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Developer's Guide to Submetering

Submetering Specifications for Multi-Housing Construction



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Dear multi-family property builder or architect,

Are you interested in increasing the value of a multi-family property with minimal effort?

As water and sewage rates continue to increase faster than inflation, property owners are looking for ways to recover those variable costs. Informed property owners are instituting water submetering at both new and existing properties. The installation of a water submetering system (or designing to allow for one to be easily installed in the future) can increase the value of a property by greatly reducing one of the largest variable costs for the multi-family property owner. The use of wireless technology makes this economically feasible. TapWatch by Inovonics is the most widely used wireless system in the multi-family market and is already installed in over 1.3 million apartment units worldwide.

Why submeter?

The primary financial justification for submetering is the elimination of a large variable expense for the property owner. Having the residents pay for their own utility usage by instituting submetering allows property owners to have better control of their expenses and thus provide more competitive rent rates. A submetering system increases the value of the property. In areas of the country where water and sewage utilities are more expensive, it is even easier to justify submetering.

Residents favor submetering over having the water expense hidden in their rent or using an allocation system. Billing residents for their actual utility usage puts them in a position to control their expenses. Environmental benefits from submetering are also important. The typical 20% to 40% decrease in water usage, documented by multiple studies, at multi-family properties reduces the need for additional water treatment plants and helps reduce the need to implement mandatory water restrictions during drought conditions.

Why design for submetering when it is not required at the time of construction?

Building design requirements that allow submetering are simple. More importantly, they can be added more easily during the construction phase than during retrofitting later. Simple items like providing un-switched power to the attic of each building and installing individual water feed lines to each unit make it easy to add a submetering system in the future.

More and more property owners are implementing submetering programs. Property owners value submetering equipment or the ability to easily install it later. A little time invested in submetering planning during the design phase is worth a significant amount of cost savings.

What is the future of RUBS?

RUBS (Ratio Utility Billing Systems) is the process of allocating water usage to each resident based on a formula that can include factors such as the number of occupants in an apartment, the apartment square footage, and the number of water-using devices. Since there is no water meter installed in each apartment, common problems are resident resistance and complaints. When water bills are not based on actual usage a resident who travels frequently pays the same as one who may use twice as much water. Many experts believe, and studies have shown, that RUBS does not encourage as much water conservation as submetering, especially over the long term.

What about the legality of submetering?

At this time, submetering appears to be legal in all fifty states. In a few areas (some cities and water districts), specific legal requirements may exist when doing submetering. In certain parts of the United States, specific legal requirements exist pertaining to the meter components that come in contact with the water, and to water testing. Areas of the country where submetering is being implemented at very high rates include: Arizona, California, Florida, Georgia, North Carolina, South Carolina, Texas, and Washington.

How do I get more information?

You can visit the Inovonics website at www.inovonics.com/submetering.aspx for a list of our submetering distributors. These companies are commonly called Read, Bill, and Collect companies (RBC's) as they provide turn-key meter installation, reading and billing services, payment collections, and distribution of the collected funds to the property owner.

You are also welcome to contact me at 800.782.2709

I thank you for your time.

Best regards,
Michael May
Senior product manager
Inovonics Wireless Corporation

1.0 Architects and engineers specifications for accommodating submetering in design

Introduction:

This section describes the physical requirements needed to reduce the cost of installing the Inovonics TapWatch submetering system into a multi-family apartment site at the time of construction. TapWatch is a wireless, fixed-network submetering system that automatically collects and stores meter readings. TapWatch can easily be installed during the construction phase of a multi-family complex, or at any point after construction if a few items are included in the design of the property.

Apartment building requirements

An electrical power source of 120 VAC, unswitched, should be made available at each apartment building.

Justification

To accommodate the installation of a wireless radio frequency (RF) signal repeater, which increases the range of RF transmissions between the transmitters and the receiver, electrical power is needed. The (house) power is not only for the initial installation of the submetering equipment, but also to support future site expansion and changes in the environment that can effect RF communication (maturing trees, building changes, etc.). The power is needed continuously so it must be unswitched (not connected to a photo voltaic eye or timer).

Other services that utilize RF technology, such as wireless internet connections, may also need to have a power source at each building (i.e. in the attic). The installation of power outlets at the time of construction will simplify the installation of equipment in the attic, whether it be used immediately or at a later date.

Individual apartment unit requirements

The plumbing in each building should have only one water feed into each apartment unit. The exterior water tap (for use on common grounds or sprinkler system) should come from the building/house water supply.

