



# ANSI Standards

## An Update for Meter Service Departments



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*for the Heartland Metermans Association 2014*

# Session Objectives

- Understand contents of ANSI C12.20-2010 for 0.2 and 0.5 Accuracy Class Meters
- Understand the Relationship of C12.20 to C12.1
- Understand ANSI C12.20 Changes Planned for 2015 Edition and ANSI C12.1 changes planned for 2014
- Understand new ANSI C12.29 for Field Testing and potential time frame
- Discuss – Will this affect how we test in the field?



# Current Meter Testing Standards

Meter Testing for new and in-service kilowatt-hour meters, both electronic and electromechanical is specified in ANSI C12.1-2008, *American National Standard for Electric Meters, Code for Electricity Metering*. Most utility commissions use this Standard as a reference or the basis for their meter testing requirements.

ANSI C12.20-2010, *American National Standard for Electricity Meters, 0.2 and 0.5 Accuracy Classes*, provides different test tolerances and a few different or modified tests for higher accuracy meters. There is no reference made in C12.20 to field testing. The only mention of in-service testing refers back to Section 5 of C12.1



# Current ANSI C12.20 Requirements

- ANSI C12.20 establishes aspects and acceptable performance criteria for 0.2 and 0.5 percent accuracy class meters meeting Blondel's Theorem. This means that C12.20 is not applicable for 2S meters.
- Where there are differences between C12.20 and C12.1, ANSI Standard C12.20 takes precedence.



# Current ANSI C12.20 Contents

- Meter Requirements
- Acceptable Performance of New Types of Electricity Metering Devices and Associated Equipment
- Refers back to C12.1 Section 4
- Also has additional (and modified) tests specific to higher accuracy class meters
- Standards for In-Service Performance (refers to C12.1 Section 5)
- No mention of Field Testing in ANSI C12.20 – 2010
- The 2010 revision of the standard was broadened to allow three phase current and voltage sources as an optional test method to the single phase, series, parallel method



# Current ANSI Field Testing Standards

- In ANSI C12.1–2008 there is no mention of field testing
- The In-Service section 5 of this standard was deemed in need of strengthening and ANSI C12 main committee decided there was a need to look at field testing.
- A draft of ANSI C12.1 – 2013 with a new section 5 is ready for approval.
- A Field Test Working Group was established to create a new ANSI standard focusing on Field Testing (ANSI C12.29)
- Both C12.1 and C12.20 will refer to this standard for field testing



# Current ANSI C12.1 Testing Requirements

Table 3 – List of Tests

Tests (✓) Performed in Series	Descriptions Of Certification Tests	ANSI C12.1
	No Load	Test #1
	Starting Load	Test #2
	Load Performance	Test #3
	Effect of Variation of Power Factor	Test #4
	Effect of Variation of Voltage	Test #5 or 5a
	Effect of Variation of Frequency	Test #6
	Equality of Current Circuits	Test #7
	Internal Meter Losses	Test #8
	Temperature Rise	Test #9
	Effect of Register Friction	Test #10
	Effect of Internal Heating	Test #11
	Effect of Tilt	Test #12
	Stability of Performance	Test #13
	Independence of Elements	Test #14
✓	Insulation	Test #15
✓	Voltage Interruptions	Test #16
✓	Effect of High Voltage Line Surges	Test #17
	Effect of External Magnetic Field	Test #18
	Effect of Variation of Ambient Temperature	Test #19 or 19a
	Effect of Temporary Overloads	Test #20
	Effect of Current Surges in Ground Conductors	Test #21
	Effect of Superimposed Signals	Test #22
	Effect of Voltage Variation-secondary Time Base	Test #23
	Effect of Variation of Amb. Temp.-second. Time Base	Test #24
✓	Effect of electrical Fast Transient/Burst	Test #25
✓	Effect of electrical oscillatory SWC test	Test #25a
	Effect of Radio Frequency Interference	Test #26
	Radio Frequency Conducted and Radiated Emission	Test #27
✓	Effect of Electrostatic Discharge (ESD)	Test #28
	Effect of Storage Temperature	Test #29
✓	Effect of Operating Temperature	Test #30
✓	Effect of Relative Humidity	Test #31
	Mechanical Shock	Test #32
	Transportation Drop	Test #33
	Mechanical Vibration	Test #34
	Transportation Vibration	Test #35
	Weather Simulation	Test #36
	Salt-spray	Test #37
	Raintightness	Test #38



ANSI C12.1-2008

American National Standard  
for Electric Meters

Code for Electricity Metering





# Current ANSI C12.20 Testing Requirements

Table 6 – List of tests

ANSI C12.20	Descriptions Of Certification Tests	Polyphase or Series-parallel loading	Tests (✓) Performed In Series	Precision or Nominal Source
Test #1	No Load	Either		P
Test #2	Starting Load	Either		P
Test #3	Load Performance	Either		P
Test #4	Effect of Variation of Power Factor	Either		P
Test #5a or 5b	Effect of Variation of Voltage	Either		P
Test #6	Effect of Variation of Frequency	Either		P
Test #7	Equality of Current Circuits	Either		P
Test #8	Internal Meter Losses	Either		N
Test #9	Temperature Rise	Either		N
Test #10	Effect of Register Friction	Either		P
Test #11	Effect of Internal Heating	Either		P
Test #12	Effect of Tilt	Either		P
Test #13	Stability of Performance	Either		N
Test #14	Effect of Polyphase Loading	Per Test		P
Test #15	Insulation		✓	NA
Test #16	Voltage Interruptions		✓	N
Test #17	Effect of High Voltage Line Surges		✓	N
Test #18	Effect of External Magnetic Field			P
Test #19	Effect of Variation of Ambient Temperature	Either		P
Test #20	Effect of Temporary Overloads			N
Test #21	Effect of Current Surges in Ground Conductors			N
Test #22	Effect of Superimposed Signals			NA
Test #23	Effect of Voltage Variation-secondary Time Base			NA
Test #24	Effect of Variation of Ambient Temperature -Secondary Time Base			NA
Test #25	Electrical Fast Transient/Burst		✓	N
Test #26	Effect of Radio Frequency Interference			N
Test #27	Radio Frequency Conducted and Radiated Emission			N
Test #28	Effect of Electrostatic Discharge (ESD)		✓	N
Test #29	Effect of Storage Temperature			N
Test #30	Effect of Operating Temperature		✓	N
Test #31	Effect of Relative Humidity		✓	N
Test #32	Mechanical Shock			NA
Test #33	Transportation Drop			NA
Test #34	Mechanical Vibration			NA
Test #35	Transportation Vibration			NA
Test #36	Weather Simulation			NA
Test #37	Salt-spray			NA
Test #38	Rain-tightness			NA





