



Marking Services Incorporated®

Best Practices for Labeling Services in Advanced Project Delivery

Why Consider Labeling in FEL?

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Executive Summary

Across industries delivering capital projects with increasing complexity and time pressure, project teams are seeking solutions that reduce risk, rework, and delays. One of the most overlooked opportunities for lifecycle value creation is the strategic integration of industrial labeling and asset identification from the earliest phases of project planning. This white paper explores how Marking Services, Inc. (MSI) provides comprehensive, standardized, and QR Enabled Smart labeling solutions that align with Advanced Work Packaging (AWP) principles to enhance safety and support execution predictability, regulatory compliance, and digital integration.

From Pre-FEED to Operations & Maintenance (O&M), MSI supports project teams with accurate estimating, specification development, field engineering, material takeoffs, material supply, turnkey installation, and technology-enabled asset management. Integrating labeling during early scope definition, rather than late in construction, improves asset traceability, streamlines commissioning, and ensures a digital-ready facility. The result is reduced rework, increased turnover clarity, and optimized long-term plant management.

By embedding QR-enabled labels into the digital thread—the continuous flow of data across the asset lifecycle—MSI enables seamless connectivity between physical assets and their digital representations. This supports real-time data access, enhances decision-making, and ensures traceability from design through operations. Furthermore, these solutions empower the connected worker by providing mobile access to asset information, work instructions, and maintenance history directly from the field, and allow for real-time reporting. This reduces downtime, improves safety, and enhances productivity by bridging the gap between engineering data and frontline execution.

“When labeling is left until the end, it’s already too late. An engineered labeling program is a critical component of AWP and APD, driving the accuracy and efficiency of your project’s digital workflows.”



Introduction

Marking Services, Inc (MSI) is a labeling manufacturer and contractor specializing in engineering, manufacturing, and installation services for pipe labels, equipment & valve tags, wayfinding & safety signs, electrical, and other asset labeling. Physical tags and labels are crucial for maintaining safety, compliance, and operational readiness. They ensure clear hazard communication, allowing workers to easily identify hazardous chemicals, high-pressure lines, and other risks, which helps prevent accidents. During emergencies, visible and accurate labels on exits, safety equipment, and shutoffs enable quick responses, minimizing the time spent locating controls and moving to safety. MSI's labeling also supports safe maintenance and operational procedures by reducing human error during tasks like lockout/tagout (LOTO) and ensuring that standard operating procedures (SOPs) are followed.

Simply put: effective labeling saves lives. We all know this impact of labels on safety; but early involvement with an expert labeling partner can also provide many more benefits for the efficient construction, commissioning, operations, and maintenance of a facility.

The construction industry is experiencing increasing pressure to accelerate project delivery while maintaining compliance, safety, and digital readiness. Yet many projects still approach labeling as an afterthought, often introducing it during late construction or turnover phases. This reactive approach leads to data inconsistencies, installation errors, schedule impacts, and incomplete digital handovers.

The purpose of this white paper is to provide a lifecycle-based framework for labeling that proactively supports Advanced Work Packaging (AWP), system turnover, and long-term operations. It demonstrates how MSI's labeling and asset management services offer practical, scalable, and value-adding solutions to project stakeholders.

The primary audience includes Owners, Engineering Procurement and Construction (EPC) firms, General Contractors, and Subcontractors who are involved in planning, executing, and operating complex capital projects. This document outlines how labeling should be scoped, designed, and implemented across each phase of the project lifecycle.

**A well-defined
labeling
program
supports every
phase of a
capital project
from Pre-FEED
through to
Operations.**



Problem Statement: The Industry Situation

Across capital projects, labeling is often considered a procurement or construction detail, not an engineered element of the facility. This approach causes costly misalignments between design, procurement, and construction. Without early scope definition, the field is left with inconsistent labeling, non-compliant signage, and missing identifiers during critical phases like commissioning.

