWS A5.5 specification electrodes and to incorporate other needed updates and improvements”

- Precaution - need to be careful that we do not make changes that result in onerous requirements to requalify welding procedures
**Task Group Members**

- Kevin Beardsley – Lincoln Electric
- Matt Boring – Applus RTD/Kiefner
- Bill Bruce – DNV GL – Chair
- Mike Childers – Southwest Gas
- Don Drake – ExxonMobil
- Marshall Farley – Consumers Energy (ret.)
- Robert Gatlin – Welding Robotic Solutions
- Bob Huntley – RMH Welding Consulting
- Robert Lazor – TransCanada PipeLines
- Jon Lee – Chevron
- David Preston – EN Engineering
- Perry Sheth – National Grid

- **Observers**
  - Ed Baniak – API
  - Tim Burns – Shell

- Four task group meetings to date (including this morning)
Current Requirements in Section 5 – 1 of 2

- **Specification Information for Filler Metal in 5.3.2.5**
  
  5.3.2.5 Filler Metal, Flux, and Number of Beads
  
  The sizes and classification number of the filler metal and flux and the minimum number and sequence of beads shall be designated.

- **Essential Variable for Filler Metal in 5.4.2.6**
  
  5.4.2.6 Filler Metal
  
  The following changes in filler metal constitute essential variables:
  
  a) a change from one filler metal group to another (see Table 1);
  
  b) for materials with a SMYS greater than or equal to that of the material specified as API 5L Grade X65, a change in the AWS classification of the filler metal (see 5.4.2.2).

  Changes in filler metal within filler metal groups may be made within the material groups specified in 5.4.2.2. The compatibility of the base material and the filler metal should be considered from the standpoint of mechanical properties.

- **Material Groupings in 5.4.2.2**
  
  a) SMYS less than or equal to that of the material specified as API 5L Grade X42;
  
  b) SMYS greater than that of the material specified as API 5L Grade X42 but less than that of the material specified as API 5L Grade X65;
  
  c) for materials with a SMYS greater than or equal to that of the material specified as API 5L Grade X65, each grade shall receive a separate qualification test.

  NOTE 1 The groupings specified in 5.4.2.2 do not imply that base materials or filler metals of different analyses within a group may be indiscriminately substituted for a material that was used in the qualification test without consideration of the compatibility of the base materials and filler metals from the standpoint of metallurgical and mechanical properties and requirements for preheat and PWHT.
### Current Requirements in Section 5 – 2 of 2

#### Table 1—Filler Metal Groups

<table>
<thead>
<tr>
<th>Group</th>
<th>AWS Specification</th>
<th>AWS Classification Electrode</th>
<th>Flux</th>
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<tr>
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<td>E7015, E7010, E7010</td>
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<td>A5.5</td>
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<td></td>
<td>E6010</td>
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<tr>
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<td>E91T0-G</td>
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</tr>
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</table>

**NOTE**: Other electrodes, filler metals, and fluxes may be used but require separate procedure qualification.

- Any combination of flux and electrode in Group 4 may be used to qualify a procedure. The combination is identified by its complete AWS classification number, such as PTAS-EL12 or PTA-EM13K. Only substitutions that result in the same AWS classification number are permitted without requalification.
- A shielding gas (see 5.4.2.10) is required for use with the electrodes in Group 5.
- In the flux designation, the X can be either an A or P for as-welded or postweld heat treated.
- For root pass welding only.
### Improved Format for Table 1

#### Table 1 – Filler Metal Groups

<table>
<thead>
<tr>
<th>Group</th>
<th>AWS Specification</th>
<th>AWS Classification</th>
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<tr>
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<td>6</td>
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<tr>
<td>9</td>
<td>A5.29</td>
<td>E9118-G</td>
</tr>
</tbody>
</table>

**NOTE:** Other electrodes, filler metals, and fluxes may be used but require separate procedure qualification.

- **a** Any combination of flux and electrode in Group 4 may be used to qualify a procedure. The combination is identified by its complete AWS classification number, such as E7010-FL12 or FE43-EM12K. Only substitutions that result in the same AWS classification number are permitted without requalification.
- **b** A shielding gas (see §4.3.10) is required for use with the electrodes in Group 5.
- **c** In the flux designation, the X can be either an A or P for as-welded or postweld heat treated.
- **d** For root pass welding only.
Suffix Designators

- AWS A5.1 and A5.5 suffixes designators commonly used (or could be used without concern) for pipeline applications* include:
  - No suffix designator
  - -1 – improved impact toughness at -40°F
  - A1 – Carbon-Moly Steel
  - C1, C2, C3, C1L, C2L, C3L – Nickel Steel
  - G – General Low-Alloy Steel
  - M – Military-Similar
  - P1 – Pipeline Steel (Cellulosic)
  - P2 – Pipeline Steel (Low Hydrogen)

- Other suffixes designators in AWS A5.5 are generally not appropriate for pipeline applications

- We need to prevent a change from one of these 13 possibilities to anything else, and vice versa, without requalification