# Current Meter Testing to Standards

- Many State Utility Commissions require that new higher accuracy class electric meters meet ANSI C12.1 and C12.20 requirements.
- New meters are tested using all or a group of tests specified in ANSI C12.1 and C12.20. These tests are typically performed by the meter vendors.
- Meter vendors have different interpretations of certain ANSI tests and even what “ANSI qualified” means.
- Meter vendors often perform ANSI testing early in the development of a meter and certify future modifications to the meter by stating the updated design is similar to the old design in form and function.



# ANSI C12.1 – 2013 Section 5

## Proposed Changes

- More options for statistical models to use
- More options for what to do if a group starts to perform poorly
- Addresses the type of statistical testing available for ancillary devices (e.g. disconnect switches; communication devices).
- Addresses the need to use statistical methods to determine as far in advance as possible the potential failure modes and life expectancies of any new technology being deployed to the field.



# What do These Changes Mean for Field Testing

- The revised Section 5 for ANSI C12.1 will not specify any new field tests. The in-service testing required can be done in the field or in the meter shop as long as the basic requirements of the tests are met.
- The revised Section 5 tries to include ancillary devices including disconnect switches included with the meter and external CT's and PT's.
- This portion of the Standard focuses on the performance of the device as a group and not the specifics of the test being performed.
- ANSI C12 Main Committee has decided that this aspect of testing has been overlooked and has created a working group to address the “how-to” of field testing. A new standard, ANSI C12.29 is anticipated to be be drafted by this working group and presented to the main committee of C12 for approval.
- This working group has no time table to complete their work, but they are hoping to have a draft ready for the Spring 2014 ANSI meeting (The main committee meets every 6 months in conjunction with the EEI TD&M conference).



# New ANSI C12.29 for Field Testing Metering Devices



ANSI C12.29 will establish recommended field testing for metering devices and should eventually be referenced in C12.1 and C12.20. The new standard is expected to have three Sections:

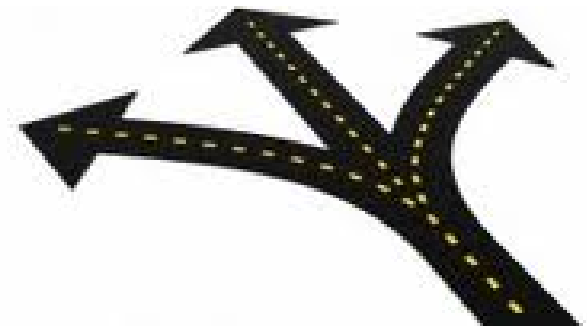
- Meter Testing
- Instrument Transformer Testing
- Site Wiring and Auxiliary Devices



# New ANSI C12.29 for Field Testing Metering Devices

Meter Testing will be divided into three categories based on where current and voltage is supplied...

- Using Customer Potential with Current Supplied by the Test Equipment
- Using Customer Potential and Customer Supplied Current
- Using Potential and Current Supplied by Test Equipment



# New ANSI C12.29 for Field Testing Metering Devices

Instrument Transformer testing is anticipated to focus on:

- Burden Testing - The theory and practical application in the field
- Ratio Testing - Practical application in the field
- Visual inspection of the CT's and PT's



# New ANSI C12.29 for Field Testing Metering Devices

Site Wiring and Auxiliary devices is anticipated to focus on:

- Visual inspection
- Continuity testing
- Service Ground testing
- Communication testing
- Disconnect testing
- Additional device testing





# New ANSI C12.29 for Field Testing Metering Devices

What the new Standard is not expected to do:

- Mandate a new test or tests
- Mandate the “right way” to do this test
- Mandate the use of any equipment or specific processes

This Standard is anticipated to be a “Best Practices” type of document and not a new set of requirements for Utility Metering Groups



# New ANSI C12.29 for Field Testing Metering Devices

Given the early stages for this Working Group this is all personal opinion and could change before the new Standard is completed.

There is also no mandate that this Standard ever has to come into existence. If the Committee never presents a draft or if the ANSI C12 main committee rejects the draft there will be no C12.9 in the near future, and if approved, C12.1 and C12.20 do not have to reference the new Standard



# Site Verification...

## The New Field Testing

Where are ANSI and the voting members heading?

Toward more comprehensive field testing that focuses on far more than just accuracy testing. The members vision for the future of field testing is that utilities will perform the following checks when checking a metering installation in the field

- Meter Accuracy testing
- Meter Communications Performance
- Software and firmware verification
- Setting verification
- Functional testing
- Disconnect/reconnect Functionality and as left setting
- Tamper Verification
- Site Audits appropriate to the type of meter



# Questions and Discussion



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