The urgency to address this challenge is increasing due to rising regulatory scrutiny, accelerated turnover targets, and the growing adoption of digital twins and data-centric execution models. Failure to embed labeling early in the lifecycle contributes to avoidable safety risks, compliance failures, delays in Mechanical Completion (MC), and diminished digital readiness.

Solution Overview

MSI proposes a proactive, lifecycle-driven solution that integrates standardized labeling and asset identification into the core execution model of AWP. The approach aligns engineered tagging, QR-code tracking, and asset documentation with Construction Work Packages (CWPs), Installation Work Packages (IWPs), and system turnover requirements.

Key elements include the deployment of trained personnel for early engineering takeoffs and field surveys, specification development for regulatory compliance, and QR-code-enabled labeling for real-time progress tracking. MSI also provides installation services and asset management integration tailored to each phase of project execution. By embedding these services into the project lifecycle—from Front End Loading (FEL) to Ready for Startup (RFSU) and beyond—teams gain traceability, compliance, and operational efficiency.

**Serious injuries and damage can
occur without proper labeling.**



Methodology

MSI applies a structured methodology that integrates directly into the Advanced Work Packaging lifecycle. The process begins in the FEL phases, where engineering teams and MSI personnel collaborate on asset identification plans and labeling specifications. MSI conducts in-house engineering to update and augment the bill of materials based on as-built conditions of initial engineering documents (e.g., P&IDs, one-lines, models, cable schedules). The team then develops a labeling strategy tailored to the regulatory and operational standards of the facility.

Once the project progresses to detailed engineering and procurement, MSI supports document controls by embedding labeling references into IFC documents and construction packages. QR codes are assigned and embedded into tags for all tracked assets, linking each to digital records. These codes are scannable with mobile tools for construction status updates, punch list resolution, and eventual handover.

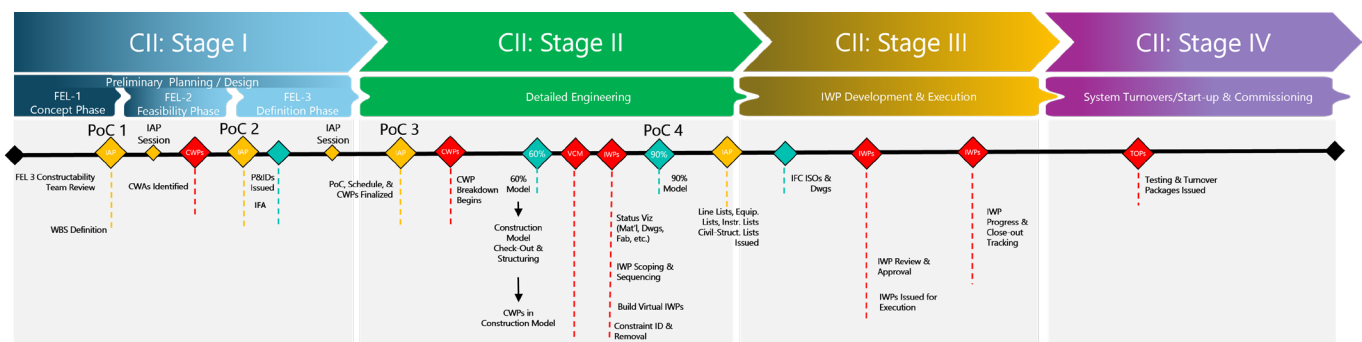
During construction, MSI's field engineers conduct boots to steel as-built verification, material manufacturing, and installation services according to standardized labeling specifications. QA/QC tools are deployed to validate tag placements via MSI's specialized field asset verification process, while establishing an effective road map for accurate / efficient installation of tagging systems and alignment with design intent. Tags are tracked through system turnovers and verified using QR-coded forms.

