BRITISH STANDARD

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Part 5 : 1993

Guide to production control

Part 5. The relationship between production control and other management functions

BSI
STANDARDS

Committees responsible for this British Standard

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British Computer Society
British Production and Inventory Control Society
Chartered Institute of Management Accountants
EEA (The Association of Electronics, Telecommunications and Business Equipment Industries)
Institute of Logistics and Distribution Management
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Nottingham University
PERA International (Production Engineering Research Association)
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University of Manchester Institute of Science and Technology

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Contents

Foreword

This Part of BS 5192 has been prepared under the direction of the Quality, Management and Statistics Standards Policy Committee.

The prime objective of production control is to help a company become more competitive and profitable. An effective production control function endeavours to fulfil this objective by keeping a balance between satisfying sales demand, achieving high plant utilization and maintaining low investment in stocks and work-in-progress. An optimum balance between these often conflicting objectives will only be achieved by a production control system designed to meet the specific needs of the company and run by well trained and dedicated staff.

BS 5192 is published in six Parts and gives comprehensive guidance in those areas that are considered essential for effective production control.

Part 1 *Introduction*:
Scope of the guide, purpose of production control, relationship to other functions, technological changes, choosing the system to fit the business

Part 2 *Production programming*:
Relationship to corporate and business programmes, planning techniques, master production scheduling, capacity planning

Part 3 *Ordering methods*:
The various types of ordering and stock control systems, comparing the advantages of each for particular applications

Part 4 *Dispatching (shop-floor control)*
The methods of shop-floor production control and documentation involved and the increasing influence of computers

Part 5 *The relationship between production control and other management functions*:
The production control information flows in the organization, their generation, presentation, use and maintenance

Part 6 *Computer aided production control*:
The application of computer software to the production control function

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Guide

Introduction

Production control (see figure 1), like other aspects of manufacturing industry, has developed over the years from a simple almost independent function to a complex sphere of influence interacting more widely with other functions. This development and its likely future development can be described in three phases.

a) The traditional role of production control:
- production scheduling;
- materials procurement.

b) The current role of production control:
- costing;
- labour planning;
- material requirements planning;
- optimizing production;
- manufacturing control;
- quality control

c) The developing role of production control:
- direct input into and feedback from computer-controlled machinery, automatic guided vehicles, processes and systems;
- networking of production control systems via electronic data interchange (EDI);
- real-time finite scheduling.

The trend inherent in production control systems is a diffusion of the production control function amongst those responsible for managing the business, in order to improve its effectiveness, e.g. a shop supervisor may schedule the optimum work flow and the sales manager may advise delivery dates to customers. The shift in authority away from the production control function to the other business functions will result in a smaller, albeit more crucial, production control function with a wider sphere of influence. Larger and more detailed volumes of information are required, interlinking and used by all departments.

Production control systems are thus becoming more critical to the efficient running of the company. Data processing systems enable the information to be handled effectively, but the flows, details, accuracy, amendments and presentation of this information should be very carefully designed and monitored. This Part of BS 5192 considers these aspects of the production control system.

1 Scope

This Part of BS 5192 gives guidance on the increasing influence of the production control system throughout the manufacturing organization. Information flows between management functions and the ways in which they are used in the control of the organization, are described in some detail.

Formats and methods of transmission, presentation and revision of information are also considered. Emphasis is given to the design of the production control system to meet the control requirements of the organization.

2 References

2.1 Normative references

This Part of BS 5192 incorporates, by reference, provisions from specific editions of other publications. These normative references are cited at the appropriate points in the text and the publications are listed on the inside back cover. Subsequent amendments to, or revisions of, any of these publications apply to this Part of BS 5192 only when incorporated in it by updating or revision.

2.2 Informative references

This Part of BS 5192 refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this standard are listed on the inside back cover, but reference should be made to the latest edition.

3 Definitions

For the purposes of this Part of BS 5192, the definitions given in BS 3138 : 1992, BS 5191 : 1975 and BS 5192 : Part 1 : 1993 apply.

4 Production control information flows

4.1 Each management function needs a constant flow of basic information in order to be able to operate effectively. The production control system can be used to supply the majority of this information (see table 1).

4.2 The principal information flows around and between the various management functions are shown in figure 2. This demonstrates that production planning and control is the centre of the information flows.

4.3 The information flows shown in figure 2 and table 1 are not all essential to the operation of the production control system itself, but they are necessary indirectly to enable inputs to the system to be made from other sources.

Other information flows between the management functions exist and can be essential to the overall operation of the organization. This Part of BS 5192 considers only those information flows that are necessary to ensure production of an item to meet required quality, cost and delivery criteria.

Some of the major information flows not considered in this Part of BS 5192 are as follows:
- cost estimates;
- sales analysis;
- production efficiencies;
- credit control;
- market research.

