PERMANENT STANDARDS WORKING GROUP

APPENDIX D

REQUIREMENTS FOR METER INSTALLATION, MAINTENANCE, TESTING, AND CALIBRATION IN DIRECT ACCESS

July 29, 1998

PSWG APPENDIX D: Requirements for Meter Installation, Maintenance, Testing, and Calibration in Direct Access

VOTING RESULTS: 100% AGREEMENT

For: 28	Against: 0	Abstain: 0
ABB		
Applied Metering Technologies		
California Energy Commission		
CPUC-ORA		
Cellnet		
Coalition of California Utility Employees		
E-Mon		
ENRON		
EPRI		
eT Communications		
Firstpoint		
GE		
Institute of Gas Technology / IEEE		
ITRON		
LADWP		
MZA Grid Services		
NERTEC		
Pacificorp		
PG&E		
Phaser		
QST (by EMS)		
SCE		
Schlumberger		
SDG&E		
Sierra Pacific Power		
So. Cal. Gas		
Star Data		
TeCom		

PSWG APPENDIX D: Requirements for Meter Installation, Maintenance, Testing, and Calibration in Direct Access

I. MSP/METER WORKER QUALIFICATIONS

There are five key elements to these Meter Service Provider (MSP) meter worker qualifications: (1) Due to varying levels of complexity, safety issues, and training required, there are five classes of meter equipment, meter service activities, and ultimately meter worker qualifications that are involved in direct access metering work; (2) Since many workers are already performing metering work in California, meter workers who are presently performing work for a Utility Distribution Company (UDC) or certified MSP will be considered qualified and certified for the level of work for which they have been trained and are performing as of **[insert the date adopted]**; (3) UDCs and certified MSPs will identify which of the five meter worker classes each of their employees performing meter work are qualified for; (4) The new meter worker certification requirements shall apply uniformly to any direct access meter worker in the employ of any UDC or MSP (ESP as MSP) after **[insert the date adopted]**; (5) procedures are also adopted to ensure meter workers remain qualified over time.

UDCs and MSPs will issue appropriate identification to each of their meter workers or employees who perform direct access meter work and will ensure that their workers carry this identification while performing meter work. This identification will indicate the worker's employer and the class of meter work which the worker is qualified to perform. If an ESP, UDC, or customer subcontracts its meter work to an MSP, the subcontracting entity must ensure that the MSP issues each meter worker or employee such identification.

All meter workers performing meter services must meet the requirements as outlined in this Appendix and exercise due care for the tasks performed. Out-of-socket meter accuracy testing, meter diagnostics, and sub-metering work[1] requirements are not addressed by this report. Also, utilization of the meter's built-in diagnostics is not considered part of meter accuracy testing.

[1] Sub-metering work performed in California is presently covered by California Business and Professions Code Sections #12531 (Meaning and Scope of Terms) and 12532 (Engaging in Business as Device Repairman or Maintaining Device Repair Service Unlawful without Registration).

PSWG APPENDIX D: Requirements for Meter Installation, Maintenance, Testing, and Calibration in Direct Access

I.A. Meter Worker Skill, Safety, and Qualification Requirements

The following are the descriptions and requirements of the five meter worker classes:

I.A.1. CLASS 1

I.A.1.1. Metering Types and Voltages

This class includes single-phase, socket-based meters, 300 V phase-to-phase maximum and does not include transformer rated meters. Communication wiring must be outside of energized meter panels.

I.A.1.2. Work to be Performed

Class 1 Meter Workers can install, remove, and replace single-phase, 120/240 V or 120/208 V, self-contained meters in standard socket based residential-type metering equipment. Connections of communication conductors must be outside the energized meter panels.

I.A.1.3. Essential Technical Skills

I.A.1.3.1. Understanding of single phase electrical metering.

I.A.1.3.2. Understanding of electric distribution safety procedures.

I.A.1.3.3. Ability to identify energy diversion or tampering related to this class of meter work.

I.A.1.3.4. Ability to install and remove damaged and undamaged meters.

I.A.1.3.5. Understanding of the meter panel and socket layout for the metering conditions related to this class of meter work.

I.A.1.3.6. Ability to read meters used in this class.

I.A.1.3.7. Ability to properly use tools appropriate to the work in this class.

I.A.1.3.8. Ability to connect meter communications external to the meter panel.

I.A.1.3.9. Ability to initialize meter communication modules - not utilizing Type 2 optical ports and meter configuration software.

I.A.1.4. Worker Safety and Safety Equipment

I.A.1.4.1. Job performance in accordance with employing MSP's procedures and safety rules.

I.A.1.4.2. Knowledge of hazards of electricity and ability to perform work to avoid electrical hazards.

I.A.1.4.3. Ability to comply with CAL OSHA requirements.

I.A.1.4.4. On-site use of personal protective equipment.

I.A.1.5. Worker Qualification: How Essential Technical and Safety Skills Are Determined

I.A.1.5.1. UDCs and MSPs must develop and implement a program to train their workers to perform Class 1 meter work safely and properly.

I.A.1.5.2. Employees must be certified by their employers, based on the use of that program.

I.A.1.5.3. MSP's Class 1 meter work training program will submitted for review and approval by the CPUC as part of the MSP certification process.

I.A.2. CLASS 2

I.A.2.1. Metering Types and Voltages

This class includes all meters and skills required for Class 1. Class 2 includes up to 600 V, single-phase and poly-phase, safety socket, and standard socket based meters, and does not include transformer rated meters. Communication wiring may be behind the panel, and work can be in and around energized circuits.

I.A.2.2. Work to be Performed

Class 2 Meter Workers can install, remove, and replace all meters consistent with the above. Class 2 Meter Workers must understand the operating characteristics of test-bypass facilities and test blocks, and may operate test-bypass facilities, but may not install, alter, maintain, or replace wiring between the meter and test block. On panels without test-bypass facilities, single-phase and poly-phase meters will not be removed or installed without first disconnecting the customer load or if deemed unsafe to do so under load. Communication wiring may be installed inside the panel, and work can be performed in and around energized circuits.

I.A.2.3. Essential Technical Skills

I.A.2.3.1. Cumulative including all skills for Class 1.

I.A.2.3.2. Additionally, possess skills related to meter voltages and meter forms used in Class 2.

I.A.2.3.3. Ability to perform phase rotation assessments.

I.A.2.3.4. Ability to operate test-bypass facilities or test blocks in a self-contained safety socket.

I.A.2.3.5. Ability to perform work required to route communication wiring to accommodate meter communications.

I.A.2.4. Worker Safety and Safety Equipment

I.A.2.4.1. Cumulative including all skills and safety knowledge for Class 1.

I.A.2.4.2. Electrical safety knowledge and work skills appropriate for single-phase and three-phase metering up to 600 V phase-to-phase, including the ability to identify and refer to a Class 5 meter installer services above 600 V phase-to-phase prior to performing work in the service equipment.

I.A.2.5. Worker Qualification: How Essential Technical and Safety Skills Are Determined

I.A.2.5.1. UDCs and MSPs must develop and implement a program to train their workers to perform Class 2 meter work safely and properly.

I.A.2.5.2. Employees must be certified by their employers, based on the use of that program.

I.A.2.5.3. MSP's Class 2 meter work training program will submitted for review and approval by the CPUC as part of the MSP certification process.

I.A.2.6. Experience Requirements

Minimum experience requirements that must be demonstrated prior to qualification for individuals wanting to become a Class 2 Meter Worker are specified below:

I.A.2.6.1. If entry level experience of any employee is that of a journeyman level electrician, journeyman level electric metering worker, or journeyman level line worker (e.g., lineman, troubleman), then upon successful completion of the MSP training program the worker may be certified as a Class 2 Meter Worker; or

I.A.2.6.2. After six (6) months as a Class 1 Meter Worker which includes three (3) months “OJT” working alongside a Class 2 or higher Meter Worker and upon successful completion of the MSP training program, a worker may be certified as a Class 2 Meter Worker; or

I.A.2.6.3. If an employee has a two or four year degree in a related subject, then after four (4) months of Class 2 Meter work training which includes three (3) months "OJT" working alongside a Class 2 or higher Meter Worker and upon successful completion of the MSP training program a worker may be certified as a Class 2 Meter Worker; or

I.A.2.6.4. After six (6) months of Class 2 Meter work training which includes three (3) months “OJT” working alongside a Class 2 or higher Meter Worker and upon successful completion of the MSP training program a worker may be certified as a Class 2 Meter Worker.

I.A.3. CLASS 3

I.A.3.1. Metering Types and Voltages

This class includes all meter types in Classes 1 and 2. Class 3 work includes up to 600 V, A base, K base, and transformer rated meters with internal diagnostics. Communication wiring may be behind the panel, and work can be in and around energized circuits.

I.A.3.2. Work to be Performed

In addition to Class 1 and 2 Meter Work, Class 3 Meter Workers can install, remove, and replace all meters consistent with the above including transformer-rated meters with internal diagnostics. Class 3 Meter Workers may operate test switches, but may not install, alter, maintain, or replace wiring between the meter, test switch, test block, and associated equipment.

I.A.3.3. Essential Technical Skills

I.A.3.3.1. Cumulative of Classes 1 and 2.

I.A.3.3.2. Additionally, possess skills related to meter voltages and meter forms used in Class 3.

I.A.3.3.3. Ability to understand the operating characteristics of metering transformers and how to operate test switches.

I.A.3.3.4. Ability to understand, interpret, identify, and take appropriate actions based upon built-in diagnostics of solid state meters.

I.A.3.4. Worker Safety and Safety Equipment

I.A.3.4.1. Cumulative of all safety skills for Classes 1 and 2.

I.A.3.4.2. Ability to understand, interpret, and take appropriate action based on built in diagnostics of solid state meters.

I.A.3.4.3. Ability to work with transformer rated meters and operate test switches and test blocks.

I.A.3.5. Worker Qualification: How Essential Technical and Safety Skills Are Determined

I.A.3.5.1. UDCs and MSPs must develop and implement a program to train their workers to perform Class 3 meter work safely and properly.

