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IMPROVING WORK CONTROL SYSTEMS: THE CORE TEAM CONCEPT

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ABSTRACT

The improved work control system at the Idaho Chemical Processing Plant minimizes review and approval time, maximizes field work time, and maintains full compliance with applicable requirements. The core team method gives ownership and accountability to knowledgeable individuals, and the teams use sophisticated scheduling techniques to improve information sharing and cost control and to establish accurate roll-up master schedules.

INTRODUCTION

Over the years, organizations become comfortable with the day-to-day routine of doing similar tasks. Personnel feel knowledgeable about the accepted way of doing business and tend to resist change; they may not look for improvements. Using a quality improvement process to evaluate the existing work control system, managers at the Idaho Chemical Processing Plant (ICPP) identified more efficient methods for initiating, approving, and performing work at the plant.

As the evaluators reviewed each step of the old work control system, they identified problems, established root causes, and proposed solutions. They developed a model for a new work control system, incorporating the new solutions and retaining practices recognized as good ideas. Parallel flow diagrams for the old and new work control systems were used to develop the new system and to identify the most efficient sequence of activities. Experts from each related functional area (operations, engineering, safety, etc.) reviewed the new system to verify that the changes would meet their needs.

With new procedures, work assignments, and training, ICPP management implemented the improved system, which relies on dedicated teams of discipline-specific individuals, called core teams, to provide ownership and accountability. The core team members facilitate work order processing by identifying work requirements and concurrently performing engineering, safety and environmental reviews, planning, and procurement.

BACKGROUND

The Idaho Chemical Processing Plant, currently operated by Lockheed-Martin Idaho Technologies Company (LITCO), covers 200 acres and contains 140 major facilities and support buildings. The plant is a nuclear waste management and spent reactor fuel storage operation at the Department of Energy's Idaho National Engineering Laboratory. Spent fuel is received and stored in underwater pools and dry storage canisters. Liquid waste is stored in tanks prior to being sent to a calciner, the first facility to convert radioactive liquid waste to a stable granular solid. The solid calcine is stored in stainless steel bins inside concrete vaults and monitored for continued environmental safety. All activities at the INEL are governed by Code of Federal Regulations requirements and Department of Energy orders.

THE OLD WORK CONTROL SYSTEM

Over the years, the old work control system, shown in Figure 1, had become cumbersome, although it ensured safe and quality work. Work orders were frequently held up for sequential approvals, the volume of work orders left little time to perform in-depth reviews, and the cycle time was no longer acceptable. The old system involved an elapsed time of 348 days at a cost of $58,000 for the typical work package to be processed through the system.

The evaluators identified the following specific problems in the old work control system.

1. The sequential nature of the work control process actually inhibited work flow.
2. Each discipline responsible for reviewing work orders had only one representative on the interdepartmental committee to review all work orders for the entire plant (the job

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control center committee was charged with reviewing, approving, processing, and closing out work orders).

3. Because of the large number of work orders submitted, it was impossible to give each work order an in-depth review.
4. Environmental and safety representatives were often unfamiliar with the facilities and their specific hazards and had to rely on operations personnel to assess those hazards.
5. Engineering representatives often did not understand interactive facility requirements and focused on isolated hardware fixes with poor results.
6. Some work orders involving plant configuration changes required as many as 89 signatures prior to final approval.

WORK CONTROL CORE TEAMS

In the new system, work control core teams are made up of trained and experienced employees who support a specific facility or process. The core teams are designed to ensure the availability of functional experts for developing maintenance work packages in hazardous and environmentally sensitive areas at the plant. The teams include members from appropriate professional disciplines to ensure that work is performed safely with the highest quality standards.

Customer satisfaction, employee safety, environmental protection, and equipment reliability are daily concerns for each core team. Core team responsibilities are listed below.

- assisting employees in resolving equipment and process deficiencies
- identifying methods to monitor equipment for reliability
- developing planning packages
- performing minor equipment designs
- reviewing and approving design and planning packages
- developing resource-loaded schedules
- approving outages

Core teams include the following members.

- *facility point of contact* - normally a staff manager or equivalent; represents the facility and the work efforts, performs preliminary evaluations of work requests, coordinates core team activities, leads group meetings, and interfaces with other groups
- *systems engineer* - provides engineering information, evaluations, and approvals for work orders
- *maintenance foreman* - directs the maintenance crew and provides work information to the core tea
- *scheduler* - reviews work orders for appropriate approvals; makes sure work is planned; schedules work
- *flow integrator* - obtains approvals; facilitates work order processing and performance
- *administrative assistant* - tracks work orders and updates status

Each core team also includes representatives from the following organizations to provide evaluations and approvals.