A water valve should be installed on the water feed pipe into each apartment. This valve must be installed in a location accessible to the resident of the apartment so they can turn the water off in an emergency or for maintenance purposes. The type of valve will be specified by the architects and engineers.

A horizontal, straight section of pipe should be placed after the valve to permit the installation of a water meter. The length of this section will be determined by the architects and engineers.

The water meter should be installed after the valve to ensure it will measure the total water consumption of the individual apartment unit. The meter must provide a pulse output proportional to the flow rate, be compatible with the RF transmitter, and be approved by the manufacturer of the RF transmitter (see list of compatible meters at www.inovonics.com/submetering.aspx). The RF Transmitter will be attached to the meter. The brand and model of the meter will be determined by the building developers.

If a submetering system is not being installed during construction, a water valve should be installed on the feed water to each apartment with a spacer after the valve. The spacer should be the same length and thread type as the specified meter so that the meter can be easily installed at any future time without the need of a plumber.

Justification

One water feed:

In order to implement submetering economically, only one water feed should be provided for each apartment unit. The plumbing in the building should reflect this. There should be no piping to exterior faucets or sprinkler systems in common areas. This allows the total water consumption of that unit to be measured by one water meter.

If more than one water feed is required, the following two options are available. The options are as follows:

1. If there is a centralized boiler for the apartment complex or building, it is possible to calculate the total water usage of the unit by doing a cold water ratio. This involves measuring the total flow from the boiler and then allocating it to each unit based on their cold water consumption. The total cold water consumption is measured through a cold water meter attached to the unit. Therefore, there should be a common point of cold water entry for each unit.
2. If there is one water heater and multiple cold water inputs for the unit, it is possible to calculate the total water usage by calculating a hot water ratio. This involves measuring the total flow to the building or site, then allocating it based on the hot water consumption of each unit. The total hot water consumption of the unit is calculated by measuring the hot water output to the unit from the water heater or from the heaters cold water input.

Note: Consultation with the property owner and the future submetering billing company regarding this issue and the legality of alternative options will be required.

Water valve and meter installation:

Installing a valve on the water pipe before each water meter is good practice. This allows the water to the entire unit to be shut off by the resident, plumber, or maintenance person, in order to change out the meter, or to allow installation of a meter at a later time. The valve needs to be installed in an easy-to-access area in order to provide individual units with the ability to turn off the water without disturbing other apartments. If submetering equipment is not installed during construction, the inclusion of a valve and spacer on the water feed to each apartment reduces the cost and simplifies the installation of a water meter at a later time.

In order to measure the total water usage in a given apartment, the water meter should be installed on the water feed to that apartment. The meter manufacturer will provide details regarding the length, location, and orientation of a straight section of pipe needed to install the meter. The meter needs to be accessible to a plumber for the initial installation and for meter replacement in the future. The meter can be installed or replaced without disruption to other residents if it is installed after the valve.

Type of water meter:

In order for the RF transmitter to operate with the meter, the meter must provide a pulse output proportional to the flow rate. Since various pulse output meters have different pulse output characteristics (rate, voltage, duration, reed switch, etc.), the meter must be selected from the list of meters that have been tested and proven compatible with the TapWatch submetering system. See www.inovonics.com/submetering.aspx for more information and the list of compatible meters.

Note: In certain parts of the United States, specific legal requirements exist regarding the water meter and other parts that come in contact with the water. The American Water Works Association (AWWA), National Apartment Association (NAA), submetering companies (RBCs), or local plumbers may be of assistance regarding this matter.

