CLASSIFICATION, CODIFICATION & SPECIFICATIONS

CLASSIFICATION, CODIFICATION & SPECIFICATION
Outline of Presentation

- Need for classification and identifications of materials.
- Classification of Materials.
- Codification: Nature, process, merits and demerits.
- Codification Systems, Stores Vocabulary, Marking of Stores.
- Objective of specifications.
- Specification.
- Categories and development.

Need for classification

- Standardization means **producing maximum variety of products** from the **minimum variety of materials, parts, tools and processes.**
- This implies reducing **unnecessary varieties** and **standardizing** to **the most economical sizes, grades, shapes, colors**, **types of parts** and so on.
- It is the process of **establishing standards** or **units of measure** by which **extent, quality, quantity, value, performance etc., may be compared and measured.**

Advantages of Standardization

All the sections of company will be benefited from standardization as mentioned below.

- **Benefits to Design Department**

1. **Fewer specifications, drawings and part list** have to prepared and issued.
2. **More time** is available **to develop new design** or **to improve established design**.
3. **Better resource allocation**.
4. **Less qualified personnel can handle routine design work.**

Advantages of Standardization (2)

All the sections of company will be benefited from standardization as mentioned below.

- **Benefits to Manufacturing Department**

1. **Lower unit cost.**
2. **Better quality** products.
3. **Better methods** and tooling.
4. **Increased interchangeability** of parts.
5. **Better utilization of manpower** and **equipment.**
6. **Accurate delivery dates.**
7. **Better services** of production control, stock control, purchasing, etc.
8. **More effective** training.

Advantages of Standardization (3)

- **Benefits to Marketing Department**

1. **Better quality products** of **proven design at reasonable cost** leads to **greater sales volume**.
2. **Increased margin** of profit.
3. **Better product delivery**.
4. **Easy availability** of sales part.
5. **Less sales pressure** of after-sales services.

Advantages of Standardization (4)

- **Benefits to Production Planning Department**

1. **Scope for improved methods, processes and layouts.**
2. **Opportunities** for **more efficient tool design.**
3. **Better resource allocation.**
4. **Reduction** in **pre-production activities.**

Advantages of Standardization (5)

- **Benefits to Production Control Department**

1. **Well proven design** and **methods to improve planning and control**.
2. **Accurate delivery promises.**
3. **Fewer delays** arise from waiting for materials, tools, etc.
4. **Follow-up** of **small batches** consumes less time.

Advantages of Standardization (6)

- **Benefits to Purchase and Stock Control Department**

1. Holding of stock of standard items leads to ***less paper work*** and ***fewer requisitions*** and ***orders***.

2. **Storage** and **part location** can be **improved.**

3. **Newer techniques** can be used for **better control of stocks.**

4. Because of **large purchase quantities involved**, **favourable purchase contracts** can be made.

Advantages of Standardization (7)

- **Benefits to Quality Control Department**

1. **Better inspection and quality control** is possible.

2. Quality **standards** can be **defined more clearly.**

3. **Operators** become **familiar** with the **work** and **produce jobs** of **consistent quality.**

Advantages of Standardization (8)

- **Other Benefits**

1. **Work study** section is benefited with **efficient break down of operations** and **effective work measurement.**

2. **Costing** can obtain **better control** by installing **standard costing.**

3. **More time** is available to the supervisors to make **useful records** and **preserve statistics.**

4. **Reduced reductions** and **scrap.**

5. **Helps supervisors** to run his **department efficiently** and **effectively.**

Disadvantages of Standardization

Following are the **disadvantages** of **standardization:**

1. **Reduction in choice** because of **reduced variety** and **consequently loss of business or customer**.

