

RFID for Precast Concrete Manufacturers

Precast concrete companies are now using passive UHF RFID tags to create an electronic quality-control trail and better manage their inventory.



A powerful wireless solution for tracking concrete structures

- Know where each item in your inventory is located without spending hours in the yard.
- Know if an item is ready to ship or waiting for more work before you put it on the truck.
- Extend this item level tracking out to your customer's job site for superior customer service.

Precast manufacturers make concrete structures for bridges, roadways, manholes, sewer and water pipes, stairways burial vaults, and various architectural precast pieces for buildings and parking garage flooring and haul the finished pieces to the construction sites. Quality control is typically accomplished by visually inspecting an item as it is being made.



In the USA, if the inspections are recorded, either electronically or on paper, that data record qualifies a company for NPCA certification. The rugged and demanding environment of concrete precasting means that bar coding identification is not feasible due to the high incidence of tag damage as well as the requirement for line of sight for reading the tag. Increasingly, projects require precast vendors to have such a certification.



Canada has a similar certification program(CPCI) which is designed to be harmonized with the US standards. CPCI Certification has reintroduced common, measurable, nationwide standards for precast certification with no increased cost to customers. In accordance with the requirements of the National Building Code of Canada, CPCI Certification is aimed to make certification designation a recognized requirement for all project specifications and for all precast operations. It does have a mandated number of audits annually. Therefore compliance is made much more efficiently by automating some of the data collection and record keeping with RFID technology.



Many different pipes are made, different specs and sizes-but can look similar-a potential problem area on a construction site even though a serial number is stamped or painted on the end ring of every pipe. Architectural precast pieces are typically large but each has its own 'building mark' or position for installation on a building. Hence, each piece is unique. This creates situations where much time can be wasted in searching the large yards, typical of precasters, for the correct piece to ship.

These issues create opportunities for RFID to automate the process and create savings in two key areas:

- **Quality Control**
- **Yard and Inventory Management**

QUALITY CONTROL

Several US firms are currently using the system to gain National Precast Concrete Association (NPCA) certification allowing it to be a supplier to projects that require such certification from precast concrete manufacturers. Although certification can be accomplished with a pen and paper trail, an electronic system makes record keeping more accurate and easier to manage. The system allows their quality-control officers to read passive UHF RFID tags on the concrete products as well as on the steel forms in which they are molded, creating an electronic data file that chronicles when the product was made, when it was inspected and by whom. RFID tags are read and corresponding data captured at each definable stage of production. With RFID-enabled employee ID badges, accountability and 'personal sign-off' can be integrated into each stage of the process as well.

Current users report a significant drop in labour hours spent keeping records for quality control.

The Batch Number can also be tracked and correlated to Product and thereby provides complete materials traceability or 'pedigree' for every product.

With the RFID system, when a concrete structure is first ordered, precast manufacturers input data about the order. The structures are cast in a steel mold or "form." The forms are tagged with a rugged encapsulated RFID tag, containing an EPC Gen 2 inlay encoded with a unique ID number linked to data about the form in the back-end system, and a matching bar-code on the front of the tag.

Typically, before casting the concrete, quality-control officers inspect the steel form and use a Motorola MC9090-G handheld mobile computer with a built-in RFID interrogator to read the form's tag, indicating identity detail, when it was inspected and by whom. That data is usually sent via the customer's wireless Wi-Fi network to their back-end enterprise or inventory management system. If WIFI is not available at that time, the mobile handheld stores the read data and updates the database the next time the network is available. This is a key value point for large yards typical of precasters..



Motorola 9090G RFID Handheld

During the casting process, quality-control officers inspect the products as well as read the RFID tag, linking it to its steel form, and respond to prompts on the handheld device as to what kind of structure is being manufactured. Whether drycast or wetcast, by the time a concrete structure is separated from its form, the RFID tags on both the structure and the form have been read two or three times. Typically, the company also puts the product through some finishing process. The structure is then moved by forklift or overhead jib crane to a storage yard.