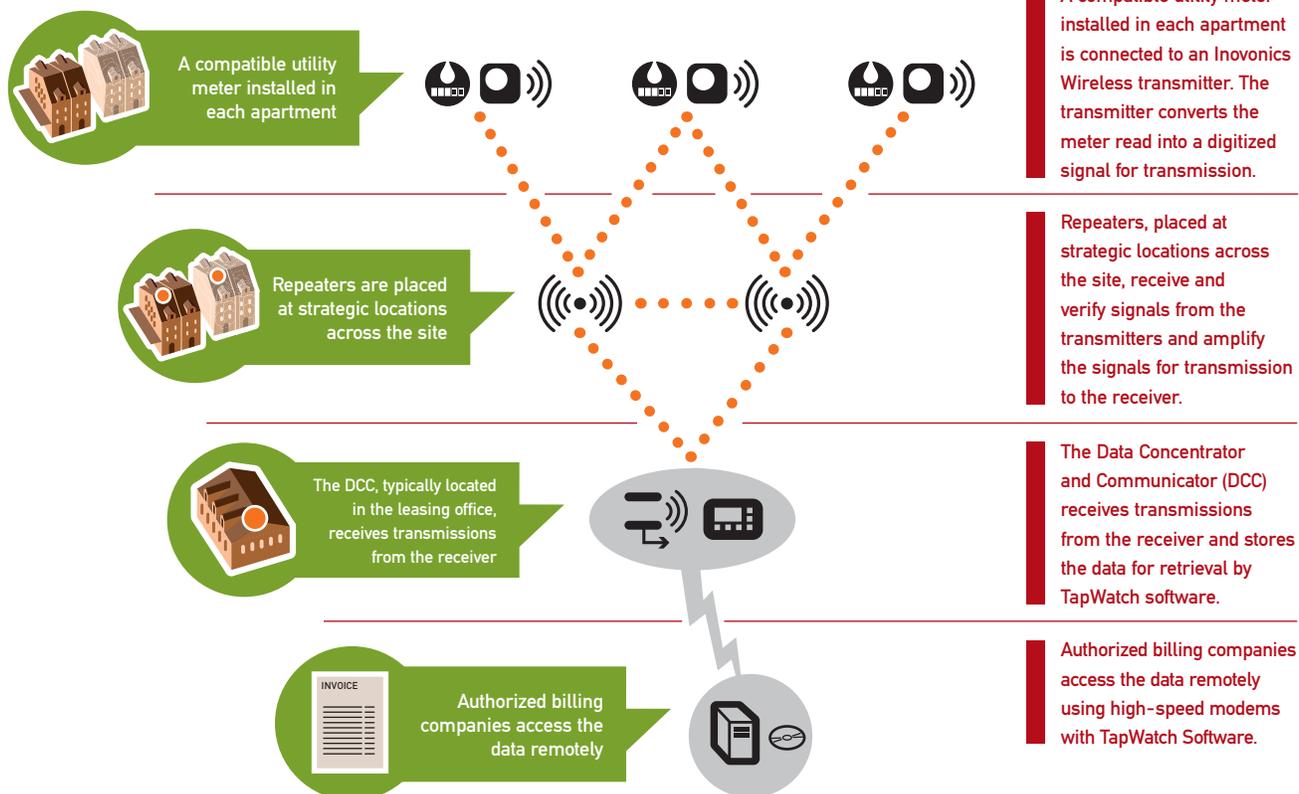
Club house or central office requirements

An electrical power source of 120 VAC of continuous power and a dedicated telephone connection must be provided at a location designated by the property owner.

Justification

The site data collector, an 11"x8.5"x2.0" wall-mount unit, is installed typically at the club house or the property manager's office. The data collector requires 120 VAC power and a telephone line to allow the submetering company to retrieve the stored meter data. The data collector should be located in an area where a service technician can access the equipment periodically for on-site maintenance.

How TapWatch works



2.0 Sample architects and engineers specifications for a wireless submetering system

Introduction:

This specification describes the functional and operational requirements needed for a wireless, fixed-network system required for submetering. The following are expected once the submetering system is installed:

- Wireless communication will occur between each transmitter connected to the meter and the site data collector.
- Daily meter readings can be sent from the meters at individual apartment units with the use of the wireless submetering system. In addition, this information can be retrieved remotely via telephone line as needed for billing and maintenance.
- The wireless submetering equipment is available from, and can be supported and used by multiple Read, Bill, and Collect companies.

Wireless submetering system description

The transmitters must communicate meter reading and transmitter status information between meters equipped with transmitters and the data collection device without the need to gain physical access to the individual apartment units. The system must utilize wireless communications technology (i.e. radio frequency-based).

The wireless submetering system must use fully supervised, wireless equipment operating in the 902 to 928MHz frequency band. In order to provide maximum reliability and interference immunity, all wireless transmitters should use a frequency hopping spread spectrum technique that sends redundant messages across a bandwidth that is at least 20MHz wide.

The RF transmitters must be certified by the Federal Communications Commission (FCC). Transmitters must meet the FCC established technical standards and allow the submetering system to operate throughout the United States without the user, supplier, or operator obtaining any type of license.

The major components of the wireless submetering system are the RF transmitters, RF repeaters, RF receiver, data collection device, and meter reading software.

A Windows® based software application should be used by the billing company to obtain meter readings.

Wireless radio frequency (RF) transmitter requirements

Physical requirements:

- When installed, the RF transmitter must not prevent the visual reading of the meter register.
- The RF transmitter must be no larger than 3.6"x1.8"x1.0", in order to remain unobtrusive when installed.
- The RF transmitter must operate continuously within an operating temperature range of -20° to 140°F.

