Automated Meter Reading

Implementation Manual

(For Lay Persons)

Case Study and Methodology

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NOTICE
This document is for educational purposes only and is not intended to be an actual planning or implementing document

Contents

Purpose.   One of the most important aspects of any Automatic Meter Reading (AMR) Implementation is the procedures and processes that make for success AMR application. This case study is designed to guide the installation of an AMR purchase at the municipality level.

Scope.   It is the intent of this document to provide guidelines and ideas for installing radio enabled meters and the methods authorized or approved by the manufacturer. It is not the intent or direction of this document to educate project mangers on project management. For a more in depth project management approach see _AMI/AMR Project Management Manual: Process and Procedures for Lay Persons (Copyrighted 2009 by Bill Melendez)_ also by the current author.

Introduction.   During this simple case study, the reader will be doing a simulated installation of 5,000 radios on various meters. This study does not cover the uniqueness of any route management software nor how it is incorporated into the billing system the customer uses. It is assumed that any route management software used is provided by either the AMR manufacturer or a different vendor. The intent is to provide some realism to the case study by using known software and hardware tools. The focus is on doing the actual installation of the AMR system.

Planning the Installation

Planning

The planning process begins with setting objectives based on defined needs. In order to define the needs, one has to ask key questions that place limits on the scope of the installation.

Location:	Where will we be installing the system?
	What are the constraints of the environment?
AMR System:	How many new installs verses retrofits?
	How are we acquiring the reads? Handheld? Laptop?
	What is the schedule for start/completion?
	Does the system need integration with existing system(s)?
Software:	Can we use existing software as is? If not what needs to be changed or modified? Who will do the changing or modification?
Personnel:	Have we identified decision makers and key players?
	Are personnel trained and/or briefed?
	Who needs training and who needs briefing and at what levels?

Planning an installation may be simple or complex depending on the siz, of the site and the number of units being installed. For this study, we will focus

an installation of 5,000 or lower and the municipality doing the actual install of the external radio units. Since the installation of this number of units is less complicated, the emphasis is therefore on providing simple steps that can be implemented as part of the project strategy. We have provided an Evaluation Worksheet in Appendix 1 as a guide for helping in the planning process.

The municipality's Request For Proposal (RFP) or the utility's Need Assessment normally drive the contract requirements for an AMR purchase. In the absence of either, a Needs Assessment can be part of the goals and objectives of the actual project. Somewhere there has to be some form of documentation delineating what the need is as a requirement for justifying AMF This need is the basis from which the project manager or supervisor in charge of the installation will determine project requirements and project acceptance criteria. These two categories drive the project and determine its success.

Define the Objective (Setting Goals)

There are two critical. goals that should be defined. The reason for the AMR purchase is the first and primary basis for defining the project. The other critical goal is the actual accomplishment of the installation. For our purpose, we will focus on the goal of the actual installation. An installation goal may be:

> *To install 5,000 radio enabled meters within a period of 20 weeks with a first read rate of 99. 5% and without any change in current scheduling.*

Implementation TIP: *Break down the installation goals into daily and weekly goals. After each day's numbers of radio enabled meters to install are met the team gets the next day's number goals. Reward for any installs beyond the projected daily numbers.*

Let's assume that the installation should take about twenty weeks based on the number of installers and meters. Outline the per week numbers based on the installation capability and rate of the installing teams and a 5,000-unit installation requirement:

Weekly Installation Numbers Goals:

Scheduled	Team 1	Team 2	Team 3	TOTAL
Week 1	100	75	75	250
Week 2	100	75	75	250
Week 3	100	75	75	250
Week 4	100	75	75	250
Week 5	100	75	75	250
Week 6	100	75	75	250
Week 7	100	75	75	250
Week 8	100	75	75	250

Week 9	100	75	75	250
Week 10	100	75	75	250
Week 11	100	75	75	250
Week 12	100	75	75	250
Week 13	100	75	75	250
Week 14	100	75	75	250
Week 15	100	75	75	250
Week 16	100	75	75	250
Week 17	100	75	75	250
Week 18	100	75	75	250
Week 19	100	75	75	250
Week 20	100	75	75	250

We used a 30-minute period per installed meter/AMR unit as a way of calculating per day basis. The first team with three people could install five more than the other two teams with only two people assigned per team. If we started the installation in May, then the monthly breakdown would look similar to the following:

Monthly Installation Numbers Goals:

Month	Units	Remarks
May	1250	5 Weeks X 250
June	1000	4 Weeks X 250
July	1000	4 Weeks X 250
August	1250	5 Weeks X 250
September	1000	4 Weeks X 250

That would give the project a 500 unit fudge factor to play with in anticipation of canceled appointments, hard to access meters, main line repairs or changes. We know that we would have to get the total number of meters that would fall into the "hard to access or difficult to install" categories prior to the first week. Hopefully, the number would be less than 500. We also see the need to maintain a two week buffer to offset these delays during the installation process (The amount of buffer is open to what the project manager feels is needed). With the buffer, we could project the completion date for the end of September of the same year. This would be ideal since October tended to be difficult due to the cold and rain.

Work Breakdown Structure (WBS)

The work breakdown structure (WBS) consists of three categories, one of which is the identified Requirements and the others being Management and Resourcing. The work listing was divided into these three areas -- Management, Resource, and Requirements. The management tasks are normally assigned to the project manager while the other categories belong to the various departments. In small municipalities, the project manager may be required to do all of them. The list not all inclusive and in some cases some of the category breakdowns may not apply to a small installation. We used the ones we felt were appropriate for the project started in the *Define the Objective* section.

Installation Management

The category labeled Installation Management is self explanatory. These are requirements and activities that the project manager will have to accomplish before, during, and after the installation.

> Determine phase goals & objectives
> Identify & schedule GO-NO GO authorization critical checkpoints
> Identify evaluation criteria-QA requirements by scheduled GO -NO GO
>   points
> Implement cost assessment by phase, by GO - NO GO points
> Identify reporting requirements
> Identify responsibilities and lines of authorities
> Identify key personnel (logistics, operations, management)
> Identify installation standards
> Determine RMA process
> Establish Material Delivery Schedule
> Determine installation equipment requirements
> Identify inclement weather tasks & schedules
> Schedule briefings & identify liaison process
> Determine communications requirements
> Determine outsourcing requirements
> Identify outsourcing companies
> Identify local & remote equipment suppliers
> Identify staging & storing area for equipment & products
> Identify security requirements

Installation Resource

Installation Resourcing category lists those items that will require resourcing or that identify a need for a resource. In most cases, the resource is identified as the action needed to meet that requirement follows. The resourcing of the project is normally done in conjunction with the accounting office and the requisition department, if one exists.

RESOURCING

RESOURCE REQUIREMENTS	TASKS OR ACTIVITY REQUIREMENT
Identify and allocate AMR requirements per customer account	Submit AMR Purchase Order
Identify and allocate meter requirements per customer account Identify and allocate meter accessories for installation per customer account	Submit meter & installation accessories Purchase Order
Identify and allocate installation equipment and tools per team	Submit installation equipment & tools request and/or Purchase Order
Identify and allocate vehicle requirements per team	Submit vehicle request form and/or rental agreement
Identify and allocate safety equipment per team	Submit safety equipment request and/or Purchase Order
Identify and allocate uniforms (or uniform ID patches) per person per team	Submit uniform request and/or Purchase Order and/or Uniform Rental Agreement
Identify personnel requirements skills and experience levels needed	Submit personnel requirements for hiring or subcontracting
Identify and rent office and warehousing storage space	Submit rental agreement for office and storage requirement
Identify and allocate building security systems for office and warehousing	Submit security equipment purchase and/or rental
Identify and allocate two-way communications radios per team Identify and allocate office and personnel communications equipment	Submit communications equipment request and/or Purchase Order (2 way radios, office telephones, etc.)
Identify and/or develop training curriculum, classroom, and equipment	Submit training requirements and scheduled training

Installation Requirements

The last category covers the actual installation process. The Installation Requirements identify requirements but not necessarily the *When* of the requirement. Tasks associated with the requirements are either outlined in this section or implied by the activity listed.