I.A.3.5.2. Employees must be certified by their employers, based on the use of that program.

I.A.3.5.3. MSP's Class 3 meter work training program will submitted for review and approval by the CPUC as part of the MSP certification process.

I.A.3.6. Experience Requirements

Minimum experience requirements that must be demonstrated prior to qualification for individuals wanting to become a Class 3 Meter Worker are specified below:

I.A.3.6.1. If entry level experience of any employee is that of a journeyman level electrician, journeyman level electric metering worker, or journeyman level line worker (e.g., lineman, troubleman), then upon successful completion of the MSP training program the worker may be certified as a Class 3 Meter Worker; or

I.A.3.6.2. After 6 months as a Class 2 Meter Worker which includes 3 months "OJT" working alongside a Class 3 or higher Meter Worker and upon successful completion of the MSP training program a worker may be certified as a Class 3 Meter Worker; or

I.A.3.6.3. If an employee has a two or four year degree in a related subject, then after six (6) months of Class 3 Meter work training which includes four (4) months "OJT" working alongside a Class 3 or higher Meter Worker and upon successful completion of the MSP training program a worker may be certified as a Class 3 Meter Worker; or

I.A.3.6.4. After eight (8) months of Class 3 Meter work training which includes four (4) months “OJT” working alongside a Class 3 or higher Meter Worker and upon successful completion of the MSP training program a worker may be certified as a Class 3 Meter Worker.

I.A.4. CLASS 4(A)

I.A.4.1. Metering Types and Voltages

This class includes all meter types in Classes 1, 2, and 3.

I.A.4.2. Work to be Performed

In addition to Class 1, 2, and 3 Meter Work, Class 4(A) Meter Workers can install, remove, and replace all meters consistent with the above. May perform in-field meter accuracy tests, calibrations, and perform all types of meter maintenance and troubleshooting on single phase meters up to 300 V. Programs and verifies internal programs and software in solid state meters.

I.A.4.3. Essential Technical Skills

I.A.4.3.1. Cumulative of Classes 1, 2, and 3.

I.A.4.3.2. Ability to perform work on metering switchboards.

I.A.4.3.3. Ability to perform calibration, repair, retrofit, troubleshooting, data collection of electric meters within the Class, and install, maintain, and program advanced metering technologies, including TOU, interval data, real time pricing, remote meter communication, and load control devices.

I.A.4.4. Worker Safety and Safety Equipment

I.A.4.4.1. Cumulative of all safety skills for Classes 1, 2, and 3.

I.A.4.4.2. Ability to conform processes to additional electricity hazards and complexities associated with metering switchboards, testing meters, and maintaining meters in service equipment up to 300 V.

I.A.4.5. Worker Qualification: How Essential Technical and Safety Skills Are Determined

I.A.4.5.1. UDCs and MSPs may develop and implement a program to train workers to perform Class 4(A) meter work safely and properly (prior to and after testing).

I.A.4.5.2. All workers must be certified by the test process outlined below.

I.A.4.6. Testing Process and Qualifications

I.A.4.6.1. All individuals seeking to perform DA meter services for a UDC or MSP as a Class 4(A) Meter Worker must successfully pass written and practical (demonstrative) tests.

I.A.4.6.2. Prerequisites for taking the written and practical tests include a showing of previous work experience that includes at least one of the following:

I.A.4.6.2.1. Employment as a journeyman electrician, journeyman metering employee, or journeyman line worker (e.g., lineman, troubleman); or

I.A.4.6.2.2. Minimum of one year experience as a Class 3 Meter Worker; or

I.A.4.6.2.3. Minimum of one year experience in utility revenue metering.

I.A.4.7. Testing and Re-Certification Requirements

I.A.4.7.1. Once an individual takes and passes the Class 4(A) Meter Worker Test, the individual is qualified to perform that class of DA meter work anywhere in California and need not re-take the test to perform work in each UDC service area.

I.A.4.7.2. If after being qualified as a Class 4(A) Meter Worker the individual does not perform metering work in California for 3 years or more, re-certification will be required by written and practical testing prior to performing that class of meter work.

I.A.4.8. Continuing Education

As part of a Class 4(A) Meter Worker's ongoing ability to remain qualified, the individual must participate in at least ten (10) hours annually of the MSP's training program regarding standards of practice and safety related issues.

I.A.5. CLASS 4(B)

I.A.5.1. Metering Types and Voltages

This class includes all meter types in Classes 1, 2, 3, and Class 4(A). Class 4(B) work includes all metering up to 600 V, including transformer rated meters with primary and secondary voltages less than 600 V. Communication wiring may be behind the panel, and work can be in and around energized circuits.

I.A.5.2. Work to be Performed

In addition to Class 1, 2, 3, and 4(A) Meter Work, Class 4(B) Meter Workers can install, remove, and replace all meters consistent with the above. May perform in-field meter accuracy tests, calibrations, and perform all types of meter maintenance and troubleshooting on all meters. Programs and verifies internal programs and software in solid state meters.

I.A.5.3. Essential Technical Skills

I.A.5.3.1. Cumulative of Classes 1, 2, 3, and 4(A).

I.A.5.3.2. Ability to perform work on metering switchboards.

I.A.5.3.3. Ability to perform calibration, repair, retrofit, troubleshooting, data collection of electric meters, and install, maintain, and program advanced metering technologies, including TOU, interval data, real time pricing, remote meter communication, and load control devices.

I.A.5.4. Worker Safety and Safety Equipment

I.A.5.4.1. Cumulative of all safety skills for Classes 1, 2, 3, and 4(A).

I.A.5.4.2. Ability to conform processes to additional electricity hazards and complexities associated with metering switchboards, testing meters, and maintaining meters in service equipment up to 600 V.

I.A.5.5. Worker Qualification: How Essential Technical and Safety Skills Are Determined

I.A.5.5.1. UDCs and MSPs may develop and implement a program to train workers to perform Class 4(B) meter work safely and properly (prior to and after testing).

I.A.5.5.2. All workers must be certified by the test process outlined below.

I.A.5.6. Testing Process and Qualifications

I.A.5.6.1. All individuals seeking to perform DA meter services for a UDC or MSP as a Class 4(B) Meter Worker must successfully pass written and practical (demonstrative) tests.

I.A.5.6.2. Prerequisites for taking the written and practical tests include a showing of previous work experience that includes at least one of the following:

I.A.5.6.2.1. Employment as a journeyman electrician, journeyman metering employee, or journeyman line worker (e.g., lineman, troubleman); or

I.A.5.6.2.2. Minimum of one year experience as a Class 3 or 4(A) Meter Worker; or

I.A.5.6.2.3. Minimum of one year experience in utility revenue metering

I.A.5.7. Testing and Re-Certification Requirements

I.A.5.7.1. Once an individual takes and passes the Class 4(B) Meter Worker Test, they are qualified to perform that class of DA meter work anywhere in California and need not re-take the test to perform work in each UDC service area.

I.A.5.7.2. If after being qualified as a Class 4(B) Meter Worker the individual does not perform metering work in California for 3 years or more, re-certification will be required by written and practical testing prior to performing that class of meter work.

I.A.5.8. Continuing Education

As part of a Class 4(B) Meter Worker's ongoing ability to remain qualified, the individual must participate in at least ten (10) hours annually of the MSP's training program regarding standards of practice and safety related issues.

I.A.6. CLASS 5

I.A.6.1. Metering Types and Voltages

This class includes all meter types in Classes 1, 2, 3, 4(A), and 4(B). Class 5 meter work includes all metering above 600 V, including metering transformers, associated devices such as isolation relays and switches, and wiring between these transformers, associated devices, and meters. Communication wiring may be behind the panel, and work can be in and around energized circuits.

I.A.6.2. Work to be Performed

In addition to Class 1, 2, 3, 4(A), and 4(B) meter work, Class 5 Meter Workers can install, remove, and replace all meters consistent with the above including transformer-rated meters. Replace high-voltage fuses. Perform in-field meter accuracy tests, calibrations, and perform all types of meter maintenance and troubleshooting on all meters. Inspect wiring and instrument transformer ratios utilizing various apparatus as necessary.

I.A.6.3. Essential Technical Skills

I.A.6.3.1. Cumulative of Classes 1, 2, 3,4(A), and 4(B).

I.A.6.3.2. Ability to identify primary metering equipment and characteristics of service equipment rated at voltages above 600 V.

I.A.6.3.3. Broad knowledge and familiarity of electrical distribution systems above 600 V and operating characteristics.

I.A.6.3.4. Ability to identify UDC service voltages and electrical service requirements.

I.A.6.3.5. Broad knowledge and familiarity of State of California General Orders.

I.A.6.4. Worker Safety and Safety Equipment

I.A.6.4.1. Cumulative of all safety skills for Classes 1, 2, 3, 4(A), and 4(B).

I.A.6.4.2. Ability to conform processes to additional electricity hazards and complexities associated with metering switchboards, testing meters, and maintaining meters in service equipment above 600 V.

I.A.6.4.3. Meet the State of California requirements for a “Qualified Electrical Worker” to perform work on metering systems with instrument transformer at voltages above 600 V.

I.A.6.4.4. Must have a minimum of two years of combined training and experience with high-voltage (above 600 V) equipment and circuits.

I.A.6.5. Worker Qualification: How Essential Technical and Safety Skills Are Determined

I.A.6.5.1. MSP may develop and implement a program to train employees to perform Class 5 meter work safely and to comply with CAL OSHA requirements (prior to and after testing).

I.A.6.5.2. All workers will be certified by the test process outlined below.

I.A.6.6. Testing Process and Qualifications

I.A.6.6.1. All individuals seeking to perform DA meter services for a UDC or MSP as a class 5 Meter Worker must successfully pass written and practical skills (demonstrative) tests.