- environmental compliance
- quality assurance
- industrial safety and health
- radiological safety

Personnel assigned to core teams have sufficient experience, training, and authority to review, approve, and schedule work requests. Each team is trained and dedicated to a specific area within the plant. Since the teams are located in or near the facilities they serve, they are able to develop a sense of ownership, understand inherent facility concerns, and develop a knowledge base for sound decision-making. The members of each core team meet daily to review work requests and the status of work orders.

THE NEW WORK CONTROL PROCESS

In the new work control system, shown in Figure 2, the core teams evaluate work requests and control work orders for their areas, obtaining outside reviews as needed. Members of the core teams provide information and direction as needed to the foreman and maintenance crew to ensure that the work progresses smoothly. A master scheduler coordinates with all core team schedulers to develop

a plant schedule. The changes in the work control process are summarized below.

Work Requests

In the old work order system, any employee could initiate a work order. In the new process, any employee can request work, but each work request is screened before it becomes a work order. If the request is covered by existing work orders or if resources to do the work are not available, the request does not become a work order. Requesters submit work needs and supply the required information through the point of contact (POC) for the appropriate core team.

Purpose of the change: to change the requester's role from one of addressing a problems's resolution to one of identifying the problem and to help remove duplicated and unnecessary work orders from the system.

Revised Review Process

The core team members have ownership and accountability for reviews related to their facility, comments, and resolution. Design verification (independent review) is required only if the work order changes the design criteria. Work order reviewers now are knowledgeable about the facility; rework and delays caused by missing information have been reduced, redundant and irrelevant review efforts have been eliminated, and the number of people performing reviews has been reduced.

Purpose of the change: to provide effective and timely reviews for processing work orders.

Procedure Modifications

Because activities at DOE facilities are directed by controlled procedures, the implementation team identified company, department, and facility procedures affected by the work control changes. Special draft procedures were developed for the pilot program. The first core team used the procedures to validate the new work order process; plant personnel not involved with the pilot continued to use the existing procedures. Modifications made during the pilot were incorporated when revised procedures were issued to implement the new process.

Purpose of the change: to modify procedures affected by the new work order process in order to provide accurate directions and to maintain compliance with DOE orders and other requirements.

Decision Checklists

Each department involved in the work order review and approval process provided a checklist to identify requirements for its organization. The checklists were used to standardize the core team reviews and to establish criteria for approving work orders. ICPP management plans to incorporate decision-tree software to guide core teams through the requirements checklists.

Purpose of the change: to ensure that each work request receives the proper evaluations for compliance with all standards and regulations, to ensure consistent reviews, and to reduce the number of incomplete work orders.

Core Team Work Areas

Work areas in or near the assigned facility were established for each core team. The work areas have a general meeting area, individual work stations for the point of contact, scheduler, engineer, and maintenance foreman, and a fully equipped computer station with access to related information.

Purpose of the change: to coordinate resources, reduce the processing time for work orders, and help resolve problems efficiently.

Materials Coordination

The work requester or the core team lists the material needed for the work, completes any necessary requisitions, and sends the information to the materials coordinator, who tracks and expedites acquisition of the materials. The materials coordinator ensures that the materials for each work order are staged before the work is performed.

Purpose of the change: to control material procurement, to ensure that material is available when work is to be performed, and to provide better materials tracking, inventory, and control.

SCHEDULING WORK

The master scheduler and core team schedulers prioritize all plant work orders, including preventive maintenance and routine work orders, and develop rough schedules for resource loading and special equipment availability (scaffolding, cherry picker, manlift, etc.). Expected time frames for typical work orders and procurement are used to develop and refine the schedules.

The master scheduler compiles the information provided by core team schedulers and creates a schedule based on all work order activities at the ICPP. Higher priority activities are scheduled and worked in a timely manner, and less time is lost to manpower or material problems.

TRAINING

To ensure that the core team members were properly trained for their new job responsibilities, the training department reviewed the core team job requirements and defined the appropriate training. Core team members attended existing classes for cross-training and new classes developed by the training department for core team functions.