2. Standard once set, resist change and thus **standardization may become an obstacle to progress.**

3. It tends **to favour only large companies.**

4. It becomes very **difficult to introduce new models** because of **less flexible production facilities** and **due to high cost of specialized production equipment.**

Simplification

- The concept of **simplification is closely related** to **standardization.**
- Simplification is the process of **reducing the variety of products** manufactured.
- Simplification is concerned with the **reduction of product range**, **assemblies**, **parts, materials and design.**

- **Advantages of simplification:**

1. Simplification involves **fewer, parts, varieties and changes in products**; this **reduces manufacturing operations** and **risk of obsolescence.**
2. Simplification **reduces variety, volume of remaining products may be increased.**
3. Simplification **provides quick delivery** and **better after-sales services.**
4. Simplification **reduces inventory** and thus **results in better inventory control.**
5. Simplification **lowers the production costs.**
6. Simplification **reduces price of a product**.
7. Simplification **improves product quality.**

Codification

- **Codification/cataloguing** is basically an **identification system** for each **item of the inventory.**
- **Standardization** supports the fundamental **precepts of build-to-order** and **mass customization.**
- Standardization **makes it easier for parts to be pulled into assembly** (instead of ordering and waiting) by **reducing the number of part types to the point** where **the remaining few standard parts** can receive the **focus to arrange demand-pull just-in-time deliveries.**

Basis of Codification

- **Codification of materials** can also be termed as the **identification of materials.** This deals with **uniquely identifying each item** in the **inventory.**
- **Codification** is useful:
  - in **requisitioning items** or the operational departments,
  - in **placing of orders** by **the purchase department**,
  - in **receiving** and **expediting** the **items on receipt** from the supplier,
  - in having a **unique record of each of the items in stores**, and
  - in **work-in-process** or in **warehouse** so as to **facilitate the control over the inventory** levels, and also in having a good control over the **loss**, **deterioration**, **obsolescence**, **non-movement**, or **pilferage** of the items in the inventory.

•**Unique identification of the materials** – whether they are **raw materials, work-in-process or finished goods** – is the first step towards a **good materials management system**. Without it, the control over inventory by rigorous exercises such as **inventory techniques is not very effective**. Without it, confusion might prevail in the operational departments. Moreover for **a good quality control system a unique identification is a prerequisite**. There are many other advantages such as **variety reduction** and **standardization**, etc.

Objectives of Codification

• The objectives of a rationalized material coding system are:

1. **Bringing all** items **together.**
2. To enable putting up of **any future item in its proper place**.
3. To **classify an item according** to its **characteristics.**
4. To give **an unique code** number to each item **to avoid duplication** and **ambiguity.**
5. To **reveal excessive variety** and **promote standardization** and **variety reduction.**
6. To **establish a common language** for the **identification of an item**.
7. To **fix essential parameters** for **specifying an item**.
8. To **specify item** as per **national** and **international standards.**
9. To **enable data processing** and **analysis.**

Codification by Group Classification

• In Coding an unique number is assigned to a particular item in the inventory.

• For example - 010237 might mean a specific item in inventory such as
- ✓a particular kind of gasket,
- ✓of a certain material,
- ✓of a certain shape, and
- ✓of certain dimensions.

• Of course, each of these numbers or groups of numbers (within the total identification number) should convey some unique information.

Examples of classification of inventory

- **By providing numbers:**
  - ✓01 – Raw materials
  - ✓02 – Purchased components
  - ✓03 – Spare parts
  - ✓04 – Tools
  - ✓05 – Fixtures and Patterns
  - ✓06 – Other supplies
- **Classification may be based on the 'shape' of the items:**
  1. Wire
  2. Tubing
  3. Rod
  4. Bar
  5. Sheet
  6. Strip
- **Another classification can be on the basis of material of construction. For instance:**
  1. Mild Steel
  2. Stainless Steel
  3. Bronze
  4. Aluminum
  5. Special alloy
  6. PVC **Notes**
  7. Polypropylene

Characteristics of a Good Coding System

(a) ***Brevity:*** The codification system **should avoid long and unwieldy description**. This implies that the codes **should consist of minimum possible number of digits.**

The size of the code would normally be **dictated by the number** and **range of items,** and **the number and types of applications** of the **data pertaining to the item.**

Example: For the pencil code 07.39.1236, the last digit representing the price range may be deleted if such information is not needed.