I.A.6.6.2. Prerequisites for taking the written and practical skills tests including verification of previous work experience that includes at least one of the following:

I.A.6.6.2.1. Recognized employment as a journeyman electrician (above 600 V) with qualified electrical worker status.

I.A.6.6.2.2. Recognized employment as a journeyman metering employee with two years minimum working experience on metering equipment above 600 V.

I.A.6.6.2.3. Journeyman Line Worker, Apparatus Technician, or similar position that has completed a recognized apprenticeship program that meets minimum CAL OSHA requirements.

I.A.6.6.2.4. Knowledge of CAL OSHA requirements and completed required training for a Class 4(B) Meter Worker.

I.A.6.7. Testing and Re-Certification Requirements

I.A.6.7.1. Once an individual takes and passes the Class 5 written and practical skills test, and has completed the requirements for performing work on energized metering equipment above 600 V, that individual is qualified to perform work anywhere in California and need not re-take the written test to perform work in each UDC service area.

I.A.6.7.2. If after being qualified as a Class 5 Meter Worker the individual does not perform Class 5 metering work in California for 3 years or more, re-certification will be required by written and practical skills testing prior to performing Class 5 meter work.

I.A.6.8. Continuing Education

As part of a Class 5 Meter Worker's ongoing ability to remain qualified, the individual must participate in at least ten (10) hours annually of the MSP's training program regarding standards of practice and safety related issues.

I.B. CERTIFICATION OF METER SERVICE PROVIDER (MSP)

An entity may be certified as an MSP and obtain a permanent certification number by following a modified version of the CPUC-approved process described in the CPUC Decision 97-12-048 dated December 3, 1997. In brief, this process is as follows: (1) In accordance with this decision the UDCs are declared to be a certified Meter Service Provider. (2) MSPs already permanently certified by the CPUC will remain certified to conduct meter business in accordance with the conditions described thereafter. (3) Other entities wishing to be certified shall submit a written request including the requested documents to the CPUC in accordance with the decision (See Attachment D-3: MSP Registration Packet). (4) After CPUC review, Meter Service Providers submitting applications that are approved by the CPUC will be granted Permanent Certification in accordance with their application and registration packet. (5) UDCs and MSPs will assign only qualified and certified metering workers under their control to perform DA metering work, as defined in the CPUC Decision D97-10-087, Appendix A, Section (H) of Metering Services and pursuant to this decision on the PSWG permanent standards. (6) The 50 joint meet process will no longer be used for the MSP certification, but MSPs will provide a detailed work schedule to each UDC for the first 20 installations to provide the opportunity for the UDC to join the MSP at these initial installations to ensure the smooth transition of these services and to verify that essential work procedures, hand-offs, and processes are clearly understood and in place. (7) Provisionally certified MSPs that have successfully completed 20 or more joint meets as of **[insert the date adopted]** will be granted permanent certification. Those provisionally certified that have not completed 20 successful joint meets as of **[insert the date adopted]** must follow the process described in (3) through (6) above. (8) If the permanent rules adopted by the CPUC require any information not previously submitted, permanently certified MSPs shall submit those documents to the CPUC within 90 days of **[insert the date adopted].** Prior to this supplemental submittal or pending the CPUC's review of the submitted documents, the MSP shall remain certified until the CPUC re-confirms the MSP's certification. (9) Subsequently, joint meets are required for special types of meter installations, testing, and maintenance as defined by a UDC's or MSP's notification published in advance

I.B.1. Implementation

UDCs and MSPs (or ESPs as MSPs) shall implement the CPUC-approved MSP entity certification process as specified in CPUC Decision D97-12-048 or other CPUC decisions thereafter. Since the worker certification process is changing, the joint meeting process between UDCs and MSPs will also change. Joint meets will no longer be a requirement of MSP certification nor will they represent the UDCs' evaluations of the MSPs workers' technical qualifications. Instead, a schedule for initial installations in each UDC's area will be provided by the new MSP to facilitate UDC and MSP job site meetings during a short, defined start up period (defined as the first 20 installations). Coordinated job site visits, if utilized, may be requested by either the UDC or MSP as a means to confirm clarity and ensure a smooth transition on issues such as: DA process awareness, verification of the processes used by UDCs and MSPs to install or return meters and documentation, and requirements for

effectively communicating essential meter related data. As is possible today where joint meets can be waived, these mutual job site visits are not mandatory. Joint meet forms and logs will no longer be required.

I.C CERTIFICATION OF METER WORKERS

I.C.1. CLASSES 1, 2, AND 3:

MSPs and UDCs may develop and implement a training program to train and certify their individual meter workers in these three meter worker classes. MSPs and UDCs must ensure that all appropriate meter worker prerequisites are met before a meter worker is certified. Only MSPs and UDCs that have certified training programs may self-certify Class 1, 2, or 3 Meter Workers based on each respectively certified training program. Prior to receiving approval to self-certify their workers in these classes, each MSP or UDC shall submit with its application to the CPUC the training programs for each of class 1, 2, and 3 meter work that they are not already qualified to perform and for which an MSP or UDC wishes to self-certify its workers. The **[CPUC or designated entity]** shall review and either provide recommendations for changes needed prior to program certification for each class of certification sought or notification of the certification granted. Upon certification of each worker class training program, the **[CPUC or designated entity]** will provide either a written letter or numbered certificate of such approval to the requesting MSP or UDC. If at a later date, a permanently-certified MSP wishes to self certify meter workers at a skill level (1, 2, or 3) not included and approved as part of the original application, the MSP shall submit the training materials for the new desired meter worker class(es) to the CPUC. Once approved, the MSP or UDC shall be qualified to self-certify these worker classes. The CPUC will also post to the web site a listing of the meter worker classes each MSP and UDC are approved to self-certify.

I.C.2. CLASSES 4(A), 4(B), AND 5:

Meter workers seeking Class 4(A), 4(B), or 5 certification shall be required to take and pass a test, composed of both written and practical components, to qualify for performing Class 4(A), 4(B), or 5 of meter work, respectively. Although individual workers may individually prepare for and seek certification in these classes, MSPs, UDCs, or other entities may also, at their option, develop and offer classes or training to prepare workers for the tests and for Class 4(A), 4(B), or 5 certification. Individual workers, MSPs, or UDCs may schedule certification tests with the **[CPUC designated entity(ies)]**. Work experience or other qualifications demanded by the requirements of each worker class (in addition to the test itself) must be verified by the MSP or UDC prior to scheduling the test and shall be provided to the **[CPUC designated entity(ies)]** at the time of the worker's test. This will ensure that the **[CPUC designated entity(ies)]** has the information necessary to issue a Class 4(A), 4(B) or 5 certification. After a meter worker has taken and passed the certification test, the **[CPUC designated entity(ies)]** will issue a permanent and numbered certification card to the worker as evidence of certification.

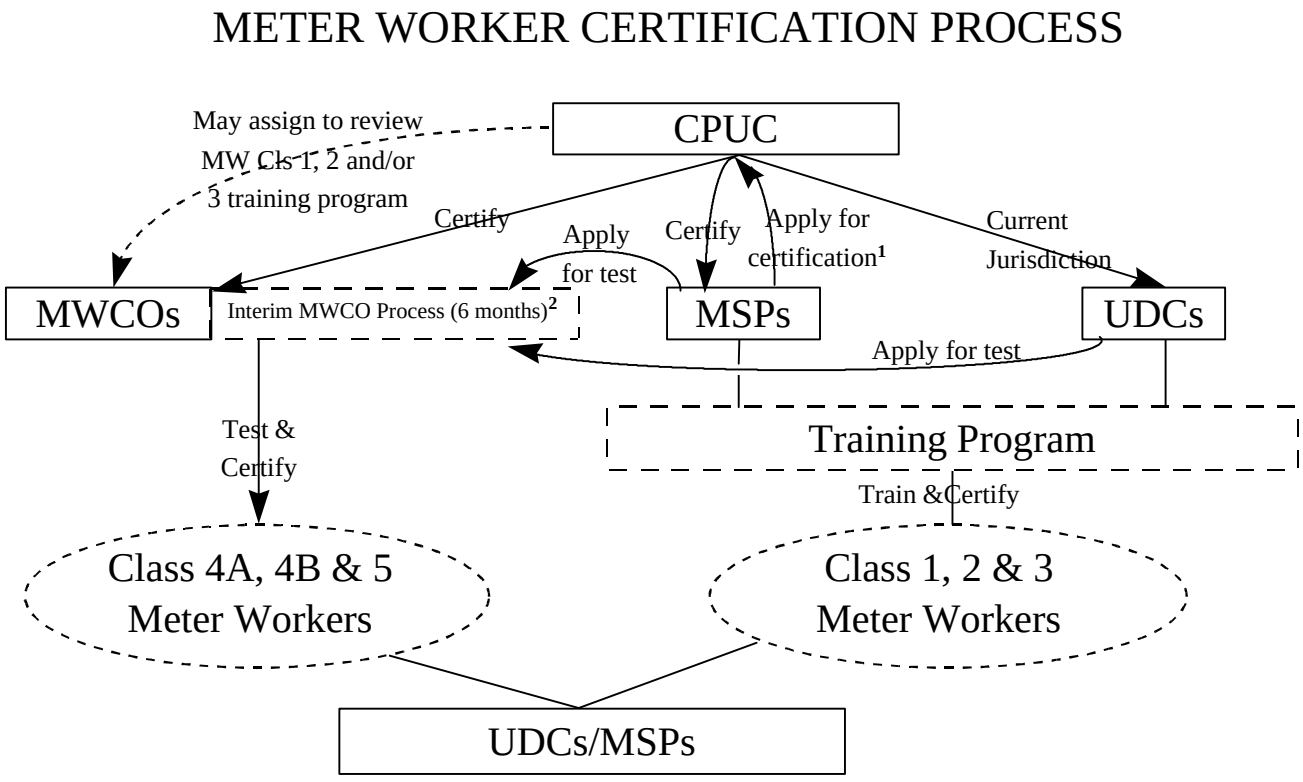
I.C.3. REQUIREMENTS FOR PREPARING PRACTICAL AND WRITTEN TESTS:
The **[CPUC designated entity]** shall develop and prepare a number of different tests for each worker classification. The tests will be periodically revised and updated to remain up to date with market needs and to ensure testing integrity. The initial set of test questions shall be developed based on examples described in Attachment D-2. Additionally, prior to use as well as periodically thereafter, questions must be reviewed by various MSP/UDC entities and knowledgeable metering employees to verify the questions are technically appropriate and valid.