The methodology is industry-agnostic and has been successfully applied to:

Data Centers For a hyperscale data center in North America, MSI implemented early QR-based labeling of electrical panels to support commissioning and OSHA compliance for temporary power. This digital process enabled the field team to provide office personnel with real-time updates.

Pharmaceutical Facilities At an active manufacturing plant, MSI collaborated with the owner to ensure labeling met FDA and GMP standards. QR-tagging of mechanical assets allowed for real-time validation during normal operations, supporting regulatory audits.

Oil & Gas Installations - Onshore MSI provided consulting and turnkey labeling services to assist a large onshore Oil Producer with their digital transformation needs. The key objectives for the project included: implementation of smart device technology for field operations (connecting asset information to field workers via intrinsically safe smart devices); enhancing asset tracking, inventory and maintenance management; & improved safety performance by providing critical asset information during maintenance procedures and daily field operations.





MSI collaborated with Operations and Commissioning to engineer, design and implement versatile and robust QR Coded tags that were used to provide a gateway for field operations to access critical asset information, improve the quality of maintenance activities (outline maintenance procedures and checklists), save cost and establish a platform for the clients digital asset management needs.

Chemical Processing Facilities MSI was engaged by a global chemical processing company to engineer, manufacture and install dynamic QR Coded equipment tags with the objective to enhance maintenance activities, connect field personnel with asset information, and capture real time information inside their asset management system. MSI's QR Coded equipment tags enabled operations to: improve asset traceability; safeguard regulatory compliance; enhance safety; streamline maintenance procedures/reduce maintenance costs; save time completing maintenance tasks; & implement digital integration strategies.

Food and Beverage Plants MSI worked with a beverage manufacturer to relabel and document existing and new lines during a major retrofit. Labeling was executed in phases to allow continuous operations while improving traceability for critical systems.

Semiconductor Facilities In a high-purity piping facility, MSI performed labeling takeoffs for Utility Systems and deployed advanced engineering services for Gas, Chemical, & Waste Process systems such as P&ID line tracing & red-lining. MSI also assisted to develop custom barcode & UHF RFID Equipment Asset tags to interface with Asset Management Systems, which streamlined startup by connecting new equipment to facility Asset & Process Management Systems Networks.

Hospitals In a new hospital tower, MSI's labeling ensured compliance with NFPA standards and helped document MEP systems for long-term operations. QR tagging simplified facility onboarding, and supported the facility JCAHO audits.

Power Generation Projects A large EPC has partnered with MSI for over 20 years to implement a standardized labeling and asset management program that enhances safety, compliance, and maintenance efficiency across its facilities. MSI provides durable pipe markers, valve tags, and equipment labels, all engineered to withstand harsh environments. A key innovation in the program is the integration of QR codes on labels, which allows personnel to quickly access real-time data, documentation, and asset history via mobile devices. This QR code-enabled system streamlines inspections, improves traceability, and supports data-driven decision-making, advancing the large EPC's goals for operational excellence.

Manufacturing Facilities MSI supported a multi-line automotive supplier by standardizing labeling across mechanical systems and supplying QR coded labels to support the general contractor's commissioning platform. This methodology ensures traceability and performance across multiple facility types and aligns labeling practices with advanced construction and commissioning strategies.

Offsite Manufacturing/Fab Shops MSI has extensive experience supporting modular assembly facilities and fabrication shops with their labeling needs. MSI's ability to support work scope in these settings facilitates consistency in labeling materials / nomenclature for the entire project, accuracy of material installation (verifying assets during the labeling process) and helps contractors/clients meet regulatory standards and guidelines.