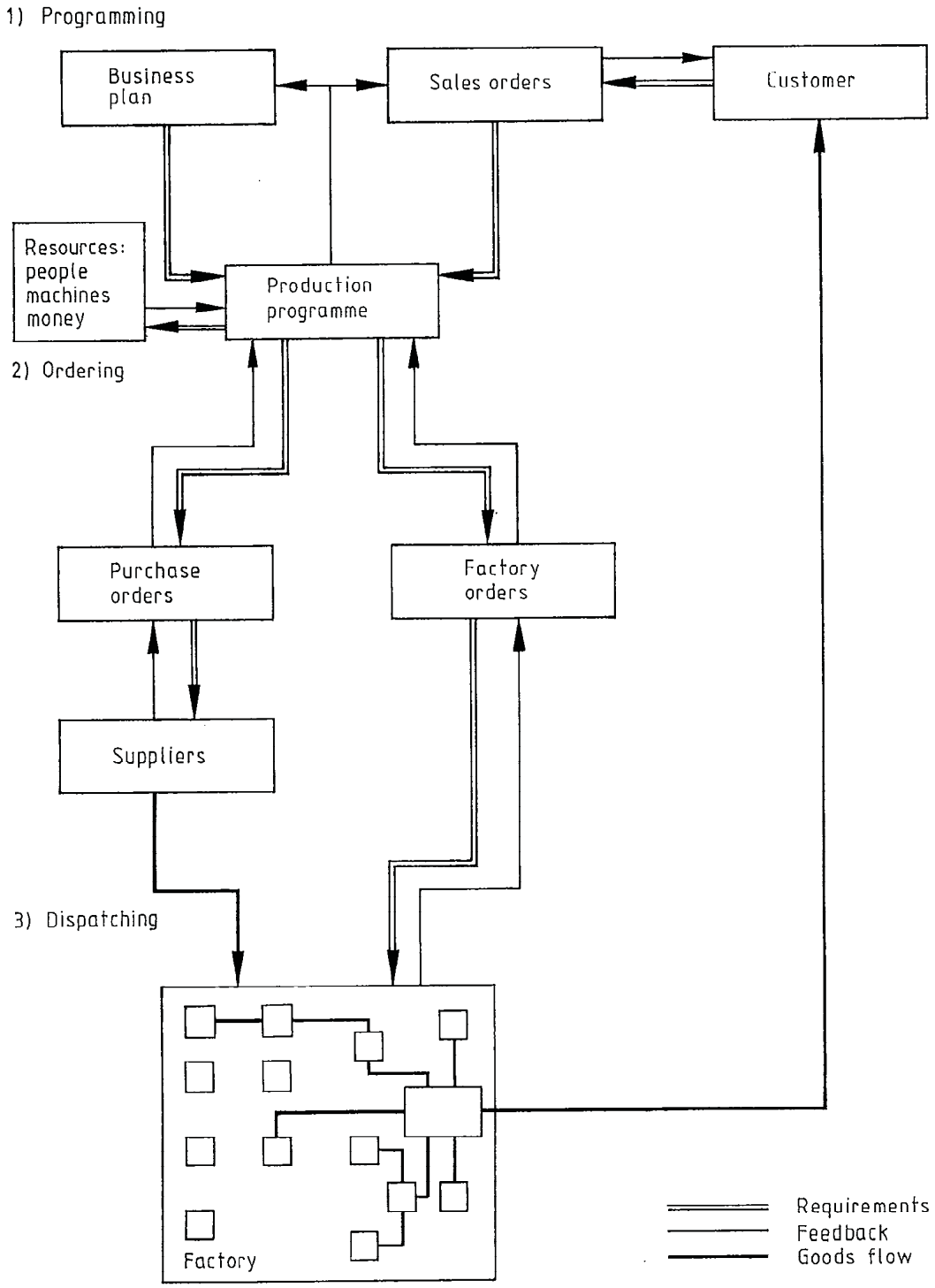


Figure 1. Stages of production control

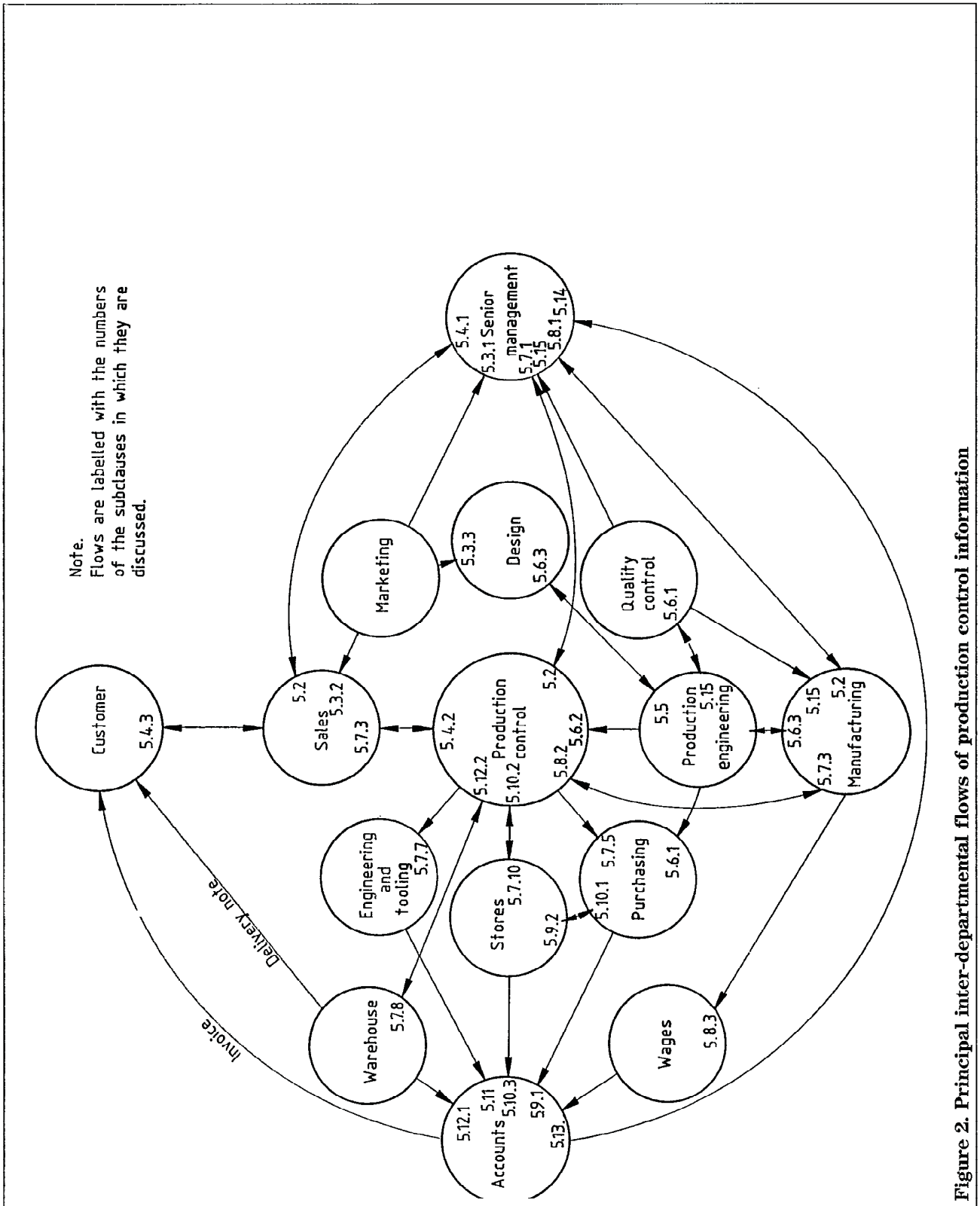


Figure 2. Principal inter-departmental flows of production control information

Table 1. Production control information flows

Input information required ⇒	Management function ⇒	Output information
Market needs Sales forecasts Factory loading data Production statistics Output statistics Quality control statistics Turnover, cost and profitability analyses Inventory forecast	Senior management	Master production schedule
	Marketing	Market requirements Market forecasts New product data
Market forecasts Master production schedule Orders from customers Order status Production schedule	Sales	Sales forecasts Order details Order acknowledgements
New product data Standard minute value (SMV) data	Research and design	Technical specifications
Technical specifications Quality control statistics	Production engineering	Material specifications Production specifications SMV data
Master production schedule Order details Material specifications Production specification SMV data Finished product stocks Plant downtime Goods received Raw material issues Work-in-progress (WIP) reports	Production planning and control	Production schedule Labour requirements Material requirements Plant/tooling requirements Stock allocations Works documentation Dispatch details Factory loading data Production statistics Order status Inventory forecast
Master production schedule Production schedule Labour requirements Works documentation Production specifications SMV data Quality control statistics	Manufacturing	Output statistics Order status Hours worked Incentive performance WIP reports
Raw material stock levels Material requirements Material specifications	Purchasing	Raw material delivery details Purchase orders placed
Stock allocations Raw material delivery details	Stores	Goods received Raw material stock levels
Plant/tooling requirements	Engineering and tooling	Plant downtime Plant/tooling costs
Dispatch details	Warehouse	Finished product stocks Dispatch notes
Hours worked Incentive performance	Wages	Labour costs

Table 1. Production control information flows		
Input information required ⇒	Management function ⇒	Output information
Purchase orders placed Labour costs Goods received notes Raw material issues Plant/tooling costs Dispatch notes	Accounts	Turnover, cost and profitability analyses Invoices
Material specifications Production specifications	Quality control	Quality control statistics

5 Generation and use of production control information flows

5.1 General

In manufacturing companies a high volume of complex production control information circulates between the various departments; the most important of these flows of information are shown in figure 2. In order to maximize the effectiveness of this information it is essential that the source of each information flow should be understood and its end use be clearly defined. In this way the format and method of information transfer can be effectively designed. It is very easy, particularly with computerized systems, to provide irrelevant or even confusing information to a management function. The information flows shown in figure 2, their sources and end uses are described in **5.2** to **5.15**. Guidance on their formats, with examples, is given in **9.3** and **9.4**.

5.2 Senior management

The master production schedule is an overall short, medium and long term production strategy. It is used by the sales department to indicate the availability of products for sale and by the manufacturing and production control departments to enable effective planning of all production resources including plant, labour and materials.

5.3 Marketing

5.3.1 Market requirements information is needed by the senior management of the company in order to assess the suitability of the product range and the level of demand likely in the future. This is an important factor in defining the master production schedule for the long term.

5.3.2 Market forecasts of trends in style, colour or other relatively minor design changes are used by the sales department to establish sales forecasts for the product range and identify the need for updating current models.

5.3.3 Market data on new products are needed by the design department to ensure that any new design meets the practical and aesthetic needs of the market place.

5.4 Sales

5.4.1 Sales forecasts are used by the senior management of the company in the definition of the master production schedule for the short and medium term.

5.4.2 Details of the customer's order including quantity, delivery date, specification/design reference are the major elements in the operation of the production control system. The planning of all production is triggered and determined by these details.

5.4.3 An acknowledgement of order sent to the customer can be used in some cases as a check on the order details if it requests formal approval of the design before manufacture. It always confirms formally to the customer that the order has been received and is included in the production plans.

5.5 Design

Based on the requirements for new or modified products, the design department produces detailed drawings and technical specifications. The production engineering department converts these into production specifications and defines plant, tooling, materials and methods specifications. The interrelationship between the research and design department and the production engineering department is particularly important in ensuring that the correct design of product is made within the defined cost and quality parameters. Compromise in the technical specification is often needed to achieve this. Many production control systems, particularly if computerized, require a formal bill of materials to be defined. This is described further in annex A.

5.6 Production engineering

5.6.1 Material specifications produced by the production engineering department are needed by the purchasing department in order to source and procure materials, by the production control department in order to complete works documentation and by the quality control department in order to define inspection techniques.

5.6.2 Production specifications are used by the production control department in order to complete works documentation, by the quality control department for defining inspection requirements and by the manufacturing department in defining plant and labour requirements.

5.6.3 The production engineering department analyses the various specifications, defines the production methods and establishes standard minute values (SMVs) for each operation by any of the available work measurement techniques. These SMVs are used by the design department in future design work where alternative methods of achieving the same design feature require comparison. They are used by the production control department to establish labour requirements and by the manufacturing department for labour allocation, scheduling and efficiency monitoring.

5.7 Production control

5.7.1 Factory loading data summarizing the order book by product type are used by the senior management for updating the master production schedule and indicating where changes to capacity are required.

5.7.2 Production statistics also indicate to the senior management whether the master production schedule is based on achievable production rates and highlight potential capacity imbalances.

5.7.3 The production schedule is the major controlling influence over the day-to-day operation of the manufacturing department. It is therefore essential that it is presented in the best format possible and contains information that enables production to be optimized.

The sales department uses the production schedule to monitor planned progress of orders and available production capacity.

5.7.4 Works documentation is used by manufacturing personnel at all levels to control the production of each specific order. Its clarity and accuracy are therefore of paramount importance.

5.7.5 The production control department uses information on stock levels and order details to establish the material requirements that enable the purchasing department to procure as necessary.

5.7.6 A similar analysis of the order details enables the labour requirements for the production schedule to be defined. The manufacturing department assesses this information to plan and allocate the available labour resources.

5.7.7 Plant and tool requirements are defined in a similar way for use by the engineering and tooling departments.

5.7.8 Dispatch details defining quantities, destination, delivery date, transport method, etc. are used by the warehouse dispatch function in order to plan dispatch of orders at minimum cost.

5.7.9 The production control department provides regular updates of order status to the sales department, often in response to customer requests. A system that can provide fast, accurate response is of great advantage. This is usually most effective in production environments with optimum production flows and minimum work-in-progress.

5.7.10 Stock allocations are provided by manufacturing to the stores to indicate requirements for specific stock items. This enables the stores to ensure availability and acts as a check on material issues.

5.7.11 Production control systems can also provide forecasts of inventory levels at all stages of manufacture to assist senior management in the financial control of the organization, particularly stock valuation and cash flow analysis.

5.8 Manufacturing

5.8.1 Manufacturing output statistics are provided to the senior management to enable detailed monitoring of production performance and identification of problem areas. These data should be in the appropriate format to enable immediate problems and longer term trends to be identified readily.

5.8.2 Regular production reports to the production control department enable the continuous monitoring of order status and the immediate identification of specific problems.

5.8.3 Details of hours worked and bonuses earned are provided to the wages department for payment calculations and the calculation of labour costs and efficiencies.

5.9 Purchasing

5.9.1 Details of orders placed are used by the accounts department to check on raw material invoices and control cash flow.

5.9.2 Raw material delivery details are passed to the stores in order to plan unloading and space allocation.

5.10 Stores

5.10.1 Stock level information is provided for the purchasing department so that material requirements can be converted into purchase orders as necessary.

5.10.2 Details of goods received by the stores are required by production control in order to establish when orders can be commenced and by accounts to monitor material invoices.

5.10.3 Details of materials issued to manufacturing are used by production control to monitor order status and stock levels and by accounts to monitor actual material usage against standard.

5.11 Engineering

Plant and tooling costs are needed by the accounts department for monitoring of product costs and the preparation of cost analyses.

5.12 Warehouse

5.12.1 Dispatch notes are given to the accounts department for invoicing purposes.

5.12.2 Regular updates of product stocks and dispatches are sent to production control for planning purposes. They enable the decision to be made on whether to supply from stock.

5.13 Wages

Labour costs are used by the accounts department to monitor actual labour cost against standard and for the preparation of cost analyses.

5.14 Accounts

Cost analyses, which can be prepared using the information inputs from the other departments on materials, labour, plant and tooling are needed by senior management for monitoring product costs. Turnover and profitability analyses are used to assess the overall performance of the company.