I.C.4. IMPLEMENTATION OF METER WORKER CERTIFICATION REQUIREMENTS:
These California Direct Access (DA) meter worker certification requirements will apply to all workers who are either hired or trained by any entity to perform DA meter services in California after **[insert the date adopted]**.

PSWG APPENDIX D: Requirements for Meter Installation, Maintenance, Testing, and Calibration in Direct Access

I.D. ADMINISTRATION OF QUALIFICATION PROCESS

A new organization will be created to manage the qualification process for higher skill level, Class 4(A), 4(B), and 5 Meter Workers in Direct Access. This organization will be the Meter Worker Certification Organization (MWCO). This is a type of organization independent of the existing role of UDCs and MSPs. There may be as many MWCO companies as determined by the market. Because these organizations do not presently exist, and because it will take a period of time for such organizations to emerge and develop, an interim MWCO process will be used, as authorized by the CPUC, and will function for 6 months, or until a MWCO is CPUC-approved and ready to operate, whichever is earlier. Following is a process chart as well as a detailed description.



[1] **Apply for Certification** is the first step in these processes.

[2] **An interim MWCO Process** will be established by a group of people. This group includes volunteers from UDCs and permanently-certified MSPs. This group will complete the CPUC-assigned tasks within 90 days of the CPUC decision, file a brief report with the CPUC of what was implemented, and post this report on the PSWG web site.

PSWG APPENDIX D: Requirements for Meter Installation, Maintenance, Testing, and Calibration in Direct Access

I.D.1. CERTIFICATION OF METER WORKER CERTIFICATION ORGANIZATION

A new entity shall carry out the function of certifying individual high skill meter workers. This entity will be known as a Meter Worker Certification Organization (MWCO). Specifically, a MWCO will be used by the market to develop and offer practical and written tests to certify meter workers in Classes 4(A), 4(B), and 5. The MWCO will establish reasonable fees for its work. This organization shall be knowledgeable about the metering services they will certify. If the MWCO is also a UDC or MSP, it shall not certify its own Class 4(A), 4(B), or 5 Meter Workers. An entity wishing to be a MWCO shall apply with the CPUC, and the CPUC shall review that application and assign a certification number to all approved MWCOs. The MWCO certification shall be accomplished by an entity submitting a written application to the CPUC along with the following information: name of the person or entity; business address and telephone number; name of the person or entity in which a business license is issued, the business license number and expiration date; a description of meter work training experience, materials, and facilities that it has or uses to train or qualify meter workers. In addition to the written application, the MWCO shall arrange a bond in favor of the State of California in the amount of $100,000, or provide the Energy Division with proof of a general liability insurance policy that meets the specifications described below:

If a bond is used, it shall be submitted with the written application. The bond shall be for the benefit of anyone who may be damaged as a result of the MWCO's actions in connection with the certification of Classes 4(A), 4(B), and 5 Meter Workers. Should a complaint for damages arising from the MWCO's actions be filed in civil court, and a claim is made against the bond, a copy of the complaint shall be served by registered or certified mail upon the Commission's Executive Director. The bond requirement will ensure that the MWCOs adhere to all applicable provisions governing the testing and certification of Classes 4(A), 4(B), and 5 Meter Workers. Should an end-use customer suffer damages as a result of the MWCO's actions, the bond will provide a source of compensation.

If the MWCO elects to provide proof of liability insurance, the insurance shall meet the following specifications: (1) the insurance policy shall be commercial general liability insurance with coverage that, at a minimum, is the same as what is provided for in the Insurance Services Office Commercial General Liability Coverage occurrence form; (2) the policy shall not be less than $1 million for each occurrence for bodily injury, property damage and personal injury, and if the coverage is subject to a general aggregate limit, the aggregate limit shall not be less than $2 million; (3) the policy shall include, as an additional insured, the UDCs and MSPs whose training programs and meter workers the MWCO is certifying; and (4) the liability insurance policy shall include a statement that thirty days' written notice shall be provided to the Commission, the UDCs, and the MSPs before the policy is canceled. Proof of liability insurance will ensure that the MSP has sufficient insurance coverage to cover any claims that might be brought against the MWCO for metering certification related activities.

MWCOs do not exist today, and it will take a period of time for such organizations to be ready to administer the qualification process. Therefore, an interim MWCO process shall be established. A small group will establish the interim MWCO process and will consist of one volunteer representative from each of the UDCs and permanently-certified MSPs. This small volunteer group will be formed within 7 calendar days pursuant to this decision and will: 1) Utilize examples given in Attachment D-2 to finalize the test contents which will be used to test and certify the Classes 4(A), 4(B), and 5 Meter Workers; 2) Establish pass/fail criteria for the Classes 4(A), 4(B), and 5 Meter Workers' testing; 3) Identify and assign an entity to administer this testing and certification; 4) Publish the information on how to apply for meter worker classes 4(A), 4(B), and 5 testing.

Within 90 days following this decision, these five tasks assigned must be completed and a brief report of what was implemented must be filed with the CPUC and posted on the PSWG web site.

PSWG APPENDIX D: Requirements for Meter Installation, Maintenance, Testing, and Calibration in Direct Access

II. METER INSTALLATION

This section proposes the minimum requirements for installation, maintenance, and testing for meters and metering equipment used in direct access. Decision No.97-10-087, Appendix A: Direct Access Tariff, Section H(1)(b) states,

"Potential and current transformers shall be considered part of the distribution system and shall remain the responsibility of the UDC."

Accordingly, and pursuant to this decision, all instrument transformers, test switches, and associated wiring up to the meter socket shall remain the responsibility of the UDCs. However, reconnecting existing wires to a replacement of an existing meter socket, A-base socket adapter, or A-base meter may be performed by either UDCs or MSPs.

II.1. Safety (customer life support, public, etc.)

For safety reasons, the following requirements must be completed prior to performing any meter work on site and visual observations must continually apply as the meter work progresses. Meter work includes, but is not limited to, meter installation, meter replacement, maintenance, programming, and testing. Visually inspect all meter sites for the following conditions:

II.1.1. Customer Life Support

II.1.1.1. If a customer premise has a life support device or equipment and a UDC requires life-support seals or stickers, they shall be installed on the meter ring or cover respectively, to prevent avoidable service interruption during the process of metering work.

II.1.1.2. If such life-support or sealing hardware is found on customer meter covers, meter panels, test switches and/or metering transformer panel sections, meter workers shall be cautious in performing meter work and not interrupting electric service to the customer premise. If service will be unavoidably interrupted for any meter work, the meter worker shall notify the customer and obtain the customer's consent prior to performing work.

II.1.2. Electrical Hazards:

II.1.2.1. Various Hazardous Conditions:

The hazardous condition may include exposed wiring, damaged sockets (loose or burnt wiring or jaws), auto-bypass devices (load jaws still hot when meter removed), loose or missing screws (i.e., in bypass area), missing panels, loose or broken service insulators, service wires in bad condition/order, missing meter, improper grounding conditions, fused neutral conductor of a 2 wire or 3 wire single phase service, defective service switch/disconnect, new installations which fail to conform with the UDC's electric service requirements, etc.

II.1.2.2. 600 V Auto Valve (aka Lightning Arrestor or Surge Protector)

II.1.2.2.1. Auto valves are also called meter protectors or transformer surge arrestors and may be found on 480 V overhead meter installations, both self-contained and transformer-rated. Functional in the field, the auto valve may be safely removed from the meter installation. If MSP meter workers find that these valves cannot be safely removed, they must notify UDCs to schedule for removals.

II.1.2.2.2. The auto valve can be identified as a round or square metal can the size of a large human fist. The auto valve is mounted through a knock out and secured with a nut on the inside of the can. There will be 3 black wires and 1 white wire. The 3 black wires are electrically connected to each of the 3 phase wires on the service. The white wire is connected to an earth ground. The auto valve is attached to the socket side of the test block or test switches. By de-energizing the socket, the wires from the auto valve can be removed. Ensure that the hole left in the service equipment is properly closed and sealed for weather.

II.1.2.2.3. At MSP's discretion, an MSP may remove and discard the auto valve.

II.1.2.3. 480 V Sticker:

If the meter does not display voltage, the Meter Worker shall ensure that a 480 V sticker is in place either on the meter or on the meter panel near the meter before leaving the site.

II.1.3. Physical Hazards:

II.1.3.1. Tripping hazards (slippery or uneven surfaces), debris, or materials stored in the working space, overhead hazards (stored materials or workers above meters), etc.

II.1.3.2. Environmental hazards: Chemical, caustic, hearing, biological, etc.

II.1.3.3. Inadequate or unsafe access.

II.1.3.4. Meter Mounting: loose meter mounting, undue vibration, inability to securely seal metering, unleveled meter, etc .

II.1.4. Customer Premises:

Unsafe conditions of customer-owned stairs, railings, platforms, etc.

II.1.5. Vermin:

Watch out for insects, snakes, and rodents when opening doors or removing panels.

II.2. Meter Security and Accessibility

The following requirements must be completed when performing any meter work on site and visual observations must continually apply as the meter work progresses. Visually inspect all meter sites for the following conditions:

II.2.1. Infraction and Evidence of Tampering/Energy Diversion:

II.2.1.1. Meter Installation

II.2.1.1.1. Awareness of significant connected loads compared to a customer's monthly energy consumption.

II.2.1.1.2. Irregularities in the service conductor's insulation ("skinned" insulation, newly-taped sections of conductors, burned or pitted service conductors, etc.)