(b) ***Logical:*** The coding system **should be logically fit** for **the needs of the users** and **the methods of data processing employed.**

For the example of pencil code - the last digit representing price range should have an increasing price range with the value of the digit increasing, that is, a value of digit as 8 may indicate a higher price range of say 2.00-2.25.

Characteristics of a Good Coding System (2)

(c) ***Flexibility:*** The code design **should be flexible to accommodate changes without disturbing existing codes.** We are familiar with the library coding system in which codes do never get disturbed by addition of new books and all books to come in future are easily accommodated by the existing code structure.

(d) ***Uniqueness:*** Each code must be **a unique representation** for the **item it identifies**. For instance, an **inventory item number** or **employee identification code** must **identify one** and **only one inventory item** or **employee**. *Notes* **The code structure must be easily understood by various users**. It should be **as simple**, **practical** and **meaningful** as possible.

Characteristics of a Good Coding System (3)

(e) ***Proper Choice of the Coding Symbols:*** While a code may have **numbers, alphabets** or **a mixture of both**, certain precautions should be taken in selection of the symbols. **Characters with similar appearances should be eliminated**. For example, the letters 0, Z, I, S and V may be confused with the numbers 0 (zero), 2, 1, 5 and U, respectively. **Where possible, letters that sound the same should be avoided** (for example, B, C, D, G, P and T or M and N).

(f) ***Layout of Codes:*** The **layout of code should be equal in length**. For example, **a code 001-199** should be **preferred over 1-199.** Codes **longer than four alphabetic** or **five numeric characters** should be **divided into smaller segments** for **human judgments.**

Characteristics of a Good Coding System (4)

(g) Capacity of a System: When calculating **the capacity of a given code** for **covering all situations** while **still maintaining code uniqueness**, the following formula applies:

$$C=S^P$$

- Where,

  C is **total available code combinations possible**,

  S is **the number of unique characters** in the set, and

  P is **the number of code positions**.
- *Example:* A **3-digit code** with numbers 0 to 9 will have 10^3 =**1,000 unique code combinations**.
- ***The size of code structure, therefore, should be decided before hand by anticipating the requirements of the unique combinations.***

Types of Coding

The **three important methods** of codification:

1. Numerical Method
2. Alphabetical Method
3. Numerical Cum Alphabetical Method

Numerical Method

- Under this method, **each number** or **numerical digit is allotted** to **each item or material**.
- For example, in printing press following codes may be assigned:

  Paper 145
  Ink 155
  Gum 165
- There are various **universal decimal classification** of **codification** used in libraries may be indicated for **identification of items**.
- This method is used where **materials accounting** is **to be mechanized** by **use of punched cards** or computers.

Alphabetical Method

- In this method **alphabets or letters** are used for codification of **each category** of materials.
- Accordingly, **each letter** or **alphabet** is **allotted for each item or material**. For example: **'C' for copper**, **'S' for steel** and so on.

Numerical cum Alphabetical Method

- This method is done by **a combination of numerical and alphabetical method**.
- Under this method both numerical along with alphabet is allotted for each item.
- For example, **IR 5** may indicate **Ink Red** of **Grade 5**, **Steel wire 6** may be denoted by **SW 6** etc.

Advantages of Codification

- As a result of **rationalized codification**, many firms have **reduced the number of items**.
- It **enables systematic grouping of similar items** and **avoids confusion caused by long description of items** since standardization of names is achieved through codification, it **serves as the starting point of simplification** and **standardization.**
- It helps in **avoiding duplication of items** and **results in the minimization of the number of items**, leading to **accurate record.**
- Codification **enables easy recognition of an item in stores**, thereby **reducing clerical efforts** to the **minimum.**
- **If** items are **coded according to the sources**, it is **possible to bulk the items while ordering.**