DEVELOPING THE NEW SYSTEM

ICPP senior management participated in a quality improvement process (QIP) to identify areas needing improvement. The QIP was the Westinghouse Technology to Improve Processes (WesTIP), developed by the previous ICPP contractor. (Information about the WesTIP method is provided in attachment 1.) The work control process was one of six areas identified as needing improvement. Personnel selected for their knowledge of the work control process participated in a workshop to develop new business and operating practices for work control. As the current process was evaluated, starting at the beginning and analyzing each step in detail, it became evident that many separate activities could be improved; as improvements were formulated, a new way of doing business began to emerge.

The old work control system was examined closely to determine resource cost and total cycle time. Improved methods to achieve significant results were then considered. The WesTIP team developed a flow diagram to clearly define the old process. The team analyzed problems associated with each step of the process and determined that a lack of ownership and accountability, excessive reviewers for each work package, procurement lags, and poor scheduling caused significant delays in accomplishing work at the ICPP.

Practices recognized as good ideas and solutions for problems were evaluated for implementation into the new model. A flow diagram for the new work control process was created in parallel with the flow diagram for the old process. As the new process was established, the team members identified activities required at each step. When the flow diagrams and requirement definitions were complete, the proposed process was reviewed by experts from each related functional areas to validate the methodology; concerns were resolved, and a new flow chart illustrated the process.

Once the new process was approved by management, an implementation team refined the methods, informed employees of the changes to be made, and implemented procedures, work assignments, and training for the new system. The implementation team, made up of knowledgeable representatives from work scheduling, maintenance, work control, and ES&H (environment, safety, and health), used problem-solving techniques including brainstorming, flow charts, and cost/time profiles to define the problems. They also researched and benchmarked best practices from the most outstanding maintenance organizations throughout the United States and tailored these methods to the ICPP.

Given the types of materials and facilities that must be managed and maintained at the ICPP, timely response to maintenance requests is often vital to the environment, the health and safety of workers, and operation of the plant. The core team concept is designed to ensure timely response, decrease down time, reduce costs, and improve all aspects of the maintenance process. The implementation team divided the plant into maintenance areas or spheres of influence and assigned a core team to each of these areas.

IMPLEMENTING THE CONCEPT

To test their proposed work control process, the implementation team set up a pilot core team for the waste operations area. They selected personnel from each discipline, provided training in the new methods, and modified the process as the pilot progressed. The implementation team chose personnel with enough experience, training, and authority to review and approve work requests. Because the pilot core team members were assigned to the processes and facilities where they worked, they were able to screen out duplicate jobs and turn back inappropriate work requests. The core team worked together to plan difficult jobs and complete minor designs without routing delays. Work order reviews were performed by personnel familiar with the facilities where the work would be performed. Materials and resources were scheduled appropriately and efficiently.

CHANGING TO THE NEW SYSTEM

After changes from the pilot program were incorporated into the new work control process, the implementation team divided the ICPP into five areas, based on the type of work performed, and established core teams for those areas. Existing work orders were recalled, except for those already being worked by engineering, planning, or maintenance, and were reviewed by the new core teams. Inappropriate work orders were cancelled (duplications, unavailable resources, work not needed, etc.). The rest of the work orders were placed in the appropriate core team's inactive file, to be activated in the new system. Existing and new work orders were then reviewed according to their priority ratings.

Although the new process has been in place for only two years, the core team system has already resulted in significant progress and improvements in the quality of work. Work order cycle time and work flow at the ICPP have improved dramatically. Duplicate work orders are detected early, and only approved, ready-to-work jobs are sent to the field. Facility personnel have seen their backlog of old work requests reduced and new jobs handled in a timely manner. Craftsmen are more efficient because the work requests scheduled by the core team have fewer problems and the materials are available when needed.

SUMMARY/RESULTS

LITCO's use of dedicated functional experts to develop, review, approve, and schedule work packages is a unique and innovative practice within the DOE complex. Although the focus of this review was chemical safety in the beginning, the core team program improves all aspects of the process, including environmental and safety concerns, product quality, and work order turnaround.

The new work control business practice has had positive results. The core teams have streamlined work control and approval and reduced cycle time for work requests by 12%. The work order backlog was reduced 10% in the first four months and the safety work order backlog has been reduced by 25%. Because maintenance foremen are involved early in the process, workable packages are delivered to the field. Using the core team concept, workable packages have increased to 95%, as opposed to the previous 45%. Figure 3 illustrates the cost/time profile of the old and new systems.