II.2.1.1.3. Unauthorized connection in overhead service entrance, on line side of meter or metering transformers, or in unsealed underground pull sections or pull cans.

II.2.1.1.4. Unauthorized seals, and unsealed or improperly sealed conditions on line side raceways, test block compartments, test switch covers, and meter sealing rings.

II.2.1.1.5. Suspicious wiring.

II.2.1.1.6. Jumpers across current leads at bottom of test switch unsealed.

II.2.1.1.7. Meter coil jumpered - Check and correct if the neutral service wire is found connected through the series coil of the meter and there are grounds on the load circuits that act as a jumper.

II.2.1.1.8. Lock fuse jumpered - Check for lock fuse jumper and perform a regular meter test. Jumper will be left as found, and this condition will be reported on the test report.

II.2.1.1.9. Blown (or loosened) fuse in one leg of a 3-wire old sequence service.

II.2.1.1.10. Rate infractions in meter program / register.

II.2.1.2. Meter Cover

An unusually clean cover, small holes in the cover, burn marks on or near the cover, visible fingerprints inside the cover, etc.

II.2.1.3. KWH Register

KWH dial pointer alignment, register mesh, and register gears.

II.2.1.4. Meter Disk

Disk alignment to magnets, irregularity of disk rotation, foreign objects or materials on disk / bearing, scratches or wear marks on the disk, etc.

II.2.1.5. Test Blocks

Damaged wiring between test block and meter, unusual marks, scratches or burns on test blocks, defective test blocks, etc.

II.2.1.6. Meter Base

Unusual marks and mushroomed screw slots on potential links; broken meter seals; unusual wear or scratches, burn or pit marks on meter stabs / blades / terminals, etc.

II.2.1.7. Meter Socket

Unusual wear or scratches, burnt or pit marks, irregular meter socket voltages, circuit bypass jumper, etc.

II.2.1.8. Hidden "Service Riser" Taps and Un-metered Circuits Utilizing Relay Devices:

Unusual noises that could indicate a relay opening when the meter is removed from the socket.

II.2.2. Meter Security

The following are the requirements for securing physical meters, panels, programmable meters, and data:

II.2.2.1. Physical Meters and Panels

Meters and meter panels shall be secured with seals and locking devices as described in Appendix A, Section IV.

II.2.2.2. Programmable Meters and Data

Only programmable meters capable of supporting passwords or other protection means to restrict access to information contained therein shall be used for Direct Access, and a security password shall be applied to prevent unauthorized access to a programmable meter and unauthorized modifications of the meter data and program. Passwords should be controlled by following generally accepted practices.

II.3. Site Verification

Visually inspect all meter sites for the following conditions:

II.3.1. DA Metering Verification

II.3.1.1. Check for proof of DA meter certification or meter types that meet the CPUC requirements for Direct Access.

II.3.1.2. Verify for correct customer and customer account (records versus meters) including billing constant, meter number, accuracy test results, customer information, address, etc.

II.3.1.3. Verify for correct meter for service characteristics (voltage, form, etc.).

II.3.2. DA Communication Verification:

II.3.2.1. Verify for correct phone or other communication devices and connections if remote read

II.3.2.2. Verify for successful communication handshakes and data retrieval if remote read (This can be done by another person at a remote location, and data accuracy is not verified at this time).

II.3.2.3. Verify for successful meter reading if manual read.

II.3.3. Transformer-rated Meter Sites:

II.3.3.1. Billing Constant: Compare between records versus sites (CT's / PT's ratios when accessible).

II.3.3.2. Improper Wiring: Shorted current by-pass links, reverse current secondary wired, unmatched voltage and current circuits, pinched or rubbed secondary wires near panel hinges, etc.

II.3.4. Pole-mounted Meter Sites

II.3.4.1. Cutouts: Open cutouts or blown triple link fuses.

II.3.4.2. Grounding: Grounding electrode conductors and connections shall not be broken at any point between the service equipment enclosure and the ground rods or other approved grounding electrode.

II.3.5. Pad-mounted Meter Sites:

II.3.5.1. Primary Metering:

II.3.5.1.1. Verify meter enclosure attached to primary metering cabinet secured and lockable.

II.3.5.1.2. Verify meter pedestal installation mounted securely and cabinet lockable.

II.3.5.2. Cabinets: Check the cabinet is free of obvious shipping damage, paint damage, or corrosion.

II.3.5.3. Cabinet Safety

II.3.5.3.1. Verify that there is at least one penta-head security bolt permanently attached to high voltage compartment door(s) and door locking handle.

II.3.5.3.2. Verify secondary non-polarity neutral points and meter enclosure / pedestal electrically connected to ground bus.

II.3.5.3.3. Verify all metering electrical connections secured and properly made.

II.3.5.4. Cabinet Markings

II.3.5.4.1. Verify exterior warning labels properly attached

II.3.5.4.2. Verify electrical schematic and metal nameplate mounted to the enclosure

II.3.6. Grounding:

Some three-phase, three-wire services have a ground connection on one of the phases. In situations where A, B, or C phase is not grounded and there is a voltage reading at or near zero volts on any phase and reading above zero volts on any other phases, this hazard shall be reported to the UDC prior to leaving the site for emergency corrections and the customer or customer's representative shall be contacted to inform them of the hazardous conditions. If it is unclear whether a phase is intentionally grounded, the local UDC shall be contacted to clarify the configuration of the service. Additionally, extreme caution must be taken on primary (above 600 V), 480 V phase-to-phase or 277 V phase-to-ground service.

II.3.7. Watt Load Clock

Calculate and record customer's load as needed.

II.3.8. Customer's Ground Fault Protection Device

Check for the existence of a ground fault protection device or equipment in customer's electrical panel or switchboard. The purpose of this verification is to ensure that meter workers, while performing meter work on a customer's three phase, 4-wire wye metering installation, do not inadvertently cause an unscheduled interruption on this service.

II.3.8.1. Background

Ground-fault protection shall be provided for solidly ground wye electrical services of more than 150 V to ground, but not exceeding 600 V phase-to-phase for each service disconnecting means rated 1000 A or more. The proper operation of some ground-fault detection systems requires a single neutral-ground point which can be established by connecting the neutral, the equipment grounding conductors, and the service equipment enclosures. Even though this protection is mandatory on all new 1000 A 277 / 480 V services, some customers may have installed it on lower voltage and amperage of a 4-wire wye service. Therefore, meter workers must follow the procedures below to avoid unscheduled service interruption while performing meter work on 4-wire wye metering installations.

II.3.8.2. Procedures

II.3.8.2.1. Visual check:

Prior to performing meter work, visually inspect for the existence of a ground fault protection device in the customer's panel, switchboard, or electrical facilities. Note: One of the most sensitive ground fault protection devices is the GTE-Sylvania Zinsco Model GTS-3 relay. A silicon control rectifier (SCR) in this relay could be triggered by transients generated simply by opening or closing the by-pass potential switch.

II.3.8.2.2. Actions:

If a ground fault protection device is found, the meter worker must contact the customer and request that the customer's representative render the ground-fault relay inoperative or be present to witness the meter work performed.

II.3.9. PT/CT Secondary Wiring

If accessible, secondary wiring shall be verified for correct wiring and no sign of tampering, and PTs and CTs shall be checked for normal operating conditions. If abnormal conditions exist, the MSP shall notify the UDC serving the customer within 24 hours for their corrective actions.

II.4. Meter Install

Below are the required procedures that a meter worker must follow when installing and/or removing meters. These procedures do not necessarily include all procedures of a meter installation.

II.4.1. Pre-Installation

Verify type and size of metering is appropriate for site.

II.4.2. Self Contained Meters

II.4.2.1. Take closing read on existing meter.
II.4.2.2. For meters with no bypass, check the load to make sure it is safe enough to remove the meter or disconnect load before replacing the meter.
II.4.2.3. For meters with a bypass, the meter socket shall be bypassed and de-energized, before replacing the meter.
II.4.2.4. Verify voltage.
II.4.2.5. Verify 0 volts between line and load side of test blocks.
II.4.2.6. Install new meter.
II.4.2.7. Take initial meter read.

II.4.3. Transformer Rated Meters (CT Meter)

II.4.3.1. Take closing read on existing meter read.
II.4.3.2. Open test switch cover and verify voltages at the test switch.
II.4.3.3. Operate test switch/test block to de-energize meter sockets.
II.4.3.4. Install new meter.
II.4.3.5. Check voltage before closing voltage switches on test switch.
II.4.3.6. Take initial meter read.

II.4.4. Meter Installation at New Sites

Installation of a meter(s) on a newly constructed premise where the customer has decided, prior to service connection, to sign up for Direct Access service must be treated differently than a change meter order. The parties (ESP, UDC, and MSPs) shall work together to achieve new meter sets and service connection in a timely manner, consistent with the customer's interest and public safety.

A new meter set is defined as a meter socket having a meter installed for the first time. This does not apply to a socket or panel replacement due to equipment failure.

There are four (4) key elements which must be completed prior to a UDC authorizing a new meter set:

1) Customer's application on file with the UDC,
2) Direct Access Service Request (DASR) accepted by the UDC,

3) UDC's receipt of authority having jurisdiction's (AHJ) inspection clearance, and
4) Service completion, or coordination for energizing service.

The UDC will issue an authorization to set a new meter and notify the ESP if coordination is required (i.e. for instrument transformer rated metering). If coordination is required, the MSP shall use best efforts in meeting the UDC schedule. If no coordination is required, the MSP shall set the new meter within two (2) working days of UDC notification.

Should an ESP install a new meter without authorization from the UDC, the ESP's Service Agreement with the UDC shall be subject to termination pending a CPUC formal investigation.

II.4.5 Rewires and Service Upgrades

If a customer rewires or upgrades their electrical service and metering equipment and if required, the MSP may remove the meter before the work on metering equipment starts. Reinstallation of the meter is subject to the same requirements of Section II.4.4.