Installation:

- Installation must be possible on qualified, existing, or new meters equipped with a pulse output. These meters may be either gas, electric, or water.
- The transmitter must be mounted on the meter or on a wall. If installed on a wall, it should be mounted within 15 feet of the meter for indoor applications.
- The transmitter should be installed by qualified personnel or subcontractors using standard tools and following industry standard practices.

Power source:

The transmitter must be powered by either

- A 3.0 Volt 2/3 A-size Lithium battery that is replaceable from the field, and has an average battery life of at least eight years, or
- A 3.0 Volt Lithium cylindrical battery that has a warranted battery life of ten years and a calculated life of twenty years.

Case open signal

- An RF message should be sent when the RF transmitter case is opened.
- The RF transmitter must send a case-open indicator with each transmission if the case remains open.

RF transmitter identification

- The RF transmitter must have a unique, permanent ID number, which is programmed in by the manufacturer.
- The RF transmitter ID number must be sent each time a transmission is made.
- The RF transmitter must have a label clearly stating all regulatory certifications.

RF transmission requirements:

- Readings from the meter should be able to transmit approximately once per hour.
- The RF transmitter must have an operating frequency between 902-928MHz, use spread spectrum via frequency hopping modulation, and be certified under FCC Part 15 rules.
- The meter reading and transmitter status information should be sent to a data collection device.
- The RF transmitter should have an open field transmission range of one half mile, minimum.

Functional requirements:

- The RF transmitter must be compatible with at least six major submetering water meters, supplied by various manufacturers.
- The RF transmitters available must support meters with a pulse output.

RF repeater requirements

To accommodate multi-family sites, commercial facilities, or to support future site expansion, an RF signal repeater product must be available. The RF signal repeater will increase the range of the RF transmissions between the transmitters and the receiver.

- The repeater should periodically transmit check-in signals to monitor the integrity of the wireless links to compatible receivers.
- The repeater must be capable of using a 120 VAC power source.
- The repeater must provide an open field transmit range of 4 miles minimum.
- The repeater should be available in an outdoor enclosure no larger than 7.0"x7.0"x3.0".
- The repeater must operate in an ambient temperature range of -20°F to 145°F.

RF receiver requirements

The wireless equipment should include an RF receiver that interfaces with the data collector device.

- The receiver requires 11-14 VAC power and 80 mA available from the data collector.
- The receiver must operate in an ambient temperature range of -20°F to 140°F.
- The receiver must have an enclosure no larger than 6.5"x3.5"x1.0".
- The receiver must use two antennas to maximize signal reception.

Data collection device requirements

The wireless submetering system will have a data collector and concentrator at the site which collects the messages from the RF receiver and stores them. The data collector will interface with the software in a remote computer via telephone modem connection or direct serial cable connection. Note that personal computers are not recommended due to the possibility of tampering.

- The data collection device must be capable of using a 14 VAC power source.
- The data collection device must operate in an ambient temperature range of 32°F to 140°F.
- The enclosure must be no larger than 11"x8.5"x2.0" to prevent obstruction when installed.
- The data collection device must be wall mountable.
- The software must be able to communicate with the data collection device via telephone modem or direct computer connection.
- The data collection device must be able to store 90 days worth of data for up to 2000 meters (gas, electric, and/or water).

Software requirements

The software will provide the means for the initial programming of the data collection device and for registering RF transmitters and repeaters in the system.

- A Windows based (98, 2000, Me, NT, or XP) software application must be available for the RBC company to obtain meter readings from the data collection device.
- Each RF transmitter must have the ability to have a unique user-defined meter ID in the software.
- Programming should be set up so the consumption reading on the meter register matches the reading in the software.
- Password protection should be provided to restrict unauthorized access to the site data collection device. The software should be offered in different versions for the RBC billing center, RBC corporate, and service technicians of the RBC.
- The software should record general site information, comments (i.e. log exceptions, list meters and buildings, register meters and repeaters, provide data backup, and create comma delimited data files), and provide an integrated communication protocol to communicate with the data collection device.

Quality assurance requirements

To ensure consistent product quality, the wireless equipment manufacturer should have an active ISO9001 certification.

Product support requirements

To ensure after-sale support of the product, the wireless equipment manufacturer should have telephone technical support eleven hours per business day in the U.S. The technical staff should have at least six full-time employees for support.

Warranty requirements

The wireless submetering system manufacturers should warranty the RF transmitter, receiver, and repeater for a period of three years from the date of shipment., and data collection device for a period of fourteen months from the date of shipment.



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