INSTALLATION REQUIREMENTS		SCHEDULE		
CATEGORY	ACTIVITY OR TASK	Prior	During	After
PERSONNEL & HR	Identify responsibilities & lines of authorities	X		
	Identify team, section, and project level managers & key personnel	X		
	Identify and implement hiring and vacancy fill procedures	X	X	
	Identify Compensation (piece work & for hourly rate)		X	X
	Identify critical skills and implement skill verification	X	X	
	Identify and implement insurance program, liability coverage, hospitalization, etc.	X	X	X
	Identify personnel authorized to make schedule changes.	X		
TRAINING	Identify and implement emergency procedures	X	X	
	Identify and allocate location for conducting training	X		
	Develop and implement installation procedural training	X		
	Develop and implement safety training	X	X	
	Develop and implement city/environmental specific training	X		
	Develop and implement security awareness program	X	X	
	Develop and implement AMR hardware/software training	X		
PRODUCTS	Develop and implement returns and warranty program	X	X	X
	Identify and record old and new meter reading data per account		X	X
	Identify meter register to meter electronic output differences	X		
	Identify and record meter ID, AMR device ID, and account address	X	X	X
	Identify and record meter body change outs (model and size)		X	X
	Identify and record meter register change outs (type and resolution)		X	X
	Tag and store received meters until read verification		X	X
	Install meters in accordance with manufacturer and local ordinance		X	X
EQUIPMENT & TOOLS	Identify and purchase installation equipment and tools	X		
	Identify and implement a vehicle and equipment maintenance program	X	X	X
	Identify communications equipment architecture	X		

Category	Task			
SECURITY	**Identify and implement applicant background check procedures**	X		
	Conduct background check for all selected applicants	X		
	Identify and implement personnel authorization & verification process	X	X	
	Conduct random personnel check (ID, drug testing, safety adherence)	X	X	
	Identify security personnel and verify with subcontractor before each shift	X	X	
	Identify and implement daily security procedures & verification for employees	X	X	
	Identify warehousing and office building requirements	X		
	Implement warehouse and office building security and alarm systems	X	X	
	Identify scrap location or disposal facility for meters	X		
BUILDING & WAREHOUSING	**Indentify warehousing and office building requirements**	X		
	Identify scrap location or disposal facility for replaced/bad meters	X		
SCHEDULING & REPORTING	**Develop a breakdown rate for installing AMR per section per team**	X	X	
	Identify a start install date and end date	X		
	Identify daily, weekly, and monthly install goals	X		
	Identify installation costs and daily cost tracking procedures	X		
	Identify reporting procedures and forms	X		
	Identify shipping schedules and receipt verification	X		
	Identify AMR to meter interfacing needs and procedures	X	X	
	Identify or develop Route Management Software (RMS)	X	X	
	Identify or develop Billing Software (BS)	X	X	
	Identify route management software interfacing and file format	X		
	Develop and program RMS & BS interfacing modules as needed	X	X	

Implementation TIP: *Each stage of the process requires some form of checks and balances to ensure proper installation of the radio enabled product. A report at the end of each work day and phase will do just that.*

The following shows a possible Work Breakdown Structure (WBS) used to deploy an AMR requirement with water meters. While the tasks listed seem extensive, most are routine work related requirements that utility workers would do in the course of fulfilling their day to day jobs. The list can be expanded to include additional tasks not listed or can be reduced to fit only those tasks that apply to the deployment. The reason for doing the WBS is that this allows the project manager the ability to determine the critical path and scheduling requirements (start and completion timelines) based on each task resourcing. By doing this, the manager can further see where the schedule needs to be longer or shorter to meet the stated deadlines. *The list below was taken from the AMI and AMR Project Management Manual: Process and Procedures for Lay Persons (Copyrighted 2009 by Bill Melendez).*