Should an ESP reset and reseal an existing meter in newly replaced metering equipment without authorization from the UDC, the ESP's Service Agreement with the UDC shall be subject to termination pending a CPUC formal investigation.

II.4.6. Locking Device

Insure appropriate locking device is in place.

III. METER MAINTENANCE

The primary purpose of the maintenance and testing program is to assure that the meter population owned by an entity is accurate as long as the meters are in service. The required maintenance and testing program is a balance between the benefits and costs of maintaining and achieving high accuracy levels throughout a meter life. This maintenance and testing program enables the entity owning the meters to verify the accuracy of the overall meter systems and to test the meters periodically and/or on the basis of an annual statistical sampling plan.

III.1. Maintenance Schedule

Electric meters used in Direct Access shall be maintained, as a minimum, according to the following meter maintenance and testing schedule:

Table III.1-1; Minimum meter maintenance and testing schedule

Maintenance and Testing Frequency	Customer Maintenance and Testing Criteria
One Year Interval	Customer's annual usage of 2 million kWh or higher
Two Year Interval	Customer's annual usage between 720,000 and 2 million kWh
Annual Statistical Sample Plan	Non residential customer's annual usage less than 720,000 kWh
Residential Meters	Either a formal sampling plan performed annually or tests done upon request and removal, where applicable
Direct Current (DC) Meters	Either a formal sampling plan performed annually or tests done upon request and removal, where applicable

III.2. Maintenance upon request

Testing and maintenance is required upon a reasonable request by a customer, ESP, or UDC. Prior consultation between the parties shall determine the entity that would perform the test and maintenance.

III.3. Statistical Sampling Requirements

The ANSI Z1.4 or Z1.9 Standards shall be used as the statistical sampling requirements for testing meters. Generally, inspection level of General II (G-II) shall be used if the use of other inspection levels is not justifiable.

III.4. Criteria for required corrections

The criteria for required corrections on the overall meter population include the trigger criteria and action criteria, which are specified in Table III.4.1 below:

Table III.4.1. Criteria for required corrections

Sampling plan applied on:	Trigger Criteria	Action Criteria
- Overall meter population	**2.5% AQL**	**4% AQL**
- A group of meter type	**2.5% AQL**	**10% AQL**

AQL is the Acceptable Quality Levels, which is the maximum percentage of non-conforming meters in the meter group. The non-conforming meters are those sample meters that are tested and found outside the CPUC-required accuracy limits. The current CPUC-required accuracy limits are ±2%. The overall meter population includes all meter types owned by an entity and is not divided into any groups of meters or meter types.

When the trigger criteria of 2.5% AQL is not met during a scheduled maintenance and testing, the second or more sampling plans for further testing and checking shall be required to monitor the accuracy performance of the overall meter population, groups, or types. Upon the violation of the action criteria, corrective actions shall be taken to correct the problems. Such corrective actions may lead to removals of certain inaccurate and aging meter groups or types.

III.5. Troubleshooting and corrective actions

Troubleshooting shall include all applicable tasks as indicated above and shall be performed to verify the meter operation and accuracy as required. If the troubleshooting indicates a hazard or out-of limit accuracy condition at a meter site, the responsible party shall take corrective actions within 48 hours of this finding.

III.6 MDMA Communications

The MSP will notify the MDMA of a problem with the meter. The MDMA is ultimately responsible for the quality of the data from the meter and will confer with the MSP regarding potential data problems with the meter. The MDMA will determine if the meter data should be adjusted, including the cause and correction factor.

III.7. Demarcation Point of Meter Work

As part of these meter worker qualifications, a clear scope of metering work must be established. Decision No.97-10-087, Appendix A: Direct Access Tariff, Section H(1)(b) states,

"Potential and current transformers shall be considered part of the distribution system and shall remain the responsibility of the UDC."

Accordingly, and pursuant to this decision, all instrument transformers, test switches, and associated wiring up to the meter socket shall remain the responsibility of the UDCs. However, reconnecting existing wires to a replacement of the existing meter socket, A-base socket adapter, or A-base meter may be performed by either UDCs or MSPs.

PSWG APPENDIX D: Requirements for Meter Installation, Maintenance, Testing, and Calibration in Direct Access

IV. METER SYSTEM TESTING

The following meter system testing requirements shall be applied to: 1) ensure the accuracy of the overall metering system at a customer site within the CPUC-required limits, 2) ensure safety in meter work procedures, and 3) provide a consistency of testing once such testing is performed for a direct access customer.

In general, there are seven tasks involved in testing an electric meter system. The metering system, defined for use in Section IV.E. only, is 1) the meter itself, or 2) the meter and its attached equipment or module(s). These tasks are described in Attachment D-1, Guideline for Meter Testing, which meter workers may use as a guideline for their meter work.

The following requirements shall are applied when testing is performed on meters, meter sockets, and metering systems:

IV.1. Meter Socket:
Voltage test (Task #1 in Attachment D-1) shall be performed on meter sockets or service connections to verify correct voltages. When a phase shifting transformer is in use, a phase angle test (Task #5 in Attachment D-1) shall be required (if load is present).

IV.2. Metering System: The following tests are required to be performed on a metering system:

IV.2.1 Light and full load test or customer load test (Task #2 in Attachment D-1).
IV.2.2. Demand test (Task #3 in Attachment D-1).
IV.2.3 Register verification (Task #4 in Attachment D-1).
IV.2.4 Separate element check (Task #6 in Attachment D-1).

IV.3. Notification: Meter worker shall notify the UDCs, ESPs, and MDMAs upon finding a defective meter that affects billing.

V. TEST STANDARDS (WATT-HOUR STANDARDS)

V.1. Calibration and Maintenance of Test Standards

The following are the requirements for maintenance and calibration of test standards which are used for testing the accuracy of electric meters in the field or in the shop:

V.1.1. Out-of-calibration

A test standard that is found to have accuracy outside the limits of ±0.1% of a reference test standard.

V.1.2. Basic Reference Test Standard

A basic reference test standard that is certified according to NIST requirements and used as an accuracy reference in the laboratory or meter shop.

V.1.3. Portable Test Standard

A portable test standard that is used to certify the accuracy of meters in the field.

V.1.4. Routine Accuracy Check Requirements

Each test function of a test standard shall be checked and compared with a reference standard monthly. If a test standard used in testing meters has a result of three consecutive meters tested out of the CPUC-required accuracy limits, this test standard shall be checked against the reference standard.

V.2. Meter Re-testing upon Finding of An Out-of-calibration Test Standard

Once a test standard is checked and found out-of-calibration, it shall be calibrated according to NIST requirements, and meters that were tested by this test standard since the last routine check or calibration of the test standard shall be re-tested with an accurately-calibrated test standard according to the following:

V.2.1. A meter sample from the meters tested by this portable standard since its last check or calibration shall be selected for re-testing as follows:

- **V.2.1.1.** 3–20 meters: All meters will be re-tested for accuracy.
- **V.2.1.2.** 21–100 meters: A random sample of 20% or 20 meters, whichever is less, will be retested for accuracy.
- **V.2.1.3.** 101–200 meters: A random sample of 10% or 20 meters, whichever is less, will be retested for accuracy.
- **V.2.1.4.** Over 200 meters: A random sample of 10% or 50 meters, whichever is less, will be retested for accuracy.

V.2.2. If at least 95% of the first sample pass the meter test for accuracy, all meters will be considered accurate.

V.2.3. If less than 95% of the first sample pass the meter test for accuracy, a second

sample of the same size will be tested.

V.2.4. If a second sample is drawn, 95% of the sample meters must pass the meter test standard for accuracy.

V.2.5. If less than 95% of the second sample pass the meter test for accuracy, all meters previously tested by the portable standard will be re-tested and re-calibrated for accuracy.

PSWG APPENDIX D: Requirements for Meter Installation, Maintenance, Testing, and Calibration in Direct Access

Attachment D-1: Guideline for Meter Testing

Matrix of Meter Testing

The following matrix indicates which testing task can be applied to a meter technology, and it serves as a guide in meter testing. Some of the specific tasks may not apply to newer meters:

		TASK									
CODE	**Type of Meters/Registers**	**1** Voltage Test	**2** Light & Full Load or Customer-Load Test	**3** Demand Test	**4** Register Verification	**5** Phase Angle Test	**6** Separate Element Check	**7** Burden Test	Possible Other Types ❹	COMMENTS	**CODE**
(a)	Self-Contained kWh Meters	**X**	**X**						**(g), (j)**	Mechanical Meter	**(a)**
(b)	Transformer-Rated kWh Meters	**X**	**X**				**X**	**X**	**(g), (j)**	Mechanical Meter	**(b)**
(c)	Hybrid Meters	**X**	**X**	**X**	**X**		**X**		**(i), (j)**		**(c)**
(d)	Solid State Meters	**X**	**X**	**X**	**X**				**(g), (i), (j)**		**(d)**
(e)	Transformer-Rated kVARh Meters	**X**	**X**			**X**	**X**	**X**	**(j)**	Mechanical Meter	**(e)**
(f)	Multi-Quadrant Meters	**X**	**X**	❶	**X**		**X**		**(g), (j)**		**(f)**
(g)	Solid State Recorders	**X**		**X**							**(g)**
(h)	Mechanical Registers			❶					**(g), (j)**		**(h)**
(i)	Electronic Registers			❶					**(g), (j)**		**(i)**
(j)	Pulse Devices			**X**							**(j)**
(k)	Self-Contained Network Meters	**X**							**(g), (j)**		**(k)**

❶ Performed if demand is present. Energy Consumption Investigation (ECI) is necessary. Performed when deemed necessary or requested by customers.
The alphabetical codes in the "Possible Other Types" column refer to the "Code" column on this matrix and indicate that additional tests must be performed as required if the other types exist at the sites.