5.15 Quality control

Quality statistics are needed by the manufacturing department for tackling short term quality problems, by the production engineering department for identifying method or plant problems affecting quality and by senior management for longer term evaluation of quality in relation to manufacturing costs and market requirements.

6 Basic parameters and controls

6.1 General

There are several basic parameters that affect the operation of the control system, defining the job to be completed and, in many respects, the way the manufacturing organization operates at any one time. It is essential that these sources of basic control information are well defined and that checks are included to ensure their accuracy. It is vital that errors are not automatically transferred throughout the system.

It should be remembered that the majority of production personnel are trained to follow written instructions. If these instructions are incorrect, particularly if they have been produced as a neat computer printout or on a visual display unit (VDU), then production errors will occur.

6.2 External parameters

6.2.1 ***Legislation***

Product designs are often subject to current legislation and this can vary between different markets, e.g. vehicle lighting or exhaust emission regulations.

6.2.2 ***Health and safety***

Manufacturing methods may be subject to statutory requirements such as the Health and Safety at Work etc. Act [1] and may also be subject to defined procedures and regulations, e.g. boiler plant and lifting tackle inspections.

6.2.3 ***Standards***

British Standards, international standards and standards produced by trade associations may specify requirements for particular products.

6.2.4 ***Company policy***

In larger manufacturing organizations, systems and methods are often defined centrally. In multi-site and international companies, production costs, material costs, exchange rates, interest rates and taxation can each dictate production planning policies for parts, subassemblies and final assemblies.

6.2.5 ***Political factors***

Manufacturing location and materials procurement can also be influenced by political factors. Different governments' policies, industrial relations climates and legislation, location, transport facilities and labour availability can all have a significant effect.

6.3 Internal parameters

6.3.1 ***Quality system***

The organization's quality assurance system, particularly if registered against BS 5750, will have precise and comprehensive measures for ensuring that design or manufacturing errors are eliminated at the earliest possible stage. These measures cover the requirements of the customer and by implication any process which has a bearing on the quality of the product or service delivered. The accuracy of information within the production control system should therefore be subject to constant scrutiny and regular auditing.

6.3.2 ***Material specifications***

Material specifications should be continuously updated as changes are made by the design or purchasing departments. Apparently small changes in material specifications or tolerances can significantly affect manufacturing methods or process requirements.

6.3.3 ***Production specifications***

Changes to production specifications can, as for material specifications, cause changes to the required materials or even the design of the product. Continuous updating is essential.

6.3.4 *Product specifications*

All changes made can affect the finished product, so it is essential that product specifications are also maintained. To avoid confusion, changes to these and to material or production specifications should be controlled within an engineering change management procedure. Such a procedure is described in annex B.

6.3.5 *Bill of materials (BOM)*

Most production control systems use the BOM to define the relationship between production specifications, materials and labour in order to satisfy the product specification. Therefore, it is vital that the BOM (described further in annex A) is accurate at all times. Any error here will travel rapidly throughout the entire system and can cause problems in all management functions.

6.3.6 *Prices and costings*

Errors in any of the areas described in **6.3.1** to **6.3.5** can generate incorrect costings and hence incorrect prices, with potentially disastrous effects. It is always worthwhile to have a final, manual check of costings produced by the system, before committing the company to contracts of any significant size. Obviously, any errors arising should be thoroughly investigated and eliminated.

6.3.7 *Production schedules*

These can be adversely affected by errors in any of the above areas, and the effect on the manufacturing organization can be dramatic. Bottlenecks, lost time, over- or under- utilization of plant, high levels of work-in-progress (WIP) and late delivery can quickly be incurred following a scheduling error.

6.3.8 *Working capital and cash flow*

The size of stock holding and the ability to produce may be limited by the amount of working capital available. Many organizations experience large fluctuations in cash flow through the year which may entail temporary restrictions on stocks. These restrictions could also affect production programmes. This situation applies particularly to businesses that operate in seasonal markets.

The cost of holding stock should include a figure for the interest chargeable on the value of the stock. The rate of interest may be notional if stock is financed from within the organization and could represent the return on the finance if it were used elsewhere by the organization, or actual if finance has to be borrowed to pay for the stock. Interest charges on stock holdings should be balanced against costs incurred as a result of reducing or not holding stock. The responsibility for stock should be clearly defined between the various functions of purchasing, production control, marketing and distribution.

6.4 Customer parameters

Some of the most basic production control information (and the most often incorrect) is provided by the customer. Checks that this information is accurate and has been translated correctly from the customer's requirement to the manufacturing requirement should be rigorously applied. Confirmation should be given where possible. Clear product specifications and close liaison by the sales department can help significantly.

The parameters supplied by the customer that are most often the cause of error are as follows.

- Quantity: the units used may be single items, boxes, hundreds or kilograms.
- Product code description: this may be missing, incorrect or confused with another.
- Transport: the destination and/or dates may be missing.

7 Other aspects affecting information flows

7.1 General

BS 5192 : Part 1 recommends careful and detailed planning of the production control system and all its characteristics. The importance of this is apparent in the way the system can be affected by the factors described in **7.2** to **7.8**.

7.2 Management organization

The type of management organization does not usually affect the information flows, since these are usually dependent upon the complexity of the product and manufacturing methods. However, in smaller companies the management functions are often combined and in larger companies an individual function can be divided into subsections by product, process or location. In all these cases the format and presentation method of the information require careful planning in order to maintain the ideal of supplying only relevant information to the appropriate functions. Dependent on the management organization, this could range from hand-written or even verbal information flows up to fully integrated multiple-computerized systems.

7.3 Type of production control system

The information flows within a production control system are constrained by the type of system and its abilities for processing and presentation of the information. It is important that the type of system is obtained to achieve the required flows of information and not vice versa. This can be better achieved by using the appropriate review, selection and implementation procedures detailed in BS 5192 : Part 1.

7.4 Product complexity

The complexity of the product and its manufacture do not affect the flows of information other than in the volumes and relative importance of each flow to the operation of the company. A full understanding of the relative proportions and complexities of labour, materials and overhead costs associated with the product can assist in ensuring that the production control system presents an appropriate level of detail within each information flow, thus optimizing the performance of each management function.

7.5 Lead times

Material supply, production and customer order lead times dictate the pace at which a manufacturing company operates. They also dictate the speed of decision making and the accuracy and amount of forward planning required. Therefore, the production control system has to be able to respond with the appropriate level of detail and at a speed compatible with these requirements.

7.6 Other systems in the organization

The details and formats within the information flows are affected by systems used by other management functions, e.g. standard costing, wage payment, purchasing and stock procedures, manufacturing control policies (Just-in-time (JIT), etc.). Information moving within the system should be compatible with these other systems.

7.7 Location and layout

The geographical locations of the different parts of the manufacturing organization and the layouts of plant within each production unit can affect the method of information flow. A requirement for fast transfer of complex information over large distances or to multiple locations is often best achieved by computerized systems. Manual systems are often adequate for smaller volumes of information flowing within a compact organization.

The production control system and the layout of the plant also interact with each other. For example, JIT and material requirements planning methods often require different plant layouts, stock policies and works documentation. Layouts on flowline, batch or jobbing principles have different requirements for the presentation and formats of production control information. This is further considered in clause **9**.

7.8 Engineering changes

The production control system and its information flows need to be able to cope with amendments and changes. These can be caused by unplanned occurrences such as:

a) late delivery of materials;

b) inadequate labour supply;

c) quality problems;

d) errors.

However, planned changes to designs, specifications or methods affect the base parameters of the system and need to be specifically controlled.

The method of achieving this is described in annex B.

8 How information flows combine to give control

8.1 General

Information flows are used by the relevant management functions to give various types and levels of control over the manufacturing organization. They combine in different sequences with many other factors to achieve this.

8.2 Capacity control

8.2.1 The master production schedule defines the planned capacity available and it is essential that all major decisions concerning volume of orders or production facility changes are made on the basis of this schedule. This will ensure that production can deliver what sales require and that sales will sell only what production has the capacity and resources to produce.

8.2.2 The scale of the schedule needs to be considered and may be multi-level based on machine, department, plant, company or product. It should include, if necessary, allowance for contract, stock or emergency orders.

8.2.3 A basic decision to be made when compiling the schedule is the unit of capacity which could be, for example, units, standard hours or percentage plant utilization. The presentation of the schedule is important and can be by paper, chart, planning cards or computer depending on the application.

8.2.4 The master production schedule has to be maintained and updated to meet the changing circumstances. The frequency of this updating can be determined by calender, production/sales performance or by specific triggers such as significant unplanned changes in sales or production requirements.

8.2.5 Effective capacity control assists in providing good customer service with minimum disruption to production.

8.3 Batch size control

8.3.1 Batch size is important to the efficient running of the production facility, since WIP, stock levels, tooling changes and scrap levels can all be affected by it. It should be an essential consideration in production scheduling and the determination of stock policy.

8.3.2 Batch size can be affected by several external factors such as customer's order size, transport limitations and financial considerations such as credit limits.

8.3.3 Optimum batch size is also affected by internal factors such as plant or process requirements and part or subassembly commonality.

8.3.4 Obviously each of these factors has a different effect and the actual batch size selected will normally be a compromise based on the specific circumstances associated with the order.

8.4 Order intake control

8.4.1 Control of the orders taken by reference to the production schedule and stock levels ensures that the organization can optimize efficiency and achieve delivery promises.

8.4.2 There should be a clear responsibility for controlling order intake and defining sales policy, particularly where the product mix, volume or production capacities are changing rapidly.

8.4.3 Close customer liaison enables forecasts of trends so that the longer term master production schedule can be updated. This assists in budgetary control.

8.5 Order release control

8.5.1 Release of orders to production should only be made based on the production schedule and subject to adequate works documentation and raw materials and parts being available.

8.5.2 The method of release differs widely dependent on the type of production system (e.g. traditional batch release, kitting or JIT systems).

8.5.3 Release timing depends on the manufacturing organization type and the method of allocating responsibility or defining trigger points for release.

8.6 Purchasing control

8.6.1 Control over purchasing is achieved from the defined material requirements and specifications and the stock policy of the company. It is a major influence on the performance of the manufacturing organization in terms of quality, delivery performance and costs.

8.6.2 The policy for single-source, dual-source or multi-source has to be established; each has its advantages in particular situations and can be affected by the type of manufacturing organization and the product lead times.