Activity	Major Activity Category	Sub Task Areas
1	**Installation Resource Management**	
1.1.1	**Product & Equipment**	Identify and allocate AMR requirements per customer account
1.1.2		Submit AMR Purchase Order
1.1.3		Identify and allocate meter requirements per customer account
1.1.4		Identify and allocate meter accessories for installation per customer account
1.1.5		Submit meter & accessories Purchase Order
1.1.6		Identify and allocate installation equipment & tools per team
1.1.7		Submit installation equipment & tools request and/or Purchase Order
1.2.1	**Transportation, Safety, & Security**	Identify and allocate vehicle requirements per team
1.2.2		Submit vehicle request form and/or rental agreement
1.2.3		Identify and allocate safety equipment per team
1.2.4		Submit safety equipment request and/or Purchase Order
1.2.5		Identify and allocate uniforms per person per team
1.2.6		Submit uniform request and/or Purchase Order and/or Rental Agreement
1.2.7		Identify and allocate building security systems for office and warehousing
1.2.8		Submit security equipment purchase and/or rental
1.3.1	**Personnel**	Identify personnel requirements by tasks and required skill sets
1.3.2		Submit personnel requirements for hiring or subcontracting
1.4.1	**Facilities**	Identify and rent office and storage space
1.4.2		Submit rental agreement for office space and storage requirements
1.5.1	**Communications**	Identify and allocate two way communications equipment per team
1.5.2		Identify and allocate office and personnel communications equipment
1.5.3		Identify and allocate training equipment for class room use
1.5.4		Submit communications equipment rental and/or Purchase order
2	**Installation Requirements Management**	
2.1.1	**Product & Equipment**	Develop and implement returns and warranty program
2.2.1	**Transportation, Safety, & Security**	Identify and implement a vehicle and equipment maintenance program
2.2.2		Identify and implement applicant background check procedures
2.2.3		Conduct background check for all selected applicants
2.2.4		Identify and implement personnel authorization & verification process
2.2.5		Conduct random personnel check (ID, drug testing, safety adherence)
2.2.6		Identify security personnel and verify with subcontractor prior to each shift
2.2.7		Identify and implement daily security procedures & verification for employees
2.3.1	**Personnel**	Identify responsibilities & lines of authorities
2.3.2		Identify team, section, and project level managers & key personnel
2.3.3		Compensation (piecework &/or hourly rate)
2.3.4		Identify and implement hiring and vacancy fill procedures
2.3.5		Identify and implement skills verification
2.3.6		Identify and implement insurance program, liability coverage, hospitalization, etc.
2.4.1	**Facilities**	Implement building security and alarm system
2.5.1	**Communications**	Identify communications equipment architecture
2.6.1	**Training**	Identify and implement emergency procedures
2.6.2		Identify and allocate location for conducting training
2.6.3		Develop and implement installation procedural training
2.6.4		Develop and implement safety training
2.6.5		Develop and implement city/environmental specific training
2.6.7		Develop and implement security awareness program
2.6.8		Develop and implement AMR hardware/software training
3	**Installation Process Management**	
3.1.1	**Mobilization & Setup**	Develop a breakdown rate for installing AMR per section per team
3.1.2		Identify a start install date and end date
3.1.3		Identify daily, weekly, and monthly install goals
3.1.4		Identify installation costs and daily cost tracking procedures
3.1.5		Identify reporting procedures and forms
3.1.6		Identify shipping schedules and receipt verification
3.2.1	**AMR System Interfacing & Programming**	Identify AMR to meter interfacing needs and procedures and programming
3.2.2		Identify or develop Route Management Software (RMS)
3.2.3		Identify or develop Billing Software (BS)