PSWG APPENDIX D: Requirements for Meter Installation, Maintenance, Testing, and Calibration in Direct Access

Attachment D-1: Guideline for Meter Testing

1. Task #1: Voltage Test

The voltage test is necessary to 1) ensure safety in the meter work procedures, 2) provide a meter worker a knowledge of the correct service voltage prior to any meter work, 3) provide a confirmation of no short-circuit or hazardous conditions in customer equipment or panel. Below is a procedure for the voltage test:

On all services, measure the secondary voltage, with an approved volt meter, between the line phases and line to ground even if it is an ungrounded service and record all voltage readings on the test tag. All nominal voltages have an allowable tolerance of ±5%.

1.1. Secondary Distribution Voltages: Normal rating of 120 V.

Table 1.1-1: Nominal Voltages and allowable limits on Secondary

Nominal Voltage (V)	Maximum (V)	Minimum (V)
120	126	114
208	218	198
240	252	228
277	291	263
480	504	456

Table1.1-2: Service Voltages and allowable limits on Secondary

Service Voltage (V)	Measured Voltage (V)	Maximum (V)	Minimum (V)
120/240 V 3w 1ø	120 V Phase to Ground 240 V Phase to Phase	126 252	114 228
120/208 V 3w 1ø	120 V Phase to Ground 208 V Phase to Phase	126 218	114 198
120/208 V 4w 3ø	120 V Phase to Ground 208 V Phase to Phase	126 218	114 198
120/240 V 4w 3ø	120 V Phase to Ground 208 V Phase to Ground 240 V Phase to Phase	126 218 252	114 198 228
277/480 V 4w 3ø	277 V Phase to Ground 480 V Phase to Phase	291 504	263 456
240 V 3w 3ø	240 V Phase to Phase	252	228
480 V 3w 3ø	480 V Phase to Phase	504	456

Attachment D-1: Guideline for Meter Testing

1.2. Primary Distribution and Transmission Voltages: These voltages have a secondary voltage rating of 115 V or 120 V. The voltage transformer primary may be connected either wye or delta.

Table 1.2-1: Primary and Transmission Voltages with their secondary voltages and ratios

Possible System L-L Voltage (V)	VT Primary Voltage (V)	Secondary Rating (V)	Ratio
2,400 or 4,200	2,400	120	20:1
4,200 or 7,200	4,200	120	35:1
7,200 or 12,000	7,200	120	60:1
12,000 or 20,125	12,000	120	100:1
17,200	18,000	120	150:1
20,125 or 34,500	20,125	115/67.08	175/300:1
60,000	34,500	115/69	300/500:1
69,000	40,250	115/67.08	350/600:1
115,000	69,000	115/69	600/1000:1
138,000	80,500	115/69	700:1
230,000	138,000	115/69	1,200/2000:1
500,000	287,500	115/69	2,500/4200:1

2. Task #2: Light Load & Full Load Test or Customer-Load Test

This test is the accuracy testing to assure that the meter is accurate at various load conditions. Typically, the accuracy of the solid state meters varies minimally in the full and light load conditions. However, the accuracy of mechanical meters is significantly better at a full load than at a light load due to friction and speed of disk shaft rotation. Therefore, it becomes a common practice to test meters for accuracy at both light and full load conditions.

Light load is 10% of test Amp rating, and full load is 100% of test Amp rating. The light and full load test is performed at 100% power factor to verify the accuracy of the meter by comparing its test results with a standard meter of known traceable accuracy. Customer Load Test will consist of two or more test runs using the customer's load. Each heavy load test run shall be at least 60 seconds in duration. Heavy load is defined as any load over 10% of Test Amp rating of the meter. Each light load test run shall be at least 90 seconds in duration and two revolutions of the meter disk

2.1. No Load or Creep Test (for mechanical & hybrid meters only):

Test meters will be energized with no connected load, and the disk observed for rotation. A minimum amount of creep is acceptable if the rotation stops when an anti-creep hole reaches the meter stator.

2.2. Accuracy test:

Single phase and polyphase meters are to be tested with potential coils connected in parallel and the current coils connected in series; or an on site test can be performed using customer load. The minimum duration of the test will be 1 disk revolution for light load and 10 disk revolutions for full load. For solid state meters, calculated pseudo revolutions will be used. Customer Load test will be at least 60 sec in duration and minimum 2 revs for heavy load test. Light load test run at least 90 sec in duration and two revolutions of the disk

2.3. Adjustments:

Meters found within the limits required by the local UDC need not be adjusted.

2.4. Reporting:

Correction factors for light load and full load tests will be recorded as the meter accuracy results as specified in ANSI C.12.1 (1995)

For example, for a 0.5% fast and slow meter:

	Correction Factor	Accuracy
Fast	0.995	+0.5%
Slow	1.005	-0.5%.

3. Task #3: Demand Test

The demand test is performed to ensure the accuracy of the demand function of a meter.

3.1. Mechanical Demand Meters

Test for the accuracy of the demand registers by checking the marked register ratio and time interval as follows:

3.1.1. Advancing Mechanism: Visually inspect the pusher arm and gears for worn out parts.

3.1.2. Clutch: Check that the pusher arm returns to zero at the end of interval when the clutch releases it. Verify that this is a smooth operation and that the pusher arm returns to the stop position.

3.1.3. Timing Motor: Check that the timing motor is operating. If the motor is not operating, the demand reading will most likely be off scale.

3.1.4. Time Interval and Demand Test: Test the time interval to ensure that it is as marked on the register name plate by timing the motor gear and clocking an interval (i.e. 900 seconds for 15 minutes), or performing a demand test. The demand test is performed by minimally applying full load current for 125 disk revolutions on 15 minute demand meters and for 250 disk revolutions on 30 minute demand meters.

3.1.5. Demand Mechanism: Check that the demand reset returns the pointer to zero on a reset action and that the pointer will advance to full scale.

3.1.6. Reporting: Correction factor for the demand test will be recorded as the meter accuracy result.

For example for a 0.5% fast and slow meter:

	Correction Factor	Accuracy
Fast	0.995	+0.5%
Slow	1.005	-0.5%.

3.2. Solid State Meters and Electronic Registers

Below is a procedure for a demand test on a solid state meter or an electronic register:

3.2.1. Place the meter register in the TEST MODE.

3.2.2. Press the reset button to clear all test registers and start a new demand interval.

3.2.3. Apply full load current for 25 disk revolutions (or equivalent) as a minimum.

3.2.4. Scroll the register display to show present kW demand. If the kW value is in pulses, calculate the actual kW value.

3.2.5. Calculate and record the correction factor by comparing the meter kW value with the kW in the test standard.

3.2.6. Return the meter to the NORMAL MODE.

PSWG APPENDIX D: Requirements for Meter Installation, Maintenance, Testing, and Calibration in Direct Access

Attachment D-1: Guideline for Meter Testing

4. Task #4: Register Verification

The register verification is performed to ensure that the register parts and components are working to provide and retain accurate billing data and information.

4.1. Mechanical Register

Visually inspect and verify that the register is correct for the watt-hour meter, and that the register constant, gear ratio, and register ratio are correct for the register.

4.1.1. Gear mechanism: Check that the gears are clean, and check the proper engagement between gears and between the first gear and the disk shaft.

4.1.2. Mechanical register: Check that the register ratio is the same as marked. The register ratio (Rr) is determined by counting the number of revolutions required of the first gear to cause the first dial pointer to make one complete revolution.

4.2. Electronic Register

Because electronic registers are different for each type and manufacturer, the manufacturer's manual should be referred to for specific procedures for these registers. Below is a typical procedure for verifying electronic registers after they are programmed with proper parameters:

4.2.1. Check all numerical segments and identifiers on the meter display.

4.2.2. Check that the meter is scrolling properly through all registers.

4.2.3. Check the function of the registers by disconnecting and then restoring power on the meter. The meter should resume normal display operations and reading after this power outage.

4.2.4. Verify the programming parameters are correct.

4.2.5. Check the register memory and load profile data memory to verify that data is being stored.

5. Task #5: Phase Angle Test

The phase angle test is performed to ensure the correct wiring for a meter system and therefore ensure the meter site accuracy because the correct wiring depends on a unique phase rotation (ABC or CBA) supplied by a UDC, customer load, and service wiring (delta vs. wye and three wires vs. four wires). The following is an example of procedures to follow when performing a phase angle test:

5.1. Utility phase rotation requirements:

Refer to specific UDC requirements regarding phase rotation prior to performing this test, and check for correct wiring on a reactive metering site and proper phase shift on each phase circuit.

5.2. Phase shifting transformer (reactaformer) voltage:

Measure the secondary voltage to ensure correct voltage is applied to the potential coil in the kVarhr meter. If the phase voltage is not correct, check for the following possible errors: 1) incorrect wiring on the phase shifting transformers, and 2) incorrect service voltage.

5.3. Power Factor Calculation:

Calculate the load on the (real power) kWhr and the (reactive power) kVarhr meters and the power factor for the site. This power factor is used as a cross check for the measured phase angles.

5.4. Current Measurement:

Measure each phase current and record it accordingly.

5.5. Phase Angle Measurement:

Use a phase angle meter to measure each phase angle and record it accordingly.

5.6. Phase Angle Plot:

After measuring all voltages, currents, and phase angles, plot a phase angle test and cross check with the calculated power factor.

6. Task #6: Separate Element Check

The separate element check is performed to ensure that each element is still in a good working condition. This check is necessary because a meter has more than one element, and it still measures energy usage even if one element is burnt or defective.

Check individual elements for proper disk rotation or registration by performing the following:

6.1. Testing:

Energize with the appropriate phase potentials and place current on individual elements, and check for forward rotation or positive registration

6.2. Correct phasing:

Check that the proper potential coil and current coil are wired correctly in the meter. If the meter is installed correctly on the socket, the meter disk will rotate forward.

6.3. No forward rotation:

If an element has no rotation, check for no load current and for open potential coil(s) with a magnet or an ohmmeter.

6.4. Cautions:

Phase angle relationships may cause reverse rotation in cases where there is a poor power factor, possible un-metered load, and/or short circuit. This will only occur on three wire three phase metered service sites.