* still taking “notes” in 5.4.2.2 and 5.4.2.6 into account
Proposed Resolution to Electrode Suffix Designator Issue in General

- Make the following changes in red to 5.4.2.6 (essential variables for filler metal):

5.4.2.6 Filler Metal

The following changes in filler metal constitute essential variables:

a) a change from one filler metal group to another (see Table 1);

b) for Groups 1 through 3 in Table 1, any change in suffix designator except within the group consisting of: no suffix designator, -1, A1, C1, C2, C3, C1L, C2L, C3L, G, M, P1, or P2;

   NOTE For example, a change in suffix designator from A1 to B3, or vice versa, constitutes an essential variable. A change from A1 to C3, or vice versa, does not constitute an essential variable.

c) for materials with a SMYS greater than or equal to that of the material specified as API 5L Grade X65, any change in the AWS classification of the filler metal (see 5.4.2.2).

   Except as indicated in b) above, changes in filler metal within filler metal groups may be made within the material groups specified in 5.4.2.2, items a) and b). The compatibility of the base material and the filler metal should be considered from the standpoint of mechanical properties.
Proposed Resolution to “G only” Electrode Suffix Designator Issue – 1 of 3

- Make the following additional changes in green to 5.4.2.6 (essential variables for filler metal):

5.4.2.6 Filler Metal

The following changes in filler metal constitute essential variables:

a) a change from one filler metal group to another (see Table 1);

b) for Groups 1 through 3 in Table 1, any change in suffix designator except within the group consisting of: no suffix designator, -1, A1, C1, C2, C3, C1L, C2L, C3L, G, M, P1, or P2;

   NOTE For example, a change in suffix designator from A1 to B3, or vice versa, constitutes an essential variable. A change from A1 to C3, or vice versa, does not constitute an essential variable.

c) for any filler metals with a G suffix designator only, a change in the manufacturer or trade name.

d) for materials with a SMYS greater than or equal to that of the material specified as API 5L Grade X65, any a change in the AWS classification of the filler metal (see 5.4.2.2).

Except as indicated in b) and c) above, changes in filler metal within filler metal groups may be made within the material groups specified in 5.4.2.2, items a) and b). The compatibility of the base material and the filler metal should be considered from the standpoint of mechanical properties.
Also make the following change **in green** to 5.3.2.5 (specification information for filler metal):

**5.3.2.5 Filler Metal, Flux, and Number of Beads**

The sizes and classification number of the filler metal and flux and the minimum number and sequence of beads shall be designated. **For any filler metals with a G suffix designator only, the manufacturer and trade name shall also be designated.**
Also make the following changes in green to 12.4.2.6 and 12.5.2.6 (specification information and essential variables for filler metal, respectively):

**12.4.2.6 Filler Metal and Flux**

The size and AWS classification number of the filler metal and flux, if available, shall be designated. For any filler metals with a G suffix designator only, the manufacturer and trade name shall also be designated.

**12.5.2.6 Filler Metal**

The following changes in filler metal constitute essential variables:

a) a change from one filler metal group to another (see Table 1);

b) for any filler metals with a G suffix designator only, a change in the manufacturer or trade name;

c) for pipe materials with a SMYS greater than or equal to that of the material specified as API 5L Grade X65, any a change in the AWS classification of the filler metal (see 12.5.2.2).

Except as indicated in b) above, changes in filler metal within filler metal groups may be made within the material groups specified in 12.5.2.2, items a) and b). The compatibility of the base material and the filler metal should be considered from the standpoint of mechanical properties.
Letter Ballot Options

- Single letter ballot
  - Someone may agree with resolution to electrode suffix designator issue in general but not resolution to “G only” suffix designator issue

- Two letter ballots – options per Ed Baniak
  - The best way to handle this is with two separate ballots.
    - Option A – The cleanest way is to run them separately….i.e., run the first ballot and if it passes, then run the 2nd. But this will extend the process by another 6 weeks for the 2nd ballot.
    - Option B – The other way is to run simultaneous ballots. But for the 2nd one, you will need to make is clear that the actions resulting from it will ONLY be actioned if the 1st ballot passes. This would require the task group to do comment resolution on two ballots at the same time.
  - Both ways are possible. Even though these are in separate ballots, we can make the resulting changes (assuming the both pass) in one addendum.
  - So it is your call…depends on how urgent the changes are and if you want to work two ballots at the same time.
Updates and Improvements to Table 1

- Initial progress of work to develop updates and improvements to Table 1 resulted in the realization that a rethink of the entire essential variable requirements for filler metal is required
  - Simply adding new classifications may result in allowable changes that are unsound
    - e.g., E6018 to E9018-P2 and vise versa
  - Need to rethink what changes should and should not be allowed without requalification
- Task group will discuss with subcommittees for Section 5 and 12 and continue to work this issue
**Summary**

- Motion for a letter ballot to address electrode suffix designator issue in general
- Motion for a letter ballot to address “G only” electrode suffix designator issue
- Continue work to develop updates and improvements to Table 1
  - Including a reevaluation of essential variable requirements for filler metal in general