3.2.4 3.2.5		Identify route management software interfacing and file format Develop and program RMS & BS interfacing modules as needed
3.3.1 3.3.2 3.3.3	**Meter Data Management**	Identify and record old and new meter reading data per account Identify meter register to meter electronic output differences Identify and record meter ID, AMR device ID, and account address
3.4.1 3.4.2 3.4.3 3.4.4 3.4.5	**Meter Removal / Installation**	Identify and record meter body change outs (model and size) Identify and record meter register change outs (type and resolution) Tag and store removed meters until read verification Install meters in accordance with manufacturer and local ordinances Identify scrap location or disposal facility for meters
3.5.1 3.5.2 3.5.3 3.5.4 3.5.5 3.5.6 3.5.7	**Project Schedule Coordination**	Identify personnel authorized to make schedule changes Identify personnel authorized to implement schedule Identify and allocate vehicle requirements per team Identify and implement work hour recording and logging Identify and implement installing schedule by section per team Identify schedule dependencies by task precedence Identify daily resource constraints
3.6.1 3.6.2 3.6.3	**Quality Assurance Testing**	Identify and verify manufacturer's compliance standards Identify and verify manufacturer's installation procedures Identify and verify city/environmental compliance
3.7.1	**Safety & OSHA**	Identify and verify safety procedures and compliance
4	**Installation Manager/Supervisor**	
4.1.1 4.1.2 4.1.3 4.1.4		Notify customers of water interrupt (2-4 days in advance) Re-schedule "no-access" or non-installed locations Identify and breakdown installation tools, two way communications, safety gear, meters (and meter accessories) and AMR devices by route per team Brief installation personnel on safety & health, security, and traffic conditions (congested and construction areas)
5	**Installation Team**	
5.1.1 5.1.2 5.1.3	**Prior to Installation**	Acquire and inventory installation tools, two way communications gear, safety gear, meters (and meter accessories) and AMR devices Brief on safety & health, security (uniforms & vehicle logo ID) and local laws requirements Issue ID tags, door hangers, phone list of contacts, paperwork & forms
5.2.1 5.2.2 5.2.3 5.2.4 5.2.5 5.2.6 5.2.7 5.2.8 5.2.9 5.2.10 5.2.11 5.2.12 5.2.13	**During Installation**	Identify, report and/or repair meter maintenance requirements for retrofits Identify, report and/or repair mains/water pipe maintenance requirements Identify, report and/or repair pit casing/cover Identify "no-access" customers or non-installed locations Identify "difficult to install" accounts Locate, inspect, and operate curb stop valve before installing new meter Remove and dispose all debris, water, sand, mud, etc., from pit before installing new meter or before installing AMR device (for retrofits) Install meter in accordance with manufacturer's specifications and local ordinances for new meter installs Configure, install, and check AMR device for functionality in accordance with manufacturer's specifications Perform a water flow test on new meter and check for leaks, correct meter register count, and correct AMR device to register count Tag old meter for ID and storage (until reading is verified -- for approximately 3 days) Record old and new meter data to customer account record Tag broken, damaged, or nonfunctional new meters or AMR devices
5.3.1 5.3.2 5.3.3 5.3.4 5.3.5 5.3.6	**After Installation**	Remove replaced meters to designated storage location Remove and inventory tagged broken, damaged, or nonfunctional new meters or AMR devices for return/warranty coverage Provide "no-access" or non-installed locations report Inventory and store all installation tools, two way communications gear, safety gear, meters (and meter accessories) and AMR devices Acquire and inventory meters (and meter accessories) and AMR devices for the following day's install Debrief on issues and problems and resolve conflicts

Work Implementation Schedule

Prior to installing the radio enabled meters, it would help to quarter the city or town into phases or stages. A city can be broken down into areas based on a NE, NW, SE, and SW orientation. Industrial Parks can also I given its own designated phase. In a 5,000 unit installation that is broken down into four phases (NE, NW, SE, SW) this would come to a requirement of 1,250 units per phase. Based on the rate of install chart (*Define the Objective* Section) this would equate to five weeks of work per phase. The first phase, done in May, would be completed during that month if everything goes as planned. The following shows how it is scheduled:

PHASE	LOCATION	MONTH	WEEKS
Phase 1	NW section of City	May	5
Phase 2	NE section of City	June - July	4 & 1
Phase 3	SW section of City	July - August	3 & 2
Phase 4	SE section of City	August - September	3 & 2

Phase 2 would require four weeks in June and one in August for a 4 & 1. September has the make up weeks for rescheduled visits or work that required re-doing.

Breaking down the city into sections of NW, NE, SW, and SE may not be feasible to some cities. Their breakdown may instead be based on the water lines and the areas they service. The idea of phases and the method above can still be applicable to this scenario. Since we know how many per day the teams can do, it is merely a matter of counting how many customers are located in a particular zone or service area and designating our phases and numbers to complete on that premise.

Implementation TIP: *The four phases can be further divided into commercial and residential installation requirements. For commercial, there might be unique needs such as the time of day when water may be turned off.*

Avoiding Schedule Delays and Work Stoppage

Problems that create delays are normally cause by occurrences external of the project manager's control or are internal due to poor planning or execution of the project plan. External circumstances may be unavoidable, hence the need for the two week buffer. Internal delays or work stoppages due to poorly done or poorly executed project plan can be minimized by using experience personnel, tried methods and processes. In the absence of experience, external expertise may be required. The best approach to minimizing delays or work stoppage is realistic work schedule that can be fine tuned each day or each week. *The key is balancing the rate of installs per day with the daily/weekly number requirement; If*

the number per day is too low, than more teams may be needed, longer hour may be required, or the numbers expectation may need adjustment.

Implementation TIP: *When a delay or stoppage is encountered due to unforeseeable situation, if possible, skip that installation and continue with the next scheduled install. At the end of the day have that account rescheduled.*

Things to look for when avoiding work stoppage and delays

There are many reasons work is delayed or stopped. The following is a small I of possible causes a project manager or site supervisor may encounter.