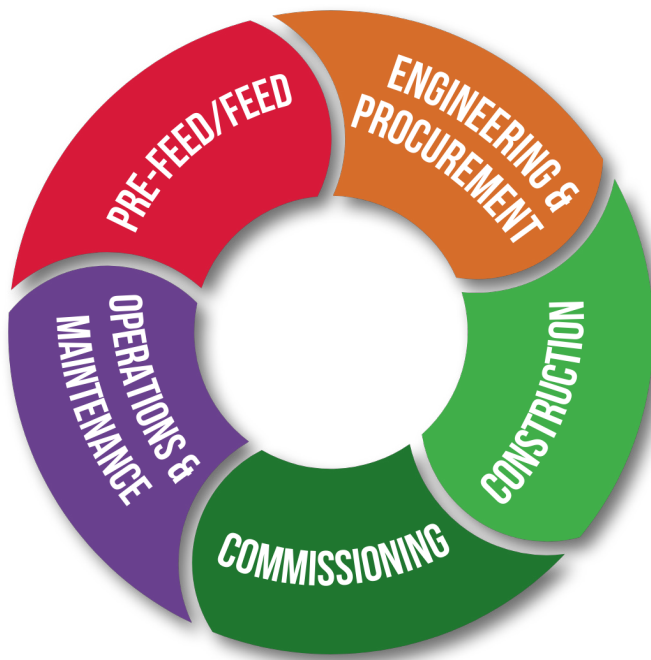
Process Safety Management (PSM) An aging oil refinery was struggling to efficiently and accurately label its process systems and communicate critical hazards to its field personnel. MSI was engaged and within 6 months was successful in upgrading the refineries Process Safety Management (PSM) labeling system and safety signage throughout the facility, while significantly improving hazard communication with field personnel, emergency responsiveness, regulatory compliance standards, maintenance / operational safety and mechanical integrity programs. The client was able to mitigate/eliminate serious safety infractions and incidents, environmental impacts, and regulatory fines, and most importantly save lives.



Call to Action

Bringing MSI into your project early isn't just a good idea; it can be the difference between hitting your startup date and scrambling after turnover. When labeling is left until the end, it's already too late. An engineered labeling program is a critical component of AWP and APD, driving the accuracy and efficiency of your project's digital workflows. As a key part of the Digital Thread, labeling supports every phase of development and construction, ensuring that information flows seamlessly from design to handover. Make it part of the plan from day one, and you'll see the results where it matters: in startup readiness.

Implementation Across the Lifecycle



MSI's lifecycle implementation is a strategic enabler for Advanced Work Packaging (AWP) and Advanced Project Delivery (APD), compliance to standards, delivering consistency from project to project, and clarity from concept through commissioning. By embedding labeling specifications, QR-coded asset identification, and field engineering services directly into the project schedule and Path of Construction, MSI ensures every phase is set up for accurate, auditable, and safe execution.

From early-stage engineering through system turnover, MSI supports proactive planning, digital traceability, and real-time readiness. Asset data is validated, installation milestones are aligned with construction work packages, and turnover documentation is streamlined to meet both regulatory and operational requirements. MSI transforms labeling into a lifecycle-integrated discipline that drives field certainty and project performance.



Pre-FEED / FEED

In early project planning, MSI supports development of a labeling philosophy aligned with the project's construction strategy. Specifications for mechanical, piping, electrical, and safety labeling are defined with regulatory compliance in mind. MSI works with Owners and EPCs to embed labeling costs and timelines into the master schedule according to the Work Breakdown Structure (WBS), enabling budgetary accuracy and early procurement planning to meet milestone billing.

Engineering & Procurement

As the design matures, MSI refines the labeling specification and integrates it into CWPs and IFC documentation. This includes identifying tagging requirements for assets listed on P&IDs, electrical schematics, and cable schedules. MSI coordinates with EPCs and Subcontractors to ensure consistent documentation and supports the introduction of QR-code-based tracking tools to align with procurement and delivery milestones.

Construction

During the construction phase, MSI mobilizes to conduct field surveys and field engineering services. In early construction, MSI supplies temporary or permanent labeling solutions such as safety/operational signage, customized barricade tape, and accident prevention tags to be used site wide. MSI activates QR code labels for working areas and installed assets, enabling field teams to track material readiness and installation progress using digital forms aligned with IWP execution and turnover planning.