Concluding Remarks

- **Codification/cataloguing** is basically **an identification system** for each item of the inventory.
- **Standardization** supports the fundamental precepts of **build-to-order** and **mass customisation.**
- **Unique identification of the materials** – whether they are raw materials, work-in-process or finished goods – is **the first step towards a good materials management system.** In **codification system**, the codes should consist of **minimum possible number of digits**. The coding system **should be logically fit** for the needs of the users and the methods of data processing employed.
- The **code design should be flexible to accommodate changes** without disturbing existing codes.
- **Numerical Method** is used where **materials accounting is to be mechanized** by use of punched cards or computers.
- In **numerical cum alphabetical method** both numerical along with alphabet is allotted for each item.
- **Standardization enables** the materials manager to **achieve overall economy** and **ensures interchangeability of parts.**
- By using **national standards**, it is easier **to locate sources of supplies** and in the case of machine parts, **the replacements can be obtained easily.**

Specification

- The first concern of purchasing—what to buy—is not necessarily a simple decision.
- For example, someone deciding to buy a car should consider
  - how the car will be used ?
  - how often ?
  - how much one is willing to pay ? and so on.
- Only then can an individual specify the type of car needed to make the "best buy."

✓ problems that organizations face when developing specifications of products, and
✓ the types of specifications that may be used.

Factors to be considered when developing specifications – CATEGORIES of SPECIFICATIONS

- In purchasing an item or a service from a supplier, several factors are included in the package bought.
- These must be considered when specifications are being developed and can be divided into three broad categories:

1) Quantity requirements.
2) Price requirements.
3) Functional requirements.

Quantity Requirements

- Market demand first **determines the quantity needed**.
- The **quantity** is important because it will be a factor in the way the product is **designed, specified, and manufactured**.
- For example, if the **demand** was for **only one item**, it would be **designed to be made at least cost**, or a **suitable standard item** would be **selected.**
- However, if **the demand** were for **several thousand**, the **item would be designed to take advantage of economies of scale**, thus **satisfying the functional needs** at a **better price**.

Price requirements

- The price specification represents **the economic value** that the **buyer puts** on **the item**— ***the amount the individual is willing to pay.***
- If the **item** is to be **sold** at **a low price**, the **manufacturer will not want to pay** a **high price** for a component part.
- **The economic value** placed on the item **must relate to the use of the item** and its anticipated selling price.

Functional Requirements

- **Functional specifications** are concerned with the **end use of the item** and **what the item is expected to do.**
- By their very nature, **functional specifications** are **the most important of all categories** and govern the others.
- In a sense, functional specifications are **the most difficult to define.**
- To be successful, they **must satisfy the real need or purpose of an item.**
- In many cases, the **real need has both practical and aesthetic elements** to it.
- **A coat is meant to keep one warm, but**

1) under what circumstances does it do so ?, and
2) what other functions is it expected to perform?,
3) How cold must it get before one needs a coat?,
4) On what occasions will it be worn?,
5) Is it for working or dress wear?,
6) What color and style should it be?,
7) What emotional needs is it expected to fill?,

- In the same way, we can ask what **practical** and **aesthetic needs** a door handle or side-view mirror on a car is expected to satisfy.

Functional specifications and quality

- **Functional specifications** are **intimately tied** to the **quality of a product** or **service.**
- Everyone knows, or thinks he or she knows what quality is, but there are several **misconceptions** about what it is and what it is not.
- Ask someone what is meant by quality, and you will get FUZZY replies such as "The best there is," "Perfection," "Degree of excellence," and "Very good." (sounds great but all are meaningless)
- There are many **definitions of quality**, but they **all center on the idea of user satisfaction**. On this basis, it can be said that an item has the required quality if it satisfies the needs of the user.

Functional specifications should define the quality level needed.
They should describe all those characteristics of a product determined by its final use.

Phases to provide user satisfaction

1. Quality and product planning

Decisions about which products and services a company is to market.

Decisions about the market segment to be served, the product features and quality level expected by that market, the price, and the expected sales volume.

The basic quality level is thus specified according to their understanding of the needs and wants of the marketplace.