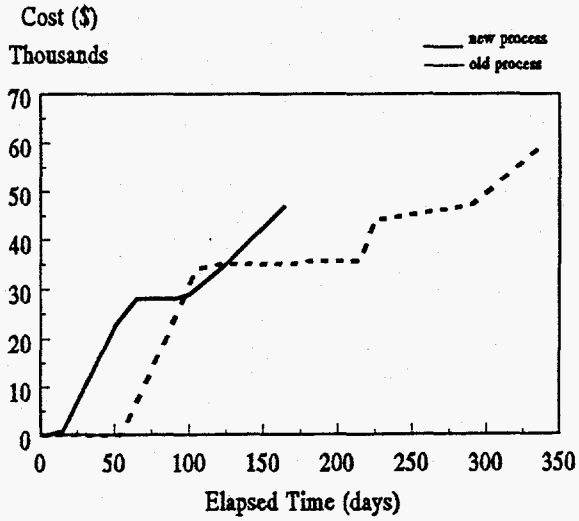

Figure 3. Cost/Time Profile

The changes made to the work control process affected the employees who were directly or indirectly involved with the process. Employees

unaccustomed to submitting work orders through a point of contact were uncomfortable with having their work requests screened and possibly rejected as work orders. As the core teams helped work requesters define the work they wanted performed, and the work was performed in a timely manner, attitudes became more positive. Working as part of a team, rather than as an individual reviewer, was a new experience for some of the personnel assigned to core teams; classes in team training and interactive communication facilitated this transition. Frequent meetings with upper management ensured continued visibility and support for the new program. As each team was phased in, the advantages of using core teams to accomplish work at the ICPP became obvious.

CONCLUSION

Within the DOE nuclear complex, maintenance work is often mired in compliance red tape. Sequential work control and approval processes can delay work flow; numerous reviews and approvals (safety, environmental, engineering, radiological control, operations, maintenance, quality assurance, planning, and scheduling) must be obtained before work requests are sent to the field. Before the core teams were implemented, five people were responsible for reviewing all work requests for the Idaho Chemical Processing Plant. Work inhibitors added up to an average cycle time of 324 days. In the new system, each core team includes members from every organization required to review the work orders. The core teams own their facilities, understand inherent problems, and are empowered to resolve conflicts.

WESTINGHOUSE TECHNOLOGY TO IMPROVE PROCESSES

Westinghouse Technology to Improve Processes (WesTIP) is a strategy and methodology designed to improve any business process through the efforts of the people involved in the process. The WesTIP strategy resulted from 10 years of development and application by a team of change agents, consultants, and quality experts at the Westinghouse Productivity and Quality Center. The method uses proven techniques to help cross-functional employee teams develop process improvement activities in a rapid, simple manner. This strategy results in measurable improvement in quality performance through a focused effort that trains and organizes personnel to achieve continuing process improvement.

WesTIP training involves a workshop with complete participant involvement. The organization and functions of the participants are described below.

1. *authorizing sponsor* - determines the process scope; selects team members and reinforcing sponsors
2. *reinforcing sponsors* - represent interface areas; implement the process within their organizations
3. *team members* - review the process scope and analyze the current process; develop improvement targets and redesign the process; develop the process quality improvement plan and evaluate implementation
4. *team leader* - organizes process team and communicate roles and responsibilities; modifies process scope as desired; measures and tracks progress; establishes and maintains process control; resolves or escalates process issues; defines and documents the process; utilizes resources; ensures implementation; continues process review and improvement; measures and rewards team for improvement efforts and successes
5. *technical experts in the process to be improved* - consult with the team to validate and walk through the new process design

Working closely with a facilitator, the team completes the following activities.

- set improvement targets
- identify key customers of the process
- document the process
- identify customer needs and values
- analyze process for measures, controls, and performance feedback mechanisms
- implement new process design
- continue to improve the process

WesTIP participants learn how to implement specific process improvement tools.

1. *Commit to business improvement.* Incorporating continuous improvement in the business; understanding the importance of process improvement; obtaining support from management and participants; determining the each participant's role in the process.
2. *Select a business or process for improvement.* Methods for selecting the process that should be improved first; the relationship between processes and the cost and cycle time of business; translating business issues into specific process improvements.
3. *Scope the process and the improvement team.* Understanding and communicating the scope of the process; identifying a motivating process mission and the key internal and external customers of the process; selecting a process improvement team.
4. *Target customer improvements.* Making dramatic improvements rather than just fine-tuning; identifying improvement targets related to customer needs.
5. *Analyze the current process.* Illustrating process steps so they are visible for everyone; eliminating the "paralysis by analysis"; determining the essential process ingredients and their impact on performance; identifying root causes of customer dissatisfaction.