Resource Constraints. Not ensuring that resources are available prior to each day's install is another area that can cause delays. Assign your sharpest individual to deal with the daily logistics to prevent this area from becoming a problem. Do your daily inventories of supplies and tools at the beginning and end of each day.

Personnel Constraints. The lack of personnel or continuous personnel turnover is a major issue at any install that subcontracts out its workers to an outside hiring firm. Individuals calling in sick or delayed due to circumstances create delays or possible cancellations. The options are: use current company employed teams or hire additional personnel to compensate for work load.

Using the current employed teams is normally the best approach since they have the skill base and experience base. The personnel have trained and worked together over periods of time and therefore have group synergism. The limitations are that the teams can only install at a certain max rate per day. If the schedule requires a short time frame than the rate per day may increase and therefore requiring more of the teams. The only way to overcome rate limitation is to increase personnel or decrease the rate of install. Both incur costs that need to be considered by the project manager or project supervisor.

Implementation TIP: *The rule of thumb is that, assuming that the number of required installed units stays constant, the number of installers increases as the time allocated to doing the installation decreases.*

Knowledge/Experience Constraints. The level of experience that a crew has impacts the number of personnel required, the quality of the work done, and the time needed to accomplish each task. Things take longer and have to be re-done continuously whenever the experience base is lacking. There are several ways to overcome a low experience/knowledge base:

1. Accept jobs that are within the team's capability or just slightly higher so as to increase the experience and challenge the personnel.

2. Team up the experienced person with the inexperienced individual so as to provide knowledge continuity and training and therefore increase the effectiveness of the teams. This tends to slow the team somewhat until the inexperienced person gains the skills needed. If this is done as part of the initial training then this limitation can be minimized.
3. Hire/subcontract external skills to complement existing skill base.

Work Implementation

The bottom line in an AMR implementation scheme is getting the radio enabled meters installed with minimal disruption to the customers. By using the previous scheduling charts and an installation check list, the installation teams can accomplish the activities needed to complete the installation on schedule. Appendix 2 has a sample Installation Checklist for doing the daily installations and end of day report. Following the end of day report is a Daily Evaluation Criteria (Appendix 3) report that allows the project manager the "heads up" on any issues that required special attention or immediate action.

Implementation TIP: *Top level management visibility produces a sense of importance and urgency to the workers doing the installation. The more visible management is to the workers, the less inclined they are to view the installation as a low priority and low quality job requirement. Maintaining management involvement and interest throughout the entire project ensures availability of authority and leadership to the entire work implementation.*

Work is categorized into *Prior, During*, and *After* installation. Those tasks and requirements that fall under Management and Resourcing normally are considered *Prior* to Installation activities since they are elements of the planning and resource stages of the install. The actual installation has activities that are unique to this stage and have been outlined in the *Installation Requirements* category. The *After the Installation* activities are the *Prior* activities but in reverse order. Namely, those activities that required warehousing, buildings, outside contracting, and so on are of the type that must have some form of closure or termination.

Conclusion

Implementing AMR is difficult only if the level of planning and experience is less than desirable. There are many project management resources to assist in the planning process. Advice on planning and implementation can also be provided by the equipment manufacturer staff and technical personnel. The level of experience and job skills, however, is critical for on site success.

Appendix 1

Automated Meter Reading Installation
Evaluation Worksheet

Project Name	Project ID
Project Manager	
Account Manager	

Site Address	☐ Water ☐ Gas ☐ Electric
	☐ Walk-By ☐ Drive-By ☐ Fixed
	☐ Pit ☐ Outdoor ☐ Indoor
Site Contact	
Installation Date	

Meter Type	Meter Size	Meter Resolution

☐ **DSTR Training**

☐ **USER Training**

☐ **MISC Training**

MANUALS	TECH BULLETINS	APP NOTES

Partner Contact	Partner Phone	Partner Email

COMMENTS

Appendix 1 Evaluation Worksheet (continued)

Project Name	**Project ID**
Project Manager	
Account Manager	

INSPECT THE SITE AND DETERMINE THE INSTALLATION PROCEDURE

☐ Was the purchase order received?

☐ Was there a request for technical site support?

☐ Were the radios/meters received and correct models?

☐ Was the site evaluated for type of installation?

☐ Are the installers sufficiently trained and in appropriate numbers?

CONFIGURE RADIOS/METERS

☐ Do end users have the proper tools for configuring product?

☐ Do end users have the proper tools for reading the meters?