2. Quality and product design

The result of the firm's market studies is a general specification of the product outlining the expected performance, appearance, price, and sales volume of the product.

The job of the product designer is to build into the design of the product the quality level described in the general specification.

If this is not properly done, the product may not be successful in the marketplace.

3. Quality and manufacturing

the responsibility of manufacturing is to meet the specifications laid down by the product designer.

If the item is bought, it is purchasing's responsibility to make sure the supplier can provide the required quality level.

For purchasing and manufacturing, quality means conforming to specifications or requirements.

4. Quality and use

To the final user, quality is related to his or her expectation of how the product should perform.

Customers do not care why a product or service is defective. They expect satisfaction.

If the product is what the customer wants, well designed, well made, and well serviced, the quality is satisfactory.

Description of functional specification

- Functional specification can be described in the following ways or by a combination of them:

1. By brand.

2. By specification of physical and chemical characteristics, material and method of manufacture, and performance.

3. By engineering drawings.

4. Miscellaneous.

Description by Brand

- Description by brand is **most often used in wholesale** or **retail businesses** but is **also used extensively in manufacturing**. It is better under the following circumstances:

✓ Items are **patented**, or the process is **secret**.

✓ The supplier has **special expertise** that the **buyer does not have.**

✓ The **quantity bought is so small** that it is not worth the buyer's effort to develop specifications.

✓ The supplier, **through advertising** or **direct sales effort**, has created **a preference** on **the part of the buyer's customers or staff.**

- When buying by brand, the customer is relying on the **reputation**, **integrity**, **quality** and **trust** on the supplier.
- **Disadvantages on description by Brand**:
  - Branded items, as a group, usually **have price levels** that are **higher than nonbranded** items.
  - It may be **less costly** to develop specifications for **generic products** than to rely on brands.
  - It **restricts the number of potential suppliers** and **reduces competition**.
- Therefore, the usual practice, when specifying by brand, is to ask for the **item by brand name** or **equivalent** (**this allows for competition**)

Description by Specification

• There are several **ways of describing a product**, but they usually **include one or more of the following.** Whatever method is used, **description by specification depends on the buyer** describing in detail exactly what is wanted:

1) ***Physical and chemical characteristics.*** The buyer must define the physical and chemical properties of the materials wanted. **Petroleum products**, **pharmaceuticals**, and **paints** are often specified in this way.

2) ***Material and method of manufacture.*** Sometimes the method of manufacture **determines the performance** and **use of a product**. For example, **hot- and cold rolled steels** are made differently and have different characteristics.

3) ***Performance.*** This method is used when **the buyer is primarily concerned** with what the item is required to do and is prepared to have **the supplier decide how performance is to be attained**. For example, **a water pump** might be specified as **having to deliver so many gallons per minute**. Performance specifications are **relatively easy to prepare** and take **advantage of the supplier's special knowledge**.

Description by Specification

Whatever the method of specification, there are several characteristics to description by specification:

1) To be useful, specifications must be **carefully designed**. If they are **too loosely drawn**, they **may not provide a satisfactory product**. If they are **too detailed** and **elaborate**, they **are costly to develop**, are **difficult to inspect**, and **may discourage possible suppliers.**

2) Specifications must **allow for multiple sources** and for **competitive bidding**.

3) If **performance specifications** are used, **the buyer is assured that if the product does not give the desired results**, the seller is responsible. They **provide a standard** for **measuring and checking the materials** supplied.

4) **Not all items lend themselves to specification**. For example, it may not be easy to specify color schemes or the appearance of an item.

5) **An item described by specification may be no more suitable**, and a great deal more expensive, than a supplier's standard product.

6) If the specifications are set by the buyer, they **may be expensive to develop**. They **will be used only when there is sufficient volume of purchases to warrant the cost** or where it is not possible to describe what is wanted in any other way.

Sources of specifications

There are two major sources of specifications:

1) Buyer specifications.

2) Standard specifications.

Buyer specifications

1) Buyer specifications.