8.7 Stores control

8.7.1 Accurate and well presented works documentation, raw materials (RM) delivery details and information on stock allocations enable the stores to operate effectively.

8.7.2 The location of the stores depends on the type of stock (materials, parts, WIP or finished products) and on the size and type of manufacturing organization. Central stores are being replaced in some companies by plant, departmental or even production line stores under JIT methods.

8.7.3 Storage and retrieval methods and systems depend on the items to be stored and the stock and manufacturing policies of the company.

8.7.4 There should be clearly defined systems for quality checks of incoming goods and their release to production in order to maintain the viability of the production schedule.

8.8 Inventory control

8.8.1 Control over inventory is based on the master production schedule with its generated material requirements, and the close monitoring of stock and WIP levels.

8.8.2 Actual inventory in different organizations can vary widely dependent on the necessary batch sizes, re-order levels and safety stocks.

8.8.3 These values require regular review, particularly if there are regular stockouts or changes in the product types.

8.9 WIP control

8.9.1 Control over WIP is notoriously difficult due to the large number of factors affecting WIP levels, and the problems in identifying its location and quantity. A production control system should enable this information to be readily (and accurately) available. This is often dependent on the overall control over the manufacturing organization, e.g. JIT systems minimize WIP, thereby reducing its importance to costs and inventory control systems.

8.9.2 Planned batch sizes and the type of product and methods affect the volumes, location and storage methods of WIP.

8.9.3 Changes to production schedule and quality problems can have unforeseen effects on the levels of WIP and it is thus vital that accurate and timely information is available. This will also assist in identifying order status and predicting order completion more accurately.

8.10 Quality control

8.10.1 Material specifications and production specifications are essential information for quality control. Production documentation should include details of special testing requirements and any shortage of test facilities that could cause a bottleneck in the system. In some cases the testing requirements are included in the production control system to enable forward planning of testing capacity.

8.10.2 The production control system has to be able to respond to changes in schedule or specifications caused by quality problems and ensure changes are clearly notified throughout the organization. Engineering change control (see annex B) details the method of achieving this objective.

8.11 Scrap control

8.11.1 Identification and control of scrap and waste materials is important from both cost and quality control aspects. The system should allow for disposal or alternative use of the materials where authorized by quality control or the customer. In the latter case the engineering change control procedures described in annex B can be useful.

8.11.2 A policy is required on the level of scrap and waste allowance to be included in the calculation of material requirements.

8.11.3 The production control system should consider the effects of scrap on inventory levels and delivery dates and include the costs in any analyses carried out.

8.12 Labour control

8.12.1 The master production schedule and resource requirements planning sections of the system can be used to define the labour requirements and enable forward planning of labour availability and allocations.

8.12.2 The production control system should allow for holidays, forecast absenteeism and the peaks and troughs of labour needs and availabilities. Resource planning can assist by enabling labour mobility, recruitment and or training to be undertaken.

8.12.3 Labour costs can sometimes comprise a large part of the production costs and should therefore be included in the cost analyses produced by the system.

8.13 Tool control

8.13.1 The production schedule and production specifications are used to identify the requirements for tooling, which in some production control systems can be additionally included in the resource requirements planning.

8.13.2 The degree of control necessary over the tooling is dependent on factors such as tool change, set times and frequencies, their location and company policy on the use of new, spare or repair procedures.

8.13.3 Tooling costs can be a significant proportion of the overall production costs and may need to be included in the cost analysis aspects of the production control system.

8.14 Maintenance control

8.14.1 In many respects, maintenance is treated in the same manner as tooling production control. Downtime for planned maintenance and the provision of special plant or process resources can all be included in the production control system.

8.14.2 The monitoring of planned and unplanned downtime can be included and used to alert and assist production schedule changes as necessary.

8.14.3 Maintenance costs can be significant and can be included in any cost analysis generated by the system.

8.15 Cost control

8.15.1 Almost all the information flows in an organization include cost details of some type. The collection, analysis and presentation of these cost details can be an important function of the production control system.

8.15.2 The type of costing system used, the important cost items and the budgetary/financial cost system in use all affect the handling of the cost details. The cost parameters in the production control systems should be compatible with the organization's cost control systems.

8.16 Performance control

8.16.1 The success of each type and level of control has an influence on one or more performance indicators of the manufacturing organization. Each different organization has a small set of key performance indicators which can quickly give an overall effectiveness measure of the systems. Monitoring these indicators in graphical form can yield useful information on performance trends, particularly on the effects of significant changes, either planned or unplanned.

8.16.2 Publicizing these key performance indicators contributes to the effectiveness of the production control system by:

a) warning of decline in the performance of the system;

b) stimulating action plans to rectify problems in specific areas of control;

c) motivating staff by providing objective proof of improvements.

8.16.3 It is important that the performance indicators are monitored on a regular basis; weekly and monthly indicators are the most often used. Target levels for the indicators can be set as an incentive for management.

8.16.4 Table 2 lists various types of performance indicators. Figure 3 shows a typical graphical method of presentation to demonstrate how the effect of changes can be monitored.

Table 2. Examples of key performance indicators		
Performance area	**Performance indicator**	
Labour	Added value/manhour	= added value for period/total hours worked in period
	Productivity	= output to schedule and quality (standard hours)/clocked hours
	Output per man	= pieces per manhour
	Labour turnover	
	Absenteeism	
	Percentage overtime	
Capacity control	Capacity utilization	= actual output/planned output
Delivery	Lateness	= no. of orders late/no. of orders delivered
	Lead time	= total orders/average weekly output
Inventory	Stock turnover	= sales value for year/average stock value
	Service level	= (no of issues − no. of shortages)/no. of issues
	No. of days' supply	= inventory value/average daily cost of sales
Cost	Labour cost per unit of production Raw material cost per unit of production	
Others	Order intake (units per period) Material yield	
NOTE. Indicators should be selected and tailored to best fit the organization. In some cases specialized indicators can be identified which may be more relevant.		

8.16.5 The indicators are often used for comparing the performance of sections, departments or factories within an organization. In this case great care should be taken to ensure complete compatibility of the indicators.

8.17 Miscellaneous controls

The controls described in **8.2** to **8.16** are not exhaustive and the relevance of each varies within each organization. Inevitably, overall control depends on each individual control being effectively undertaken.

This requires that responsibilities, authority and boundaries of control are clearly defined; that the relevant information is presented in the right format to the right person at the right time and that the system is updated promptly to cope with significant changes as they occur.

Above all, the system should be designed to suit the requirements of the organization and its customers.

9 Display and presentation of control information

9.1 Management function requirements

The design of the production control system should include consideration of the specific information requirements of each management function and the optimum method of achieving this. Often, this will be a compromise since different functions have different requirements which may not be compatible within a single system. However, the users of the information should be consulted and involved to ensure their approval and commitment to the system.

9.2 Information flow methods

There are three basic methods of transmitting production control information throughout the organization.

a) *Verbal method.* This can be and is used in small, simple organizations. It can be adequate but has the inherent dangers of loss or misunderstanding of information. It is unlikely to be acceptable for use in conjunction with quality assurance schemes such as that described in BS 5750.

b) *Manual paper method.* This is used very successfully in many small to medium sized companies. Provided that the information flows are carefully planned and there are no geographical or speed difficulties this method is acceptable. Its main disadvantage is that as complexity or the amount of secondary analytical information increases, the cost of effectively running the system increases due to its high labour element.

c) *Computerized method.* For complex production control systems, with high volumes of information flowing between many functions in separate areas, the use of computer applications

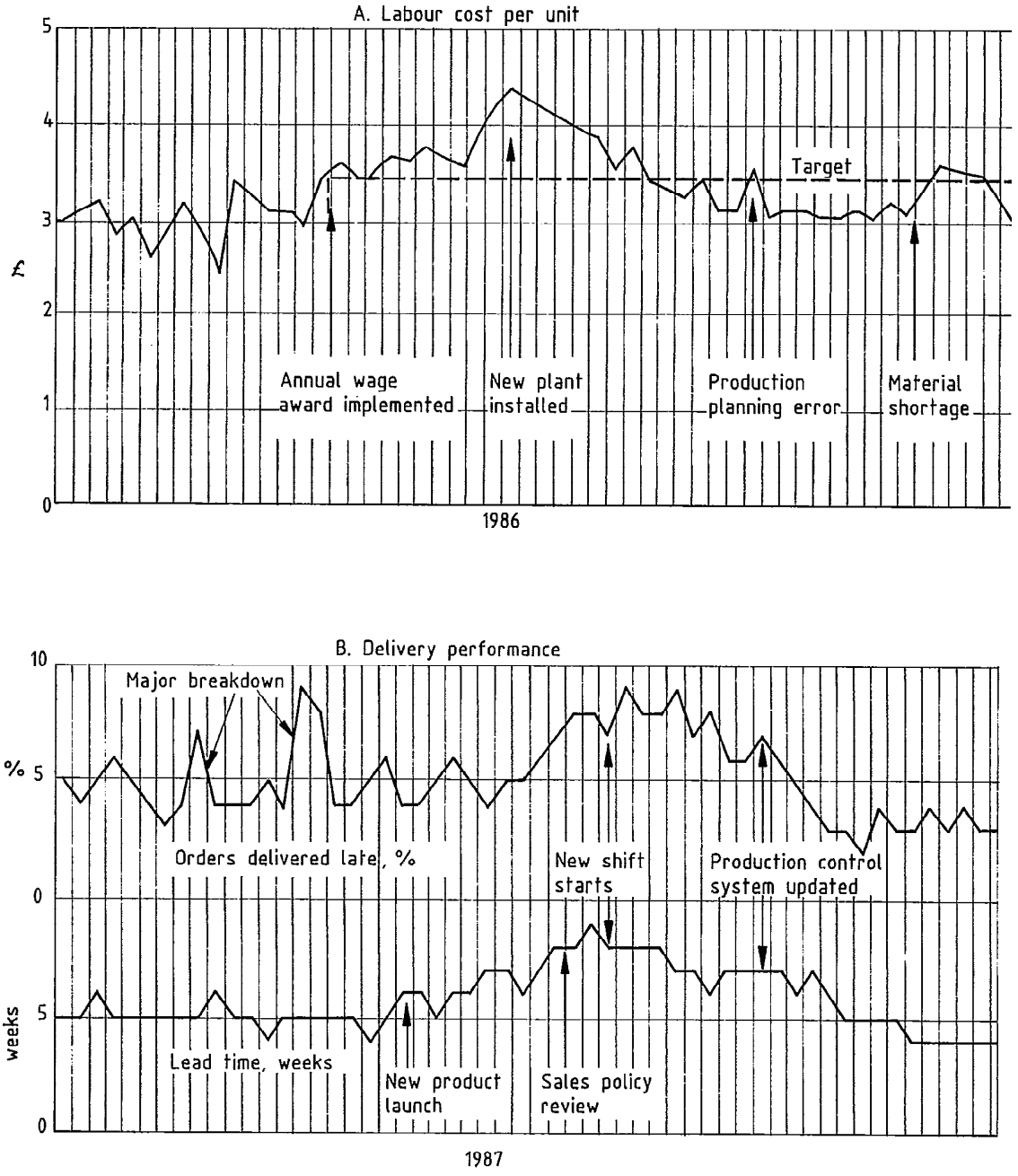


Figure 3. Examples of use of performance indicators

is essential. Computer applications also give the benefit of easily accessible secondary analytical information. The computer system itself can take several forms which also need to be considered:

- a centralized system providing printed information;
- a centralized system with remote terminals for data input and visual display;
- an open architecture networked system receiving, processing and transmitting information to linked computers throughout the organization for further processing.