☐ Do end users have the necessary Handheld or PC with software?

☐ Do end users know how to set the meter resolution?

☐ Did the installation support material get purchased?

INSTALL THE RADIOS/METERS

☐ Are the radios attached/integrated and properly configured?

☐ Do the team(s) have all the equipment needed for the install?

DO A WALK-BY/DRIVE-BY TO DETERMINE 100% READ CAPABILITY

☐ Were the radios positioned correctly for max reception?

☐ Were the radios configured correctly for proper reads, etc.?

☐ Do the team(s) have the correct radio reading equipment?

☐ Is the route management software installed and working correctly?

REPLACE/TROUBLESHOOT NONFUNCTIONING RADIOS/METERS

☐ Are there spare backup radios/meters?

Appendix 2

Installation Checklist

Phase _____Week _____ Approved By _____

Task Leader _____ Today's Date _____

Installation Supervisor

TASK	COMPLETED	REMARKS
Notify customers of water interrupt (2-4 days in advance)		
Re-schedule "no-access" or non-installed locations		
Identify and breakdown installation tools, two way communications, safety gear, meters (and meter accessories) and AMR devices by route per team		
Brief installation personnel on safety & health, security, and traffic conditions (congested and construction areas)		
Update Daily Status Report / Daily Evaluation Criteria Sign Off		

Installation Team

Prior to Installation:

TASK	COMPLETED	REMARKS
Acquire and inventory installation tools, two way communications gear, safety gear, meters (and meter accessories) and AMR devices		
Brief on safety & health, security (uniforms & vehicle logo ID) and local laws requirements		
Issue ID tags, door hangers, phone		
List of contacts, paperwork & forms		

Appendix 2 (Installation Checklist continued)

During Installation:

TASK	COMPLETED	REMARKS
Identify, report and/or repair meter maintenance requirements for retrofits		
Identify, report and/or repair mains/water pipe maintenance requirements		
Identify, report and/or repair pit casing/cover		
Identify "no-access" customers or non-installed locations		
Identify "difficult to install" accounts		
Locate, inspect, and operate curb stop valve before installing new meter		
Remove and dispose all debris, water, sand, mud, etc., from pit before installing new meter or before installing AMR device (for retrofits)		
Install meter in accordance with manufacturer's specifications and local ordinances for new meter installs		
Configure, install, and check AMR device for functionality in accordance with manufacturer's specifications		
Perform a water flow test on new meter and check for leaks, correct meter register count, and correct AMR device to register count		
Tag old meter for I D and storage (until reading is verified -- for approximately 3 days)		
Record old and new meter data to customer account record		
Tag broken, damaged, or nonfunctional new meters or AMR devices		

Appendix 2 (Installation Checklist continued)

After Installation:

TASK	COMPLETED	REMARKS
Remove replaced meters to designated storage location		
Remove and inventory tagged broken, damaged, or nonfunctional new meters or AMR devices for return/warranty coverage		
Provide "no-access" or non-installed locations report		
Inventory and store all installation tools, two way communications gear, safety gear, meters (and meter accessories) and AMR devices		
Acquire and inventory meters (and meter accessories) and AMR devices for the following day's install		
Debrief on issues and problems and resolve conflicts (Daily Status Report)		
Daily Evaluation Criteria Sign Off		

Appendix 3

Daily Evaluation Criteria

Team _____ Today's Date _____

Phase _____Week _____Approved By _____

1.   Was each product verified for quality and performance before installation?

        YES _____ NO _____ Priority Level (1   2   3   4   )

        If NO, answer the following:

        REASON: _____

        _____

        _____

        CORRECTIVE ACTION: _____

        _____

        _____

2.   Were all products installed IAW manufacturer's specifications and installation procedures?

        YES _____ NO _____ Priority Level (1   2   3   4   )

        If NO, answer the following:

        REASON: _____

        _____

        _____

        CORRECTIVE ACTION: _____

        _____

        _____

3. Were the results, both old and new, recorded to each account for verification at a later time?

YES _____ NO _____ Priority Level (1   2   3   4   )

If NO, answer the following:

REASON: _____

_____

_____

CORRECTIVE ACTION: _____

_____

_____

4. Were all installation tasks completed?

YES _____ NO _____ Priority Level (1   2   3   4   )

If NO, answer the following:

REASON: _____

_____

_____

CORRECTIVE ACTION: _____

_____

_____