Attachment D-1: Guideline for Meter Testing

7. Task #7: Burden Test

Burden is the total load or impedance in the current transformer (CT) circuit due to meter coils, leads, and other connected devices. The burden test is performed to check for the proper operating conditions of CTs. This test is necessary to verify that the output current is proportional to the CT's nameplate ratio. Below is an example procedure for the burden test on a CT:

7.1. Procedure:

Put built-in burdens of a multi-range Ammeter in series with the secondary of the test CT to obtain the Amp readings. These Amp readings should have the same deflection.

7.2. Possible Problems:

If a CT has a reading significantly different from the others, check for shorted turns or other problems, such as short circuited primary turns, short circuited secondary turns, high resistance connections in the secondary circuit, short circuited secondary wiring, or grounding of normally ungrounded wire.

PSWG APPENDIX D: Requirements for Meter Installation, Maintenance, Testing, and Calibration in Direct Access

Attachment D-2: Class 4(A), 4(B), and 5 Meter Workers Certification Tests

Part 1: Written Exam

The written test includes questions which are a combination of multiple choices, description, and problem solution. Below is a summary list that can be developed into one or several specific questions for each item:

SAFETY:

⇒ Given a specific condition at a metering site, describe safety procedures that metering personnel need to perform.

⇒ Describe the conditions or procedures, if any, when opening the secondary of CTs and PTs. Why?

⇒ Given a customer's operating load conditions and six voltage reads on both phase-to-phase and phase-to-ground during a field test of a meter, ask for the following:

a) Provide preliminary diagnosis of the metering.
b) If OK, describe what will happen if an accuracy test is conducted.
c) If not OK, what troubleshooting steps & customer information are needed prior to leaving the site.

⇒ Describe safety procedures when disconnecting a meter from CT's secondary while CT's primary is carrying load or energized.

⇒ When performing work on or around the meter site, what dictates the safety protection equipment that must be used and when it should be used?

TECHNICAL METERING:

⇒ List the phase voltages to ground conductors of some specific services.

⇒ Provide a gear ratio of a typical residential meter given a stamped register ratio and Kh.

⇒ Define Kh of a watt-hour meter.

⇒ Describe the driving torque component in an induction meter.

⇒ Describe the phase shifting transformer component for reactive metering.

⇒ What are the functions, purpose, and procedures for using a phase angle meter.

⇒ Describe how to safely connect voltmeters, ammeters, and wattmeters in electrical circuits.

⇒ Describe relationship between the current and voltage in some specific meters at unity PF load.

⇒ Describe various aspects of the 3 wire network service.

⇒ Given a circuit diagram of a meter and service connection and load in amperes, provide one or more of the following types of values: the total load registered by the meter, the voltage drop across the potential coil, the form, the number of elements of the meter, etc.

⇒ Using the given base values of Kh, current, and voltage, calculate the new Kh based on a different current and voltage.

⇒ Calculate the light load accuracy or correction factor on a specific self-contained meter, given its Kh and disk revolutions in a specific time period.

⇒ Calculate the kW load and dial multiplier for a specific transformer-rated meter given its current transformer ratio, Kh, and disk revolutions in a specific time period.

PSWG APPENDIX D: Requirements for Meter Installation, Maintenance, Testing, and Calibration in Direct Access

Attachment D-2: Class 4(A), 4(B), and 5 Meter Workers Certification Tests

Part 1: Written Exam (continued)

⇒ Describe if a test result is right or wrong given specific test conditions and result (e.g., in a 2 element meter test, a rotating standard register 2 times the number of revolutions it should, and the meter is properly connected for the test with the potential coils in parallel and current coil in series).

⇒ Calculate disk revolutions given a demand reading on a specific interval and a Kh value.

⇒ Complete a meter jaw configuration for a specific meter and label expected terminal-to-ground voltage reads on each line terminal (jaw). Will be given a blank circle representing meter base along with meter form, class, voltage, wires, phase, and connection.

⇒ Understand detent, describe when it should and should not be used.

⇒ Given a specific meter diagram (connected to a socket with 4,5, or 8 jaws), answer questions on its metering performance and ask for explanations.

⇒ Given a customer's operating load condition and six voltage reads on both phase-to-phase and phase-to-ground during a field test of a meter, ask for the following:

a) Provide preliminary diagnosis of the metering.
b) If OK, describe what will happen if an accuracy test is conducted.
c) If not OK, what troubleshooting steps & customer information are needed prior to leaving the site.

⇒ Given a specific meter and a service, question its metering accuracy on a certain portion of the service load and ask for why it is so (i.e. 3-wire single phase meter on a 3 wire network load: what is the error (if any) and why there is an error on 1) a single phase load, and 2) line to line load.)

⇒ Given a service (phase, wires, voltage, and connection) and the customer's kW load demand and phase angle, calculate the load current and show the calculations.

⇒ Calculate power factors of element tests on a 3-wire 3-phase meter, given a meter Kh and disk revolutions in a certain time interval.

⇒ Given a picture of the transformer winding diagram, meter socket diagram, and internal wiring between the meter and transformer, provide the meter information: class, volt(s), wire(s), and phase(s).

⇒ Given a picture of a complete wiring diagram for a complicated metering installation which includes a service connection diagram, CTs, 10-pole test switch and 13-jaw meter diagram; also given a specific meter, customer service main ampacity, color-coded wires and all detailed information on service (i.e. volt, wire, connection, phase, etc.); questions on the following: 1) CT's primary / secondary rating, 2) billing constant, 3) which wires are connected to what (switch, transformers, hot legs, power legs, etc.), 4) phase to neutral voltage readings, 5) phase to phase voltage readings, 6) which wire(s) should be connected to ground, and 7) Describe if anything is wrong with the installation.

⇒ Given a specific service connection along with CTs, a specific meter diagram, and the option of either a 6-pole test switch or a 10-pole test switch, each of which has numbered and connected wires, complete the following: 1) select the test switch, 2) identify potential and current wires, and common wires for CTs, 3) provide the billing constant, and 4) identify ground wire(s).

⇒ Given an internal diagram of a single phase meter with the meter jaws numbered, perform a

single phase test on the meter, describe step-by-step how to place the current coils in series and potential coils in parallel, and accordingly label the input and output of each jumper placed in the circuit diagram (assume that the test switch is not needed and the meter is not energized).

Part 2: Practical Exam

The practical exam is prepared to include two parts: 1) the description of the metering work that a test candidate needs to hands-on perform, and 2) the check list of all necessary steps (including safety) that the test observer needs to record for scoring. All necessary test equipment, tools, meters, and associated devices shall be provided to the candidate for performing meter testing. Below are the sample questions on some metering work:

⇒ Set up the wiring for the test standards and phantom load box for a field meter test.
⇒ Perform test on a specific meter on a 200 A meter panel that has a test bypass facility.
⇒ Perform meter removal, installation, and test of specific CT rated meters. Describe any abnormalities, if observed, and corrections to be applied.

PSWG APPENDIX D: Requirements for Meter Installation, Maintenance, Testing, and Calibration in Direct Access

Attachment D-3: MSP Registration Packet

(Revised) APPLICATION FOR METER SERVICE AND INSTALLATION CERTIFICATION

*****PLEASE PRINT OR TYPE*****

MSP No. _____

Date Granted _____

Worker Levels Incl._____

1. Name of Person or Entity:

_____

2. Current Business Address:

_____
Street Address

_____
City **State** **Zip Code**

3. Current Business Telephone Number:

_____

4. CALIFORNIA ELECTRICAL CONTRACTOR'S LICENSE: (attach a copy to this Application)

Name of the person or entity in which the General Electrical Contractor's License is issued: _____

License #_____ **Expiration Date:** _____

5. BOND OR GENERAL LIABILITY INSURANCE REQUIREMENT: the Applicant shall arrange a bond in favor of the State of California in the amount of $100,000 or provide the Energy Division with proof that the Applicant has general liability insurance meeting the specifications described in the CPUC Decision D98-05-044. The bond or proof of insurance shall be submitted with this application.

6. Please attach a detailed description of all of the applicant's electric meter installation, maintenance, repair, and removal experience, including Meter Worker Classes as specified in the CPUC Decision [insert the Decision No.]

7. Please attach a detailed description of how the Applicant acquires qualified workers in each class of meter work you intend to perform. If the Applicant intends to self-certify its meter workers in Classes 1, 2, and/or 3, please submit the training program materials commensurate with the classes of meter work the Applicant intends to self-certify.

8. Please attach a detailed description of the <u>educational, training, and experience requirements (or programs) in electrical work and electrical safety</u> that have been certified according the CPUC-approved certification process and that the applicant will implement to certify and require of its employees before they are allowed to install, maintain, repair, or remove electrical meters or metering devices. However, these educational and training requirements (or programs) will not be required if the Applicant employs only meter workers who have already been certified according to the CPUC-approved meter worker qualification process.

9. By submitting this Application, the Applicant shall comply with any and all of the CPUC-approved requirements for Meter Service Provider including meter worker qualification, meter installation, maintenance, testing and calibration work, and applications of the approved ANSI Standards on electric meters or metering devices, CAL OSHA, and applicable laws, rules, and regulations in California. Failure to comply with these requirements shall be grounds for the CPUC to revoke the Applicant's certification to conduct business in California.

PSWG APPENDIX D: Requirements for Meter Installation, Maintenance, Testing, and Calibration in Direct Access

Attachment D-3: MSP Registration Packet

DECLARATION

I, (print name and title) _____ declare under the penalty of perjury that the above statements are true and correct.

Dated this _____day of _____ 19_____ at _____
(day) (month) (year) (place of execution)

Signature:_____

Note: if this Application is verified outside California, the verification must be made by an affidavit sworn or affirmed before a notary public.

Return this Application with required attachments to:

MSP Certification Unit

California Public Utilities Commission

505 Van Ness Avenue

San Francisco, CA 94102

INCOMPLETE APPLICATIONS CANNOT BE PROCESSED

FOR CPUC USE ONLY

Application Processed

By: _____

Date: _____