YARD and INVENTORY MANAGEMENT

Revolutionize your concrete yard management with RFID and GPS

In addition to using the RFID for quality control, 'Precasters' will also use it for inventory control and yard management, assisting the companies in locating items in their large acreage yards, where they are stored prior to being transported by truck to a customer. Subsequently, in most operations, these large concrete structures can also be moved by overhead jib crane or industrial fork lift truck within the yard for reorganization and space optimization. Reliably knowing exactly where an inventory item is saves considerable 'walk-about' time as well as improving time to delivery and eliminating a costly 'remake'.



Certain companies have expressed the concern regarding reliance on a worker to always manually use the RFID Handheld to read the tag when placed in the yard and every time it is moved within the yard. To automate this manual process, a specialized System Integrator such as FALKEN Secure Networks(FSN) can also equip the forklift trucks with RFID interrogators to capture the ID number on the tag as soon as the vehicle comes close to the structure. The forklift's interrogator would continue to read the tag until the structure has been placed in storage. Then, a GPS function in the reader would determine the zone in which the structure has been placed and send that information to the back-end system when the forklift reader stops receiving transmission from the tag. FSN also can integrate GPS capability into the mobile handheld as an alternative. GPS Coordinates captured on mobile computer are then stored with the inventory record. When the item is delivered to a customer, the truck driver can use the MC9090-G's RFID interrogator or bar-code scanner to capture the structure's tag ID number, thereby providing proof of delivery.

Once a company is equipped with forklift readers, the system will display data about the location of each piece based on where it was unloaded by a forklift. In addition, an employee can walk through the yard with a handheld reader on a quarterly basis to confirm or audit the database and location of concrete pieces to eliminate any record discrepancies.

Omnitrol 'All-In-One' Network Server Appliance

A next generation network server appliance encapsulating all RFID processing, middleware and management



RFID Tags may be surface-mounted with an aggressive adhesive, mechanically affixed with screws or rivets, or 'hang-tag' or imbedded and flush-mounted in the final product

TAG SELECTION-Harsh Environment

FALKEN Secure Networks, as a leading RFID System Integrator, takes extra care to understand the precise customer operational environment and RF physics and selects the tag best matched among the myriad of tag choices currently available. This is a complex process of optimizing the readability and performance between readers and tags. There is no 'one solution fits all' for the precast industry and every customer has unique issues and variables to understand and satisfy.

However, some specifications are common. Among them, we recommend:

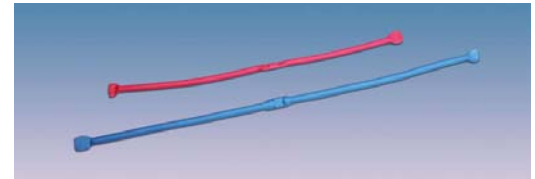
- Incorporate the latest generation RFID Passive UHF Gen2 902-928 MHz, Inlay technology for optimum read performance(eg. such as Alien Higgs 3 or Raflatac Monza)
- Fully encapsulated RFID inlay for harsh environments
- Impact resistant
- Dustproof & Waterproof at least at a certified IP66 or IP67 level
- Operating temperature range of -20C-85C
- Read Range, several feet through 6-10 inches of concrete(needs testing for wetcast and drycast) for the mobile handheld and 10-15

feet for fixed readers or mobile readers mounted on fork lifts or cranes.

- Optional: A Re-Usable Tag which is removed at the point of shipment can substantially improve the economics of RFID implementation.
- Future: Ideally, the RFID tag will contain some 'writeable' memory in addition to simply its EPC id number. The reason for this is that customers in the construction industry or building or bridge owners may wish to be able to read the product history which otherwise is only contained in the precasters database. Ultimately, we see value being created by a readable tag with its complete product description and history being extended through the supply chain.