In many organizations, the production control system is a combination of methods a) to c). Often, a long term development plan can be made that allows phased introduction of information technology as the organization increases in size or complexity. This is also an accepted way of introducing computer applications to replace traditional methods, with minimum disruption and risk. The importance of fully applying the review, selection and implementation procedures detailed in BS 5192 : Part 1 cannot be overemphasized in these cases.

9.3 Information formats

The format of the information supplied to a management function or production operative should be designed specially for its end use. The objective is to provide relevant information in the most cost-effective way; such information can be divided into two major categories.

a) Information for intermittent or occasional use at one location is required as a straight instruction or for reference purposes only. This is often best presented as printed information.

b) Information for continuous use may be rapidly changing, in large volumes or complexity. This can often only be handled by using VDUs.

These two categories are necessarily general since each organization has its own special requirements. They are further affected by the locations and number of end users. For example, presentation of the same information for a large number of end users in widely spread geographical locations is often best achieved with a VDU, even though it may only be used intermittently.

The trend in advanced manufacturing technology is towards building integrated information and control systems that link an organization's business, technical and production functions. It is feasible to replace much of the traditional paper based production control documentation by computer applications that enable electronic exchange and display of information, monitoring and centralized management of production process and operations.

Examples of the following production formats are shown in figures 4 to 7:

- a master production schedule is shown in figure 4;
- a production schedule is shown in figure 5;
- material requirements planning is illustrated in figure 6;
- examples of works documentation are shown in figure 7; a works order is shown in figure 7a and job instructions are shown in figure 7b.

10 Review of information flows, formats and controls

Control of the manufacturing organization is based on the information interactions between management functions. Each is dependent upon the others and the trend is towards more detailed and complex systems carrying out more and more of the information transfer electronically. Production equipment that incorporates programmable control systems can often by further automated when directly linked with a computerized production control system. Any production control system should be subject to regular review to ensure the continued relevance of its various information flows as the needs of the system change.

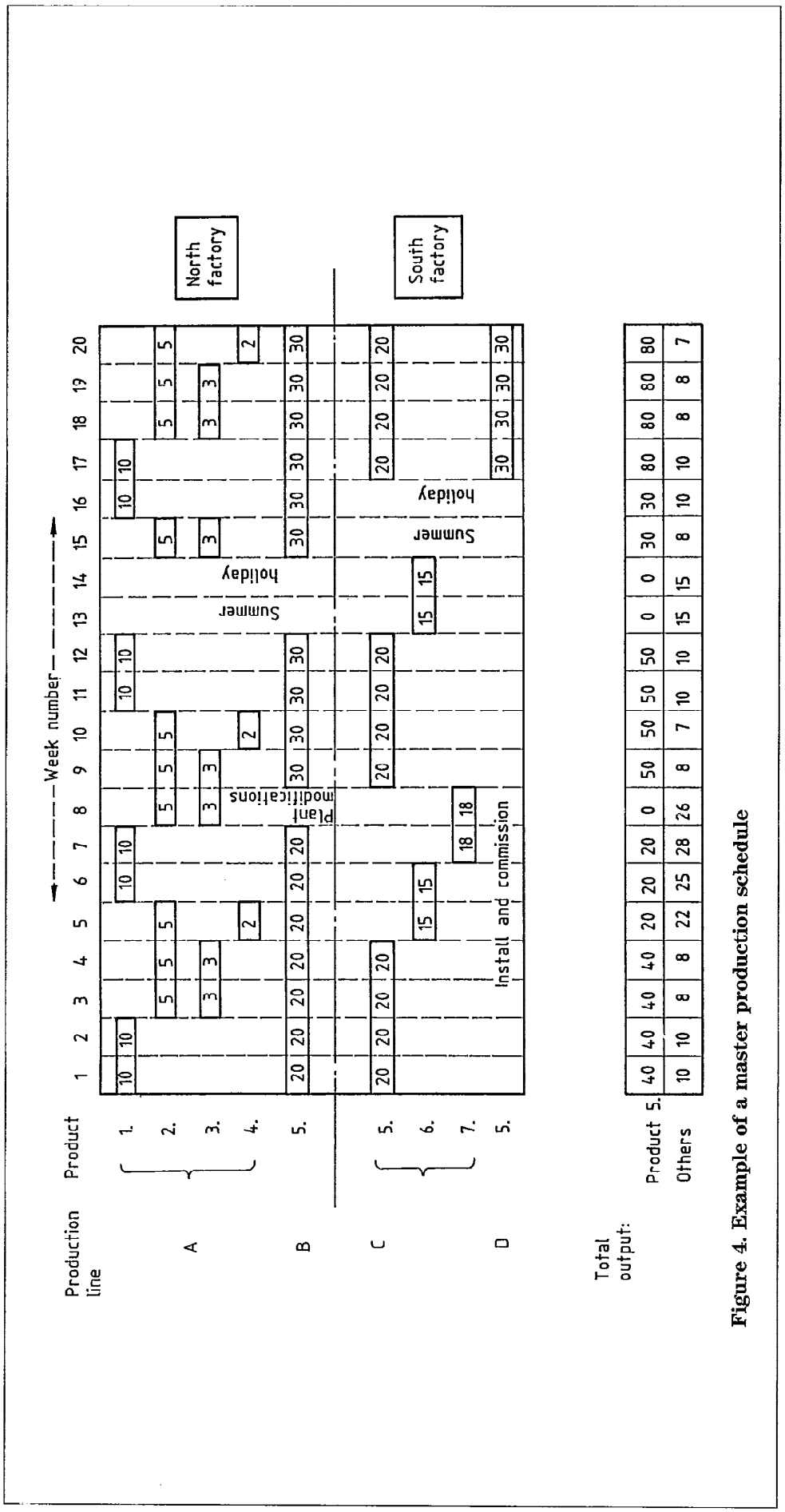


Figure 4. Example of a master production schedule

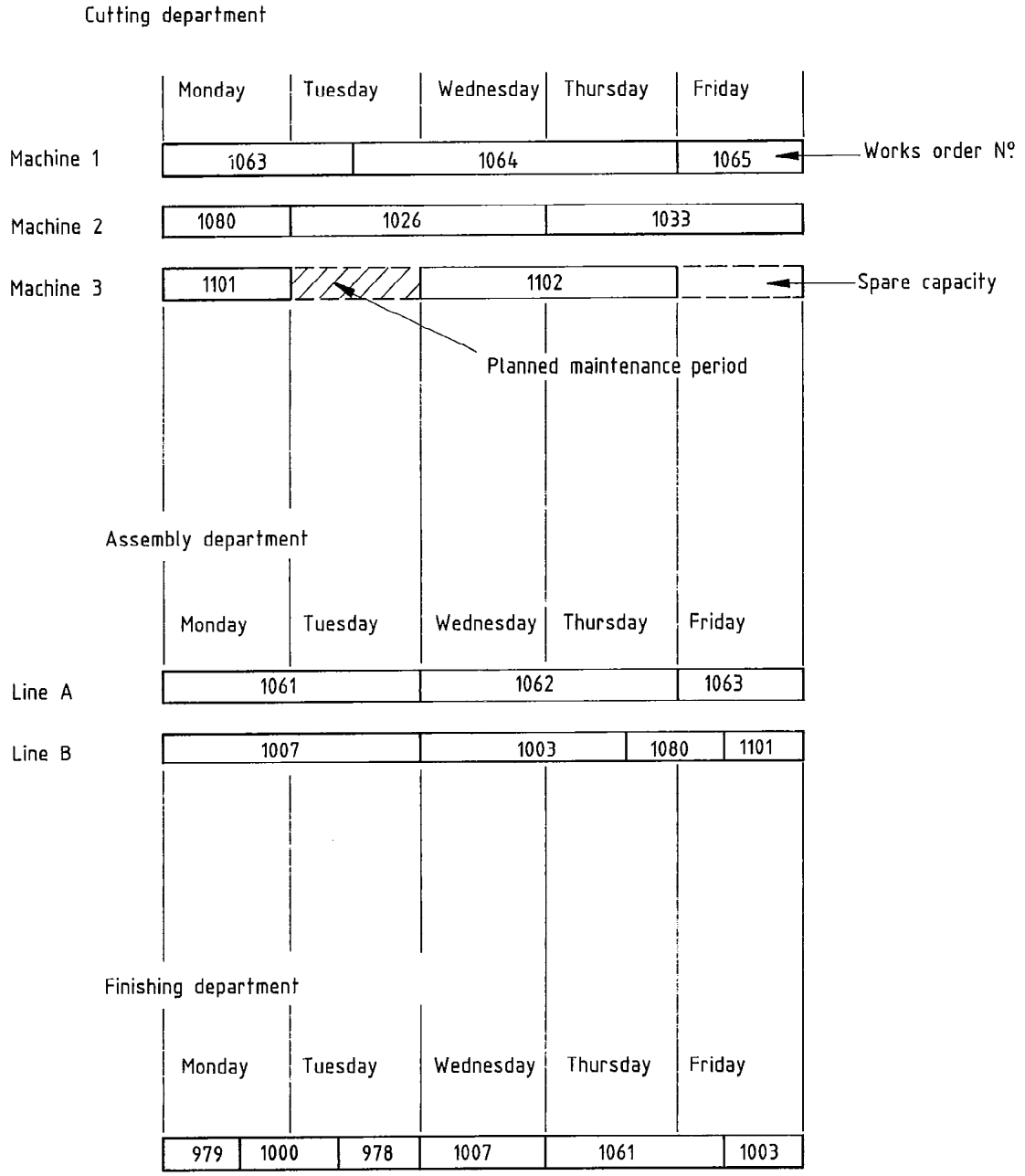


Figure 5. Example of a production schedule

DATE PREPARED : 20/06/86 NET REQUIREMENTS PLANNING REPORT EXPLOSION DATE : 20/06/86 TIME PERIOD : WEEKS PAGE: 1

PART NUMBER	DESCRIPTION	U/M	LEAD TIME	PART TYPE	PART CAT.	TOTAL STD COST	ECONOMIC ORDER QTY	RE-ORDER QUANTITY	W/H	L M	VENDOR
000001	ADHESIVE TAPE	METRE	010	R	B	0.2800	0.000	1000.000	A	M	FACTORY 12