Commissioning & Turnover

In this critical phase, MSI validates all labeling through field walkdowns, ensuring accuracy of label information/ location, quantity of labels, and affix strategies with respect to as-built P&IDs, project redlines, and labeling specifications. Once assets are validated, MSI will use the engineered Bill of Materials to manufacture the required labels and then proceed with its turnkey installation services to safely, accurately, and efficiently install permanent labels throughout the facility.

QR-coded assets support automated turnover documentation and punch list resolution. Engineering services include 3D laser scanning for record models, ensuring data handover integrity and system readiness for RFSU.

Operations & Maintenance

MSI offers ongoing support through Maintenance Service Agreements (MSAs), including QR code updates for modified or new assets and data mining for regulatory audits or process safety improvements. As facilities evolve, MSI supports change management with updated labeling, refreshed documentation, and 3D scanning services for asset replacements or modifications.



Key Benefits and Value Proposition

An effective lifecycle driven labeling strategy can have a major impact on construction projects and it's key stakeholders. MSI's Smart Labeling approach, structured methodology and experience as a major turnkey labeling contractor integrates seamlessly with AWP concepts and can provide construction project key stakeholders with significant benefits. These include but are not limited to the following:

Owners

For an industrial facility owner, implementing a labeling program—especially one that is standardized and well-managed—can deliver several strategic and operational benefits. Here are three key advantages:

- Enhanced Safety Compliance
- Improved Operational Efficiency
- Facilitates emergency response and maintenance procedures

EPC (Engineering, Procurement & Construction)

For an EPC (Engineering, Procurement, and Construction) firm executing a capital project, implementing a labeling program during the project lifecycle offers several strategic and operational benefits. Here are the three key advantages:

- Streamlined Commissioning and Turnover
- Improved Construction Coordination and Quality Control
- Integration with Digital Twin and Asset Management System

Construction Contractors

For a Construction Contractor working on a capital project, implementing a labeling program offers practical and strategic benefits that support project execution, safety, and coordination. Here are the three key benefits:

- Improved Field Installation Accuracy
- Enhanced Safety and Site Communication
- Efficient Coordination with Other Stakeholders

Technology Solutions Providers

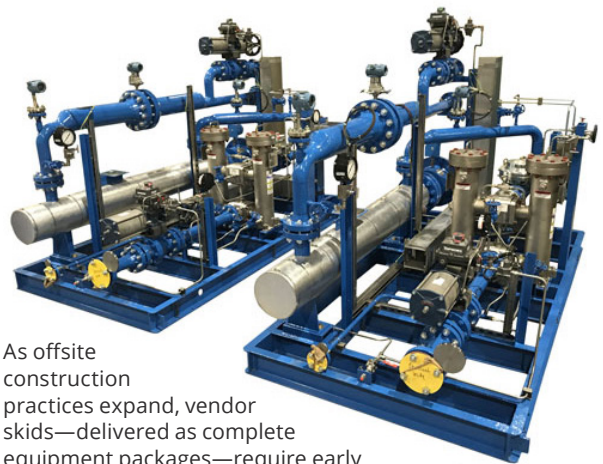
For a Construction Technology Solutions Provider, implementing a labeling program during a capital project offers distinct advantages that align with digital transformation, data integrity, and stakeholder value. Here are the three key benefits:

- Seamless Integration with Digital Tools and Platforms
- Accelerated Deployment and Adoption of Tech Solutions
- Enhanced Data Quality and Lifecycle Traceability

Vendors and Suppliers

For a Vendor and Supplier, it is essential to implement a labeling program that aligns with a project's labeling strategy and deliverables. Here are three key benefits:

- Early Alignment with the Project
- Reduced Onsite Rework and Delays
- Improved Integration with Digital Systems