Buyer-developed specifications are

a) Usually expensive and time consuming to develop.

b) Companies usually do not use this method
- unless there is no suitable standard specification available, or
- unless the volume of work makes it economical to do so.

Standard specifications

2) Standard specifications.

- **Standard specifications** have been developed as a result of much study and effort by **governmental** and **nongovernmental** agencies.
- They **usually apply to raw or semifinished products**, **component parts**, or the **composition of material**.
- In many cases, they have become **de facto standards** used by **consumers** and **by industry**. For example, **SAE 10W30** - **motor oil for a car**, we are specifying a standard grade of motor oil established by the Society of Automotive Engineers.
- Most of the **electrical products** we buy are manufactured to **Underwriters Laboratory, (UL) standards. Steel and structural steel members** are manufactured **to standards set** by the **American Society of Mechanical Engineers**.

Advantages to using standard specifications

1) they are **widely known** and **accepted** and, because of this, are readily available from most suppliers.
2) because they are widely accepted, manufactured, and sold, they are **lower in price than nonstandard items**.
3) because they have been developed with input from a broad range of producers and users, they are **usually adaptable to the needs of many purchasers**.

Market grades are a type of standard specification usually set by the government and used for commodities and foodstuffs. When we buy eggs, for example, we buy them by market grade—small, medium, or large.

Engineering Drawings

- **Engineering drawings**

✓ describe in detail the **exact configuration** of the **parts** and the **assembly**.

✓ **give information** on such things as **finishes**, **tolerances**, and **material to be used**.

✓ are a major method of specifying **what is wanted** and are widely used because often there is **no other way to describe** the configuration of parts or the way they are to fit together.

✓ are produced by the engineering design department and are **expensive to produce**, but they give an exact description of the part required.

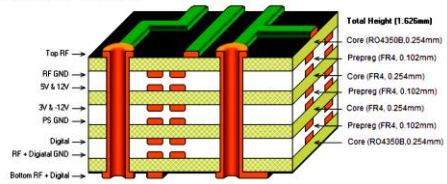
Miscellaneous

- There are a variety of other methods of specification including the famous phrase "**Gimme one just like the last one**."
- Sometimes **samples** are used, for example, when colors or patterns are to be specified.
- Often a variety of methods can be used, and the buyer must select the best one.
- The **method of description is communication** with the supplier. How well it is done will affect the success of the purchase and sometimes the price paid.

Example 1- specifications of PCB

Item: Fabrication of multilayer RF PCB for RFFE of single pass BPM

1. **PCB Size** : 250mmX300mm
2. **No. of Layers** : **8**
3. **Overall thickness of PCB:** ~ 1.6 mm
4. **Quantity** : 5 Nos.
5. **Layer stack management:**



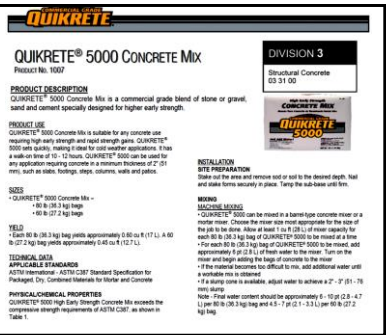
Example 1- specifications of PCB page 2

6. **Detailed specifications:**
   1. **Top and bottom layer core material:** RO4350B make Rogers or equivalent
   2. **Dielectric constant of top and bottom core:** 3.48±0.05
   3. **RF track impedance:** 50 ohm
   4. **Intermediate core layer:** FR4 or equivalent
   5. **Prepreg:** FR4 or equivalent
   6. **Thickness of the core:** 10 mil
   7. **Thickness of prepreg:** 4 mil
   8. **Copper thickness (top layer and bottom layer):** 35 µm
   9. **Copper thickness (intermediate layer):** 35 µm
   10. **Minimum conductor (track) width for all layers:** 8 mil
   11. **Minimum via drill** : 10 mil
   12. **Via types:** Blind via (L1-L2,L1-L3, L6-L8 and L7-L8). Buried via(L3-L6).Through via
   13. **Component pad plating: ENIG**
   14. **Solder mask colour:** Red
   15. **Legend colour:** White
   16. Gerber data will be provided in soft-copy for fabrication