	WEEK NO: 05 BACKLOG	WEEK NO: 03	WEEK NO: 05	WEEK NO: 07	WEEK NO: 10
QTY ON HAND :	0.000	0.000	0.000	0.000	0.000
PURCHASE ORDERS :	0.000	0.000	0.000	0.000	0.000
OUTSTANDING WIP :	0.000	0.000	0.000	0.000	0.000
SALES REQUIREMENTS :	0.000	90.000	240.000	180.000	150.000
WIP ALLOCATIONS :	300.000	0.000	0.000	0.000	0.000
NET REQUIREMENTS :	300.000-	90.000-	240.000-	180.000-	150.000-
(SMOOTHING) :					

PART NUMBER	DESCRIPTION	U/M	LEAD TIME	PART TYPE	PART CAT.	TOTAL STD COST	ECONOMIC ORDER QTY	RE-ORDER QUANTITY	W/H	L M	VENDOR
111050	361 CM PN065 POLYPROPYLENE	SQMTR	005	R	B	0.3800	0.000	1000.000	A	M	01

	WEEK NO: 03	WEEK NO: 05	WEEK NO: 07	WEEK NO: 10
QTY ON HAND :	300.000	0.000	0.000	0.000
PURCHASE ORDERS :	0.000	0.000	0.000	0.000
OUTSTANDING WIP :	0.000	0.000	0.000	0.000
SALES REQUIREMENTS :	1410.000	3760.000	2820.000	2350.000
WIP ALLOCATIONS :	0.000	0.000	0.000	0.000
NET REQUIREMENTS :	1110.000-	3760.000-	2820.000-	2350.000-
(SMOOTHING) :				

PART NUMBER	DESCRIPTION	U/M	LEAD TIME	PART TYPE	PART CAT.	TOTAL STD COST	ECONOMIC ORDER QTY	RE-ORDER QUANTITY	W/H	L M	VENDOR
20	BASE/TOP ASSEMBLY	HOURS	000	R	M	8.1000	0.000	0.000	A	L	

	WEEK NO: 02	WEEK NO: 03	WEEK NO: 05	WEEK NO: 07	WEEK NO: 10
QTY ON HAND :	0.000	0.000	0.000	0.000	0.000
PURCHASE ORDERS :	0.000	0.000	0.000	0.000	0.000
OUTSTANDING WIP :	0.000	0.000	0.000	0.000	0.000
SALES REQUIREMENTS :	0.000	14.490	38.640	28.980	24.150
WIP ALLOCATIONS :	48.300	0.000	0.000	0.000	0.000
NET REQUIREMENTS :	48.300-	14.490-	38.640-	28.980-	24.150-
(SMOOTHING) :					

PART NUMBER	DESCRIPTION	U/M	LEAD TIME	PART TYPE	PART CAT.	TOTAL STD COST	ECONOMIC ORDER QTY	RE-ORDER QUANTITY	W/H	L M	VENDOR
251050	100 CM P3804 FABRIC	SQMTR	005	R	B	0.3500	0.000	1000.000	A	M	FACTORY 6

	WEEK NO: 05 BACKLOG	WEEK NO: 03	WEEK NO: 05	WEEK NO: 07	WEEK NO: 10
QTY ON HAND :	1000.000	0.000	0.000	0.000	0.000
PURCHASE ORDERS :	0.000	0.000	0.000	0.000	0.000
OUTSTANDING WIP :	0.000	0.000	0.000	0.000	0.000
SALES REQUIREMENTS :	0.000	420.000	1120.000	840.000	700.000
WIP ALLOCATIONS :	1400.000	0.000	0.000	0.000	0.000
NET REQUIREMENTS :	400.000-	420.000-	1120.000-	840.000-	700.000-
(SMOOTHING) :					

Figure 6. Example of material requirements planning

< PRODUCTION UNIT 4 > < ORDER SPECIFICATION > < CUSTOMER DETAILS >

CUSTOMER: PRODUCTION UNIT 9 — BAG TYPE: WS8SSOO — CUSTOMER'S ORDER NO: R5281 — WORKS ORDER NO: 2694
DESCRIPTION: WHITE ST TOP + BOTT SPOUT — QUANTITY: 250 — " " DATE: — " " DATE: 26/11/86
PRICE: 6.50 — TERMS: DELIVERED — DESPATCH: 5/12/86 — DELIVERY ADDRESS:- — INVOICE ADDRESS:-
ISTG PRICE: 6.50 — BATCH TYPE: C — INV.CODE: 510107 — PRODUCTION UNIT 9 — PRODUCTION UNIT 4
ROTHERHAM — WORKSOP
NOTTS

< DIMENSIONS (CMS) >

BODY: 89 X 89 X 65 — SEAM ALLOWANCE: 9 — LOOPS: 79 — DELIVERY:
INVOICE:
TOP/DUFFLE: 100 X 100 X — BASE: 100 X 100
TOP SPOUT: 35 DIAM. X 50 — BASE SPOUT: 25 DIAM. X 50 — ADD. CHARGE: TRANSPORT £40
OUT SPOUT: DIAM. X — OUT. SPOUT: DIAM. X
LINER LNTH — DRAWING: — SMV= — PROFIT/LOSS — PROFIT %=

< CUTTING DETAILS > < SEWING DETAILS >

	STENCIL	LOCATION	COLOUR
UNIT 9	LOGO + BOX	SIDE 1	BLACK

ITEM	TYPE		MATERIAL DESCRIPTION	DRWG
BODY:	ST	111050	18 X 12 1500 KG WHITE 361 CM T	
TOP:	SPOUT	342000	11 X 10 WHITE EXT 100 CM	
TOP SPOUT:		342000	11 X 10 WHITE EXT 100 CM	
OUT. SPOUT:				
TOP TIE:	TAPE	683100	J832 20 MM TAPE BLACK	
BASE:	SPOUT	241000	14 X 11 WHITE 100 CM	
BASE SPOUT:		171000	14 x 11 WHITE 52 CM	
OUT. SPOUT:				
BASE TIE:	TAPE	683100	J832 20 MM TAPE BLACK	
LINER:				
LOOPS 1:	STND.	433950	50 MM WEBBING ANY COLOUR	
LOOPS 2:				

< ADDITIONAL CUTTING DETAILS >

OPERATION	TYPE		MATERIAL DESCRIPTION	DRWG
TOP ASSY:	2 NEEDLE	540000	TKT 15 THREAD WHITE	
BASE ASSY:	2 NEEDLE	540000	TKT 15 THREAD WHITE	
BOX/CROSS:	JUKI	540000	TKT 15 THREAD WHITE	
	PITNS: 4			
SIDE SEAM:	81-200	580700	6000 DEN THREAD BROWN	
BASE SEAM:	81-200	580700	6000 DEN THREAD BROWN	
LINING:				
TOP SEAM:	81-200	560000	4000 DEN THREAD WHITE	

LABEL 1: 710330 UNIT 4 1000 KG BLUE — LABEL 2:
LABEL 3: — LABEL 4:

< ADDITIONAL SEWING DETAILS >

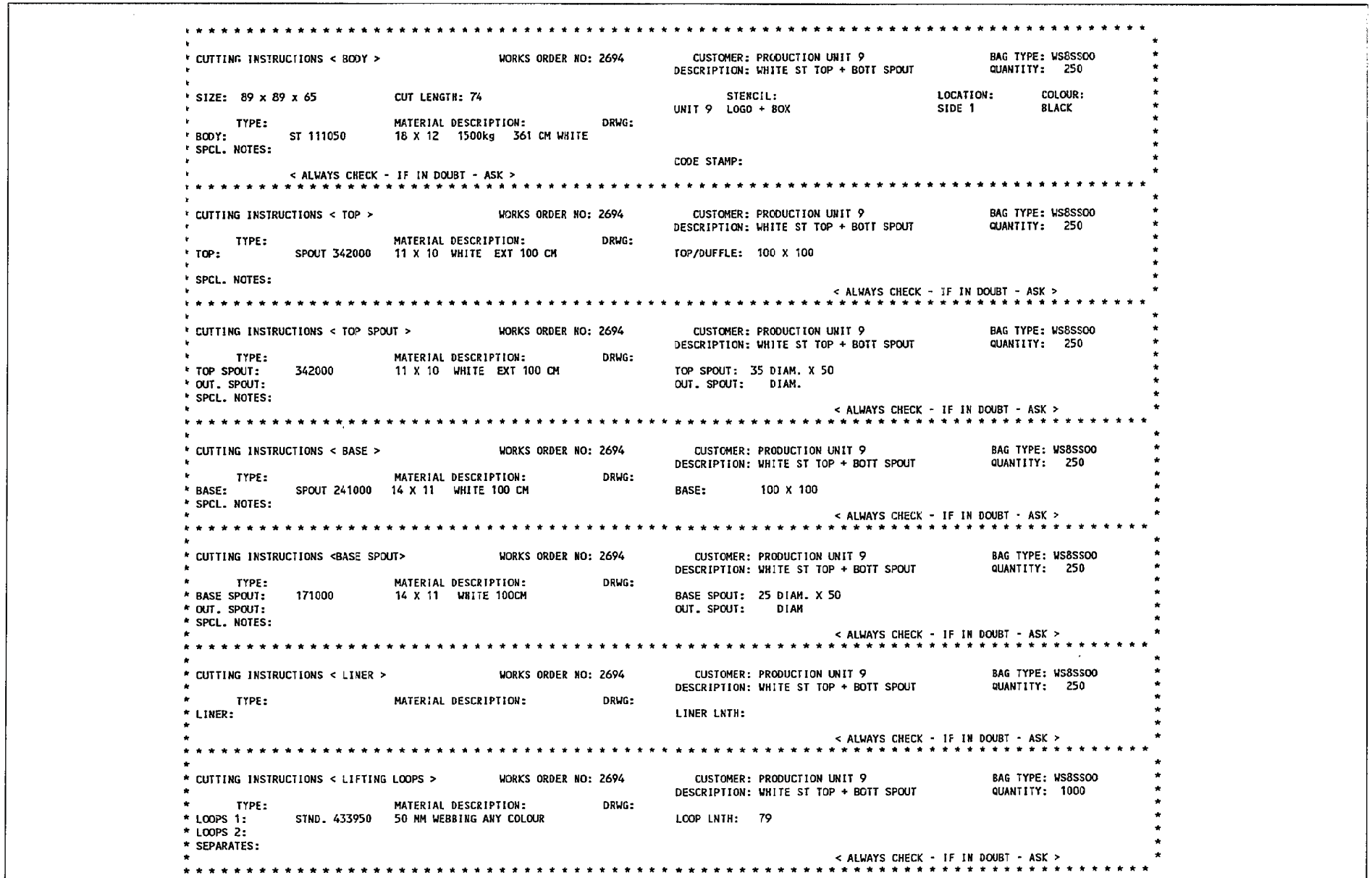
< OTHER PRODUCTION DETAILS >

FOLDING: TIE + SWAN-NECK BASE SPOUT — BALING: 25 PER BALE
QUALITY: ENSURE GOOD STENCILLING
OTHER: THIS SHEET IS ONLY AN EXAMPLE

WORKS ORDER NO: 2694

a) Example of a works order

Figure 7. Examples of works documentation



b) Example of job instructions

Figure 7. Examples of works documentation (*concluded*)

Annexes

Annex A (informative)
Bill of material (BOM)

For detailed analysis of the material and labour requirements for a particular production schedule, many computerized production control systems depend upon a bill of material (BOM) being defined for each product. The BOM is a list of the items (raw materials, parts and assemblies) required to make a product, arranged in a hierarchical structure to show the level by level build up of the product. For each item, the BOM shows the unit quantity of that item required to make its parent item at the next level up. Bills of material may also include other information such as the unit material and labour costs of an item and the time required to make it.

An example is shown in figure A.1. At level 1, finished product A is assembled in a standard time of 5.00 min from one subassembly B1 and two bought-out subassemblies B2.

At level 2, subassembly B1 is assembled in a standard time of 3.50 min from 2.50 units of material C1 and 1.75 units of material C2.

Since the computer system contains the unit cost of raw materials and purchased parts and the labour cost per standard minute, it can calculate detailed material and labour usages and costs for each level and each product.

In this way the order book can be analysed to produce a gross material requirements report. Comparison against stock levels and purchase orders placed enables a net material requirements report to be produced.

In addition, standard product costs can be calculated from the BOM.

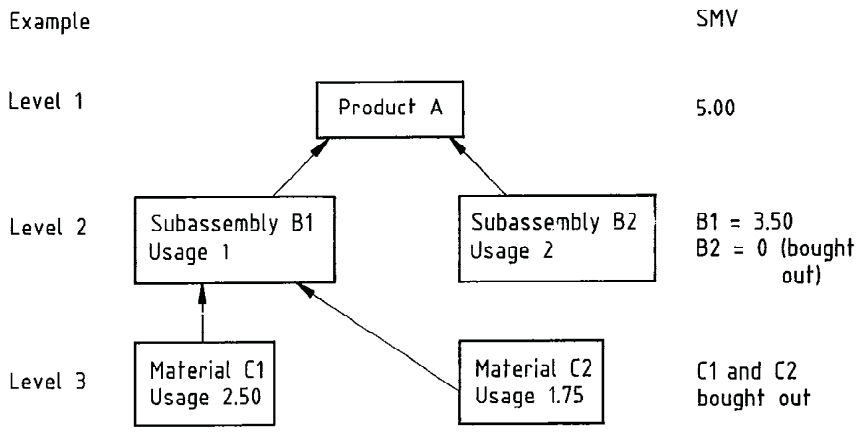


Figure A.1 Typical BOM hierarchy

Annex B (informative)
Management of changes in design

B.1 General

Design changes are necessary from time to time in order to improve the performance or marketability of a product and/or achieve reductions in unit manufacturing costs. Production control should be involved from an early stage in order to avoid excess and obsolete stocks of components or products no longer required and deterioration of service level.

Experience shows that even the best planned operation can have problems which affect the successful operation of a manufacturing company. The production control system and its information flows should be able to cope with amendments and changes. These can be caused by such things as late delivery of materials, inadequate supply of labour, quality problems or mistakes.

Other changes to designs, specifications or methods also affect the system and need to be specifically controlled.

B.2 Role of production control

The role of production control is to plan, monitor and record the implementation of design changes to ensure that:

- stocks are either consumed, modified or declared obsolete;
- new production orders are not started when a change is in hand;
- non-urgent changes are timed to ensure a smooth change-over;
- changes are actioned by both engineers and production in a timely fashion.

In designing a change control system the need to communicate change details widely has to be balanced against speed of action. Some aspects of the system may be designated as being necessary only for the few complex changes rather than the many simple ones.

In **B.3** and **B.4** the principles of change control are reviewed and some methods of implementing and controlling changes are described.

B.3 Principles of change control

B.3.1 *Objective*

The main problem in achieving effective control of design changes lies in ensuring that the right people are aware of the change in good time to act.

B.3.2 *What constitutes a design change*

A design is represented by some sort of master information record. It is the change to this which then has to be reflected at an appropriate time in the product being manufactured. Such design data may be in the form of one of the following:

a) engineering drawings;
b) list of parts or materials;
c) samples or models;
d) records in a computer system.

There are often secondary data on record which have to be amended as a result of design change before the product can be changed. Secondary data may also be modified when there is no change in basic design. These data can include technical specifications, method sheets, test specifications etc.

B.3.3 *Reasons for change*

When a new design is being launched, essential design changes will probably arise to help the product achieve its specification, rectify specific technical problems or improve manufacturability.

Another unavoidable cause of design changes is obsolescence, or the permanent loss of supply of a component or material. For example, a single source manufacturer may discontinue a product, or a grade of raw material from an overseas source may become unavailable owing to political changes.

In addition, there are optional design changes which are intended to improve sales, service or method of manufacture. They may be required to cut production costs, to facilitate a change of supplier or to make more sources available.

B.3.4 *Who needs to be involved*

For any design there should be one person clearly responsible for that design and for authorizing changes to it. This person is sometimes referred to as the design authority and is usually responsible for an easily defined product or product range. Depending on the nature of the product, its stage of development and the size of the company this responsibility could lie with the managing director, project manager, chief engineer, chief chemist, production engineer, etc.

Once a change has been specified and authorized some consistent means of communicating it is required. The people who need to know about design changes vary with product, product life and company structure, so a circulation list for change information is needed.

B.3.5 *Timing*

When authorizing a change, the design authority has to indicate the timing of the change; this changeover point may be mandatory or optional. If the timing is optional, the production control department is usually responsible for determining the introduction point (cut-in), of the change on the production line. This decision, in the form of a date, time, batch number, machine number, etc., has to be communicated to all the people identified as necessary recipients of change information.

B.4 Method of implementing and controlling changes

B.4.1 *General*

The process of identifying a problem, modifying the design and implementing this in production can be divided into the following stages (see also figure B.1):

- stage 1, advising the designer about the problem;
- stage 2, reviewing the problem and assigning the task of solving it;
- stage 3, reviewing the proposed solution;
- stage 4, detailing the change and notifying relevant departments;
- stage 5, validation by these departments;
- stage 6, changing master information and notifying departments;
- stage 7, changing secondary information (tools, routeing, costing);
- stage 8, production to revised design;
- stage 9, dealing with obsolete and surplus stocks and spares requirements;
- stage 10, modification of stock, work-in-progress and products in the field.

B.4.2 *Requesting a change*

Depending on the company involved, formal identification of product problems or suggestions is the responsibility of:

a) all employees; or

b) designated staff (e.g. production engineers, post-design engineers, test engineers, supervisors).

The simplest form of design change request, applicable in small organizations, is a note or memo to the designer. Even larger enterprises with a change board could be satisfied with a memo, but a change request form is more usual. An example of such a form is given in figure B.2 which shows the essential information to be included.

B.4.3 *Reviewing the problem*

The simplest review of a change request consists of a discussion between the originator and the designer. This is all that is needed if the designer is responsible for authorizing all changes to the design and if the originator is responsible for implementing changes in production and in the field. Where this is not so, more people are involved and a committee is usually established, often known as a change board, or modification board.

A design change may be implemented at a selected point in the future or it may be retrospective. Embodiment points should be specified. They may be expressed as effectivity dates, batch numbers or machine serial numbers.

B.4.4 *Reviewing the solution*

If specialist advice and action was required after stage 2, the solution is usually reviewed by the change board to assess its impact on the departments represented. The change may be approved, there may be no justification for a change or it might be necessary to investigate the problem further.

B.4.5 *Detailing the change*

Having received a change request form approved by the change board, the drawing office can then produce revised design information. At this stage this is on some form of copy or secondary documentation. Drawing masters, etc., are left intact but may be marked in some way to indicate that a change is pending.

The revised documentation is then shown to selected departments. Since this may represent a considerable delaying factor it may be sufficient for simple changes to be verified by the designer only. Where this is an acceptable procedure, it should be considered at the change board and the change request form endorsed to that effect.

The revised drawings, etc., are generally accompanied by a document detailing the changes, known as the change order (see figure B.3).