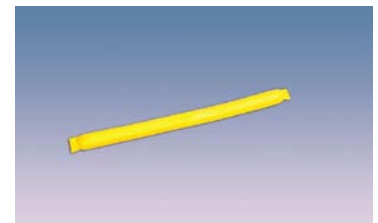
Low Profile, Metal Mount, Impact Resistant Tag



Imbeddable Tag



Imbeddable, Re-Usable Tag



Shrink-Wrap, Metal Mount, Imbeddable Tag



Encapsulated, Metal Mount, Tag

ADDITIONAL RFID VALUE EXTENDS TO CUSTOMERS

Precast product with imbedded RFID can add value for end customers and, for the precaster, serve as a competitive differentiator in a very competitive industry. Equipped with a similar RFID system, the end customer at a construction site can read the imbedded tag at any time and instantly identify the supplier, cost, date and technical data of that precast product. While a visible, surface-mounted approach has instant tag location advantages, certain RFID tags can also be read through 8-12 inches of concrete, making it possible for someone to use an RFID reader to capture the identity of a specific piece within an assembled bridge or other structure. The system also allows manufacturers to link data about the piece to data about the concrete batch that it was built from.

After construction, and throughout the precast product's life, the RFID tag continues to provide benefits in terms of its identity, source, scheduled maintenance or replacement dates, and automated asset tracking. So-called 'Smart Buildings' or 'Smart Infrastructures' will significantly benefit from imbedded RFID. Since the Passive RFID tag contains no battery, there is no battery replacement maintenance issue and its operating life can be indefinite.

The \$998 million, 2.2 million-sq.-ft. open air Meadowlands Stadium in New Jersey is a massive project that will make the new venue — built to house both the New York Giants and the New York Jets National Football League teams — one of the three largest NFL stadiums. Using a tight material-tracking system comprising radio frequency identification (RFID) tagging and software deployed via tablet personal computers, lead contractor Skanska USA Building set a productivity benchmark, automatically monitoring 3,200 precast pieces for the 84,000-seat structure. As reported in RFID Journal, the contractor estimates the tracking solution will have accelerated the construction schedule by 10 days and saved about \$1 million. The precast pieces are outfitted with RFID tags or "smart" tags at High Concrete's Buena, N.J. plant, located about two hours from the Meadowlands site. The pieces are then identified through the use of an RFID reader communicating with a tablet PC that has Materials Tracking software. As the pieces move through the four phases of the production process, information is fed into Tekla Structures, a BIM solution that covers the entire structural design process from conceptual design to detailing, to fabrication and construction. Skanska is able to view the supply chain and visualize the status of each piece in the BIM system with up-to-date information from the field, including which pieces have been fabricated and their quality assurance status; job site areas that need to be prepared for arriving product; and, what product has been erected.

The Omnitrol Middleware and Application software, along with its 'all-in-one' network server appliance and RFID Tags and Readers from FSN, is an innovative and cost-effective real-time system for production and quality tracking for precast concrete elements and other building products.

Radio-frequency identification (RFID) technologies combined with multi-location networking, built-in middleware, and web services can now help manufacturers of precast components to cut costs and assure customers of the authenticity and quality of their products. The system from Omnitrol Networks and FSN is a RFID-based system for precast concrete production, inventory and yard management, asset tracking through the supply chain, quality assurance and product certification. Authorized users just need a personal user ID and password to gain access to real time data about the status of each precast element (at any stage in its manufacture), and also enable the production, inventory and quality records of each element to be traced online.

FALKEN Secure Networks(FSN)—Your partner for RFID automation

If you choose to pursue RFID implementation in your organization, here is the FALKEN Secure Networks commitment to you:

- FSN will provide solution architects to work with you to define system requirements for your particular installation. Multiple locations can be networked together for a central and real-time view and centralized management.
- FSN will do a RFID site survey to validate radio frequencies, tag types, system design and performance
- FSN will provide all necessary hardware and software to make the system work for you
- FSN will integrate the system with your existing enterprise management software
- FSN will provide documentation for the system, including operating procedures
- FSN will train your people, provide warranty and continued system support

FALKEN Secure Networks (FSN) brings together industry-leading technologies to give you control over your finished goods inventory and delivery to customer site and make your operation run more efficiently.

Contact Us FALKEN Secure Networks is a specialized System Integrator, RFID Solution Architect, and Value-Added Reseller with focused expertise in the RFID site survey, cost-effective design, and turn-key project implementation.

Contact FSN at sales@falkensecurenetworks.com



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Authorized Value-Added Reseller



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Authorized Value-Added Reseller



Omni-ID™

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Authorized Mikoh Partner



Authorized FileTrail Partner



Authorized ERT Partner



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