Terms and condition:

1. Quotation received from original manufacturer or their authorized representative / reputed dealer will only be accepted.
2. It is mandatory to declare the name and address of the original manufacturer.
3. Material must be supplied in original manufacturers packing. Batch number should be mentioned on the packing. The supplier must provide all the films related to the PCB along with the fabricated item.
4. A test report showing conformance to the specifications must be provided from the manufacturer.
5. The PCB will be accepted on the basis of certificate of compliance (COC) from the manufacturer and testing of PCB at RRCAT.

Example - Cement Concrete Mix



QUIKRETE® 5000 CONCRETE MIX

PRODUCT No. 1007

DIVISION 3

Structural Concrete
03 31 00

PRODUCT DESCRIPTION

QUIKRETE® 5000 Concrete Mix is a commercial grade blend of stone or gravel, sand and cement specially designed for higher early strength.

PRODUCT USE

QUIKRETE® 5000 Concrete Mix is suitable for any concrete use requiring high early strength and rapid strength gains. QUIKRETE® 5000 sets quickly, making it ideal for cold weather applications. It has a walk-on time of 10 - 12 hours. QUIKRETE® 5000 can be used for any application requiring concrete in a minimum thickness of 2" (51 mm), such as slabs, footings, steps, columns, walls and patios.

SIZES

• QUIKRETE® 5000 Concrete Mix –
  • 80 lb (36.3 kg) bags
  • 60 lb (27.2 kg) bags

YIELD

• Each 80 lb (36.3 kg) bag yields approximately 0.60 cu ft (17 L). A 60 lb (27.2 kg) bag yields approximately 0.45 cu ft (12.7 L).

TECHNICAL DATA

APPLICABLE STANDARDS

ASTM International - ASTM C387 Standard Specification for Packaged, Dry, Combined Materials for Mortar and Concrete

PHYSICAL/CHEMICAL PROPERTIES

QUIKRETE® 5000 High Early Strength Concrete Mix exceeds the compressive strength requirements of ASTM C387, as shown in Table 1.

INSTALLATION

SITE PREPARATION

Stake out the area and remove sod or soil to the desired depth. Nail and stake forms securely in place. Tamp the sub-base until firm.

MIXING

MACHINE MIXING

• QUIKRETE® 5000 can be mixed in a barrel-type concrete mixer or a mortar mixer. Choose the mixer size most appropriate for the size of the job to be done. Allow at least 1 cu ft (28 L) of mixer capacity for each 80 lb (36.3 kg) bag of QUIKRETE® 5000 to be mixed at a time
• For each 80 lb (36.3 kg) bag of QUIKRETE® 5000 to be mixed, add approximately 6 pt (2.8 L) of fresh water to the mixer. Turn on the mixer and begin adding the bags of concrete to the mixer
• If the material becomes too difficult to mix, add additional water until a workable mix is obtained
• If a slump cone is available, adjust water to achieve a 2" - 3" (51 - 76 mm) slump

Note - Final water content should be approximately 6 - 10 pt (2.8 - 4.7 L) per 80 lb (36.3 kg) bag and 4.5 - 7 pt (2.1 - 3.3 L) per 60 lb (27.2 kg) bag.

Example - Cement Concrete Mix

APPLICABLE STANDARDS
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PHYSICAL/CHEMICAL PROPERTIES
QUIKRETE® 5000 High Early Strength Concrete Mix exceeds the compressive strength requirements of ASTM C387, as shown in Table 1.