6. *Redesign the process and measures.* Determining when redesign is essential; avoiding lengthy and costly efforts that never reach implementation; working "backwards" to include both internal and external customers; establishing key measures that matter to customers.
7. *Implement the improved process.* Overcoming roadblocks to successful implementation; involving all process participants in the implementation phase; keeping the improvement effort alive for ongoing improvement.

WesTIP process improvements result in the following effects.

- more customer satisfaction
- quality performance
- reduced process cycle time
- more employee involvement and ownership
- lower costs
- simplified systems and procedures
- fewer process errors

Several exclusive features of the WesTIP approach provide a framework for permanent and effective changes.

- commitment to change everyday actions at all levels (not just global changes)
- permanent cross-functional improvement teams (rather than individual assignments, single-discipline teams, or temporary task forces)
- emphasis on customer needs (ahead of internal needs)
- redesign of entire process (rather than improvements for single tasks)
- customer-based measures (not control-oriented employee measures)
- involvement of employee participants in redesign and implementation of process changes, (rather than outside experts or managers alone)

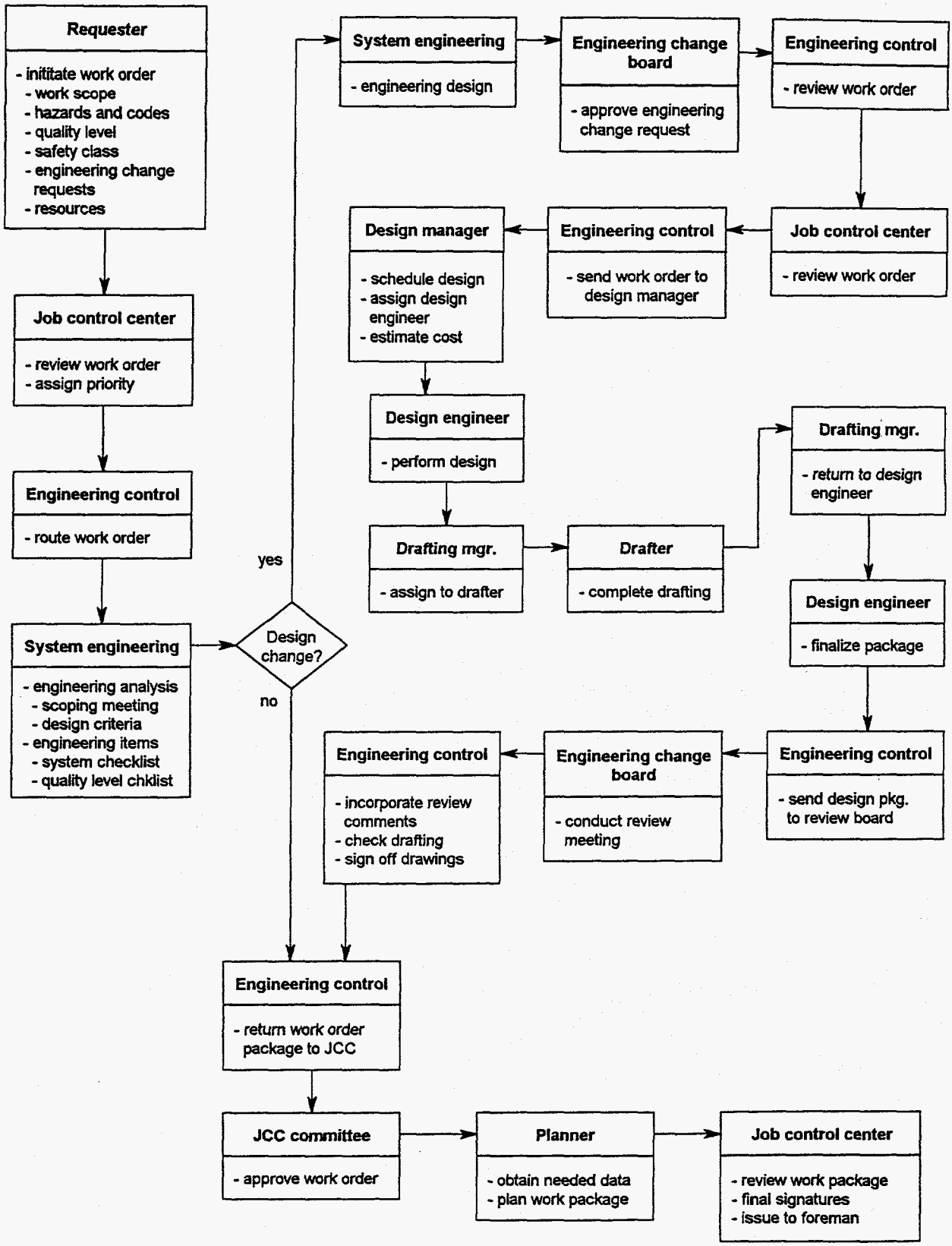

Figure 1. Old Work Control System

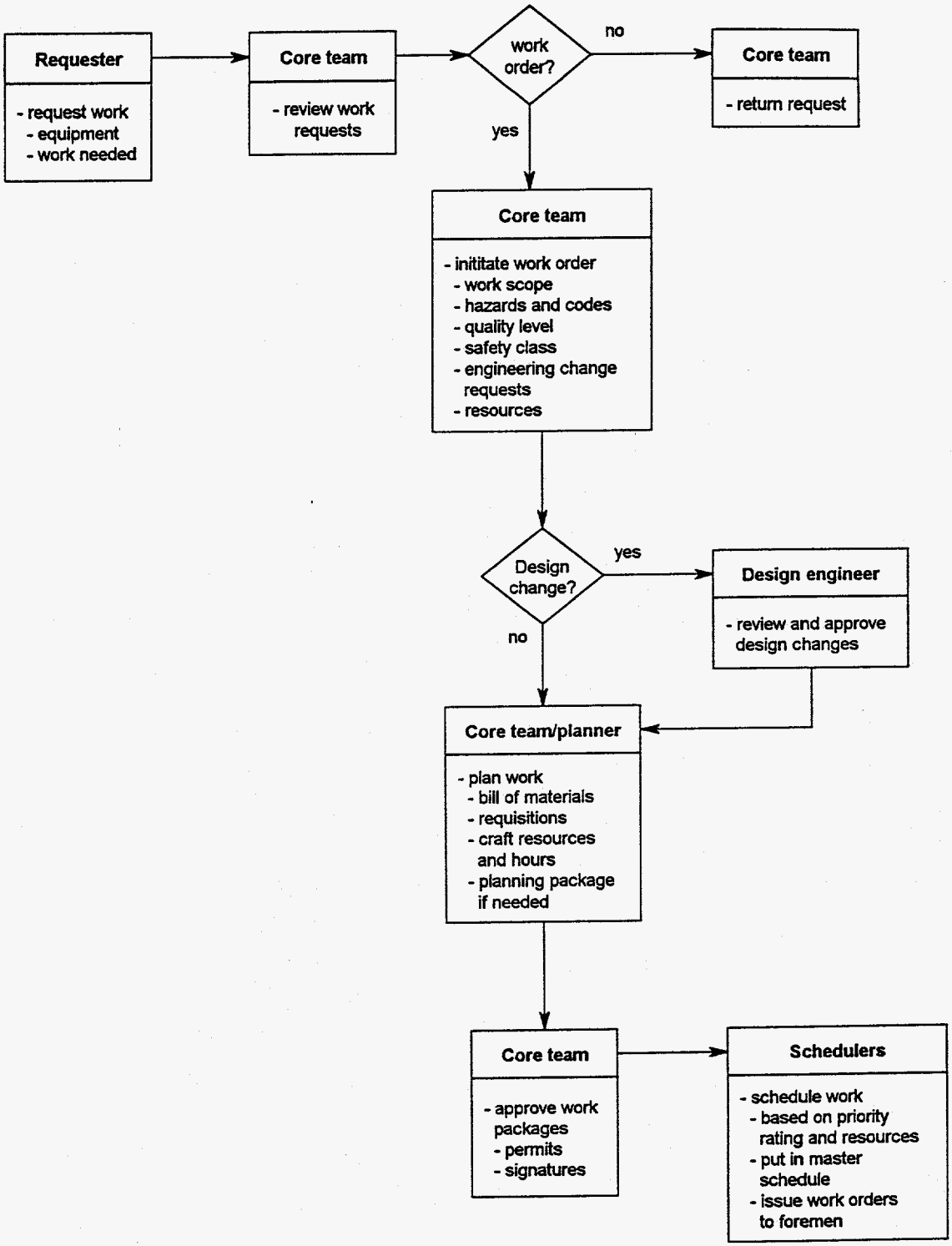

Figure 2. New Work Control System