B.4.6 *Validation of the change*

The revised documentation needs verifying technically to ensure that it represents the chosen solution correctly and to check that it is practicable. A realistic plan for introducing the change into production is required, including plans for dealing with stock and WIP (see **B.4.10**). A plan is also needed for introducing the change in the field. Typically, therefore, the documentation and production change note will be checked and signed by a production or process engineer, production controller and the design authority. In some cases, documentation needs to be validated by accounts, purchasing, material control, quality control, etc.

B.4.7 *Changing the master information*

Amended master information, plus special drawings produced at stage 4 for field changes and temporary changes, now needs to be added to the store of master design data. In the case of permanent production changes, the master documentation is amended so the copies circulated at stage 4 are no longer needed. Revised master documents, modification drawings and change notes now need to be copied and circulated according to a predetermined list of those needing such information.

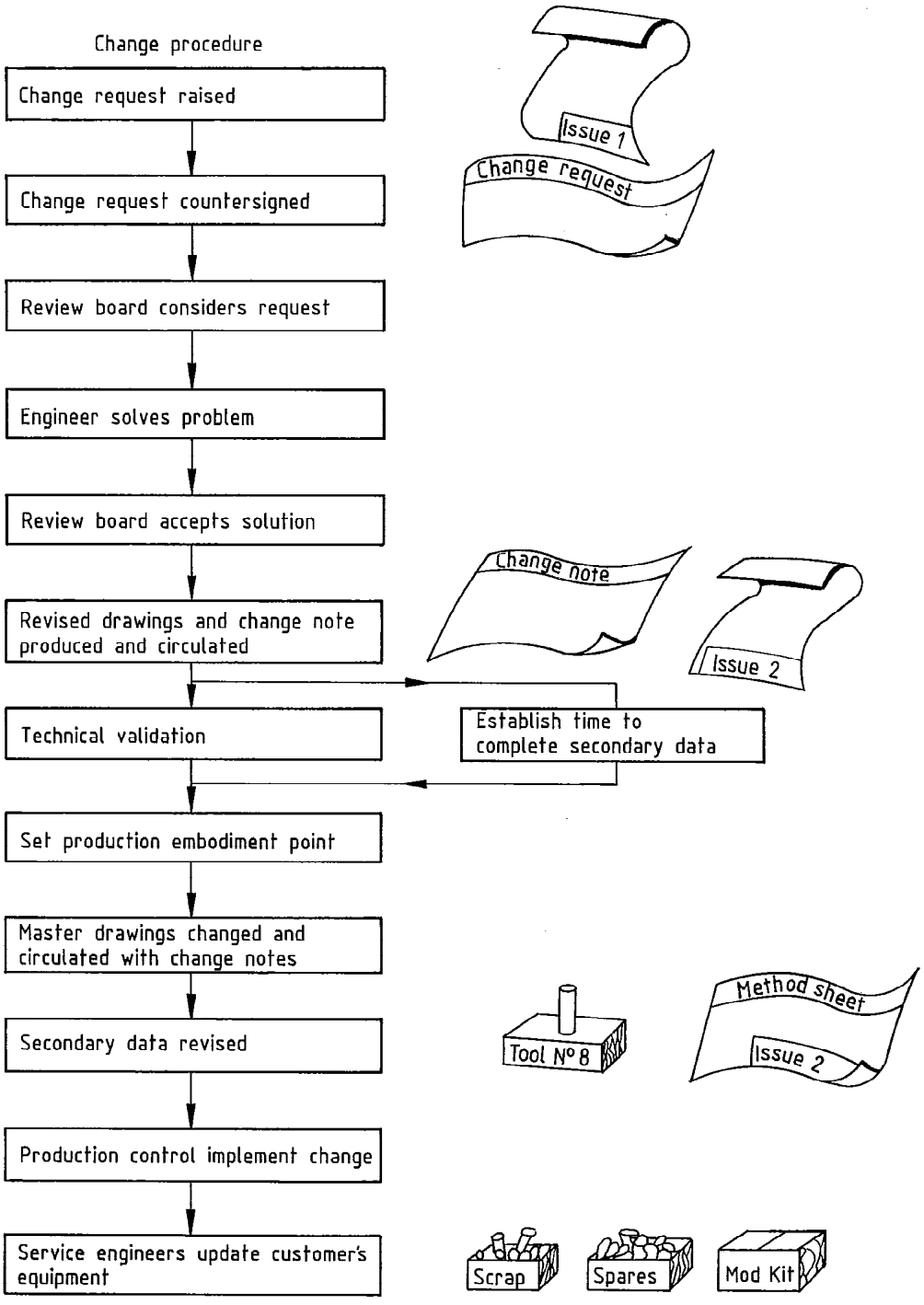


Figure B.1 Engineering change procedure

	ENGINEERING CHANGE REQUEST	N° 10001 SHT 1 OF 1 SHTS	D,R or F R
originator J blake date 29.10.90	this change will affect assy/part no. 123400		REV. A
supervisor L Hampton date 29.10.90	title Door Assy		

statement of problem (and suggested solution where possible) (use sketches) (use grid refs)

PROBLEM

Fitting 2 labels with 2 screws each is time consuming

SOLUTION

Use self-adhesive labels

Notes

Cost of tooling recovered in 6 months at current output rate

TOOLING LEADTIME 4 weeks.

min	APPROVALS	date
	ECC K. Parkis	30.10.90
	sect. leader E. Cobbett	30.10.90
	engineer	
	eng. mgr	
	matl ctrl	
	mfg	
	market	
	field serv	
	finance	
	other	

CATEGORY

- ☐ reliability
- ☐ performance
- ☐ safety
- ☐ produceability
- ☐ documentation
- ☐ serviceability
- ☐ customer special
- ☐ feasibility
- ☑ cost reduction
- ☐ new release

PRIORITY

- ☐ EMERGENCY
- ☑ SCHEDULE
- ☐ COMBINE/DEFER

(tick as appropriate)

TARGET DATE SOLUTION REQ'D:

BUDGETARY LIMIT

SPECIAL INSTRUCTIONS

☐ software update is reqd see ECR ----------

ENGINEER TO INVESTIGATE

DATE OF DESIGN REVIEW | signed

ECO No (solution to this problem) 6789

REMARKS

Figure B.2 Engineering change request

	ENGINEERING CHANGE ORDER	N° 6789
		SHT 1 OF 1 SHTS

ASSY/PART N°	TITLE	REV is	REV was	solution to problem started on	status D,R or F
123400	Door Assy	B	A.	ECR Nos 10001	R.

ITEM	IS part number	IS rev.	IS qty	add.	WAS part number	WAS rev.	WAS qty	del.	matl desp.	matl mgt aids	REMARKS
2	123404	A	1	✓	123401	A	1	✓	0		LABEL 1
3	123405	A	1	✓	123402	A	1	✓	0		LABEL 2
1	123406	A	1	✓	123403	B	1	✓	0		DOOR
10	991234		4				8				SCREWS
											DISPOSITION
											USE UP STOCK
											& CURRENT ORDERS

AFFECTS		EFFECTIVITY		CHANGE IMPACT CODE	
SYSTEMS IN FIELD	☐	MACHINE Nos BATCH No. 1200	PREFERRED ☑		
MFG WIP/INV	☐		ESSENTIAL ☐	MIN	☐
TEST/TOOLING FIX	☐	RELATED ECOs (those which must be implemented at the same time)		REPLAN	☐
MANUALS	☐			COST	☑
SPARES	☑			MAJOR COST	☐

prepared by	P. Parker	date 2.11.90	APPROVALS			
checked by	J. Bennet	2.11.90	ECC D.C. Hall	date 10.12.90	mfg	date
RELEASED			sect. leader		market	
assemble and test one off then consult engineer before proceeding	☐		eng.		field serv.	
			eng. mgr		finance	
			matl. ctrl		other	

Figure B.3 Engineering change order

B.4.8 *Changing the secondary information*

Departments responsible for secondary design data should be on the circulation list for design change notes. On being advised of a design change they modify the secondary information if necessary and circulate the modified version to those who need it. A design change cannot usually be implemented until this is done. For example, before a new component can be obtained, the purchasing information is needed. For this reason, it is appropriate in some circumstances to insist that certain secondary data are revised before the design change is considered complete. For instance, the general issue of new casting drawings may be delayed until an approved pattern exists.

B.4.9 *Production to the revised design*

Production control should ensure that purchase requirements, production paperwork, computer records, etc. are amended to call for the new design data at the embodiment point. Where this is so far in the future that such records have not yet been generated, either they are produced at once or some record is kept to show what action is needed at the appropriate time.

Many computer based planning systems use effectivity dates or batch numbers to control future embodiment.

It is usually incumbent upon the production controller to make sure that secondary data, tooling, etc. are available in time to produce the modified product by the appointed time.

Generally, the production control department is also involved at this time in producing modification kits for the service department and possibly for in-house updating of finished stock and work-in-progress.

B.4.10 *Obsolete items, surplus and spares*

An important and often complex task is to establish what stock and work-in-progress will exist at the embodiment point and to decide what to do with them. Spares also need to be considered and it may be necessary to produce obsolete items after the embodiment point for this requirement. Responsibility for this can be assigned to production control, production engineering, design office, sales or a spares organization, as appropriate.

B.4.11 *Modification of old items*

Modification of finished stock and products in service generally requires a kit of materials (and possibly tools) and the use of production resources. The content of the kits should be specified by the designers, listed and issued as part of the modification documentation. The number of kits required for finished stock is assessed by production control or the distribution organization, depending on where it is stored. The number of kits required for products in the field is assessed by the spares and service organization.

Production control then has the task of breaking these quantities down into material requirements and arranging modification of stock and customers' equipment which is returned for updating. Kits of material may also be required to modify subassemblies held as WIP stock. These requirements are rarely detailed by designers and are evaluated by some combination of change control, production control, production engineering and quality control.

List of references (see clause 2)

Normative references

BSI standards publications

BRITISH STANDARDS INSTITUTION, London

BS 3138 : 1992	*Glossary of terms used in management services*
BS 5191 : 1975	*Glossary of production planning and control terms*
BS 5192 :	*Guide to production control*
BS 5192 : Part 1 : 1993	*Introduction*

Informative references

BSI standards publications

BRITISH STANDARDS INSTITUTION, London

BS 5750	*Quality systems*

Other references

[1] GREAT BRITAIN. Health and Safety at Work etc. Act 1974. London : HMSO.

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