TABLE 1 TYPICAL PHYSICAL PROPERTIES[1]

Compressive strength, ASTM C39	
1 day	1500 psi (10.3 MPa)
3 day	2500 psi (17.2 MPa)
7 days	3500 psi (24.1 MPa)
28 days	5000 psi (34.5 MPa)
Slump range 2" - 3" (51 - 76 mm)	

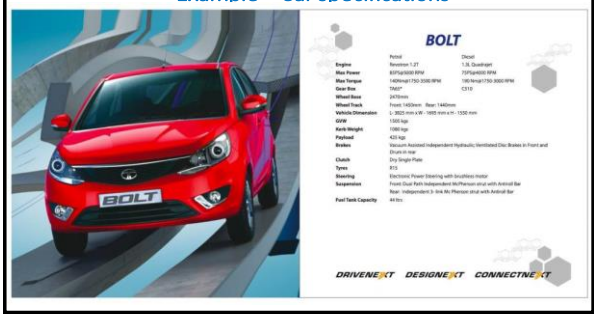
[1]Tested under standard laboratory conditions in accordance with ASTM C387.

water and begin adding the bags of concrete to the mixer
• If the material becomes too difficult to mix, add additional water until a workable mix is obtained
• If a slump cone is available, adjust water to achieve a 2" - 3" (51 - 76 mm) slump
Note - Final water content should be approximately 6 - 10 pt (2.8 - 4.7 L) per 80 lb (36.3 kg) bag and 4.5 - 7 pt (2.1 - 3.3 L) per 60 lb (27.2 kg) bag.

HAND MIXING
• Empty bags into a suitable mixing container
• Add approximately 6 pt (2.8 L) of clean water for each 80 lb (36.3 kg) bag
• Work the mix with a shovel, rake or hoe and add water as needed until a stiff, moldable consistency is achieved
• Do not exceed a total volume of 10 pt (4.7 L) per 80 lb (36.3 kg) bag or 7 pt (3.3 L) per 60 lb (27.2 kg) bag
• Be sure all material is wet; do not leave unabsorbed puddles of water

TEMPERATURE OF WATER
Set times will fluctuate in extremely hot or cold weather. Use cold water or water mixed with ice cubes in severely hot weather; use hot water when mixing in severely cold weather.

Example – Car specifications



B2B Specifications

- Stages in the typical B2B buying cycle:
  - initial phase where **users research their company's problem** to find possible product solutions,
  - a phase where **users compare product options** from multiple vendors and assess which solution fits their needs best.
- Users at different stages of the conversion funnel need different levels of detail about products and solutions.
- **Prospective customers** interested in a product need **clear answers** to **make sure that the product fits their specific requirements**, so **comparison** against competitors is **possible.**
- **Product-specification** lists need to go **beyond** the **product benefits** and **high-level descriptions**, and include
  - **clear**, **specific**, **realistic** details that can **speak** in **detailed terms** about all of the important aspects of
    - **how a product works**,
    - its **physical characteristics**, and
    - **how it integrates** into larger systems.

Factors to be considered while preparing specifications

1) **Footprint** (i.e. the physical size for physical products or resources consumed by software products)
2) **Ingredients** (what key components, parts, technologies, or materials are used)
3) **Requirements and integrations** (environmental conditions, consumable physical resources, system requirements, and integrations with software or other physical products needed to form a complete solution to your problems)
4) **Performance** (measurements of desired capabilities, behaviors, operation, and output, as well as any waste byproducts that are produced in operation)
5) **Tolerances and durability** (allowed level of deviation from listed specs, error rate, resistance to environmental conditions)

Typical Examples – Specifications of Physical products

Type of Specification	Examples and Notes
Detailed physical dimensions of products	•Engineering diagrams with measurements •Physical space required for installation •Ventilation space needed for safe operation
Weight of item	•Variations for both loaded and unloaded weights (such as a vehicle loaded with fuel or payload)
Physical connections with other products	•Interconnects •Ports •Diagram of physical layout of ports and connectors, including dimensions, so users can determine if there is enough physical space for convenient hookup.

Typical Examples – Specifications of Physical products

Type of Specification	Examples and Notes
Key components	•Types and grades of materials used for critical components, such as: • Metals • Plastics • Wiring