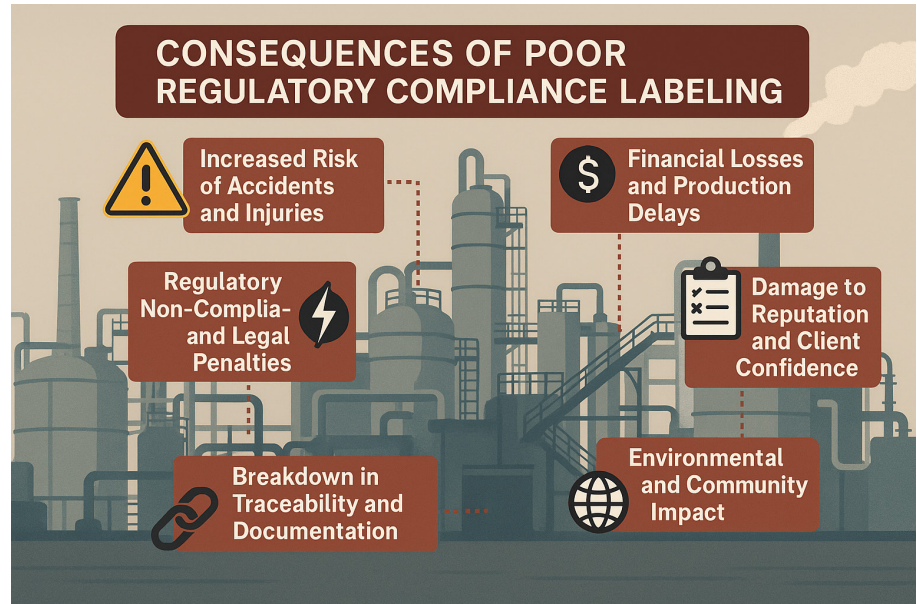


As offsite construction practices expand, vendor skids—delivered as complete equipment packages—require early integration into the project's labeling strategy. Providing vendors with standardized self-apply labels upfront ensures these units arrive marked to facility standards, enabling uniform system operation and avoiding costly post-installation updates.



Risks and Mitigation Strategies

The primary risks to implementation include cultural resistance to early labeling integration, unclear governance for labeling across project teams, and a lack of coordination between engineering and construction deliverables. MSI mitigates these risks through stakeholder training, labeling playbooks, and integration with the AWP execution model. QA/QC processes and field validation tools ensure compliance with specifications and reduce onsite surprises.



Recommendations and Next Steps

Project teams should integrate labeling into FEL deliverables and assign responsibility for labeling scopes early in the WBS development. Using MSI's lifecycle model, teams can define digital-ready labeling specifications, activate QR-coded asset tracking during construction, and validate these during turnover. MSI offers training, consulting, and turnkey support services to assist in adoption and alignment.

Conclusion

Labeling is a foundational element of successful capital project execution. When introduced early and integrated throughout the lifecycle, it enables traceability, standardization, and data clarity that benefits stakeholders from construction through operations. MSI brings nearly four decades of experience, field-proven practices, and digital tools to ensure labeling is done right, on time, and with lifecycle value in mind. For those seeking improved execution and readiness, MSI offers the roadmap and support to make labeling a core part of project delivery.

Contact MSI to begin planning your project labeling strategy.

Email: apd@markserv.com

Ask us for more information from our case studies on:

- The Impact of Your Labeling Program on Health, Safety, and Environment (HSE)
- Early Labeling for Better Supply Chain Visibility – Fabricators, Original Equipment Manufacturers (OEMs) and Mod Yards
- The Unexpected Return on Investment (ROI) of Embedding a Labeling Subject Matter Expert (SME) into the Construction Management Team (CMT) or Workface Planning (WFP) Team
- Integrated Labeling and Your Preferred Software: Enabling Digital Mobile Workflows
- Smart Labels as the Physical Entry Point to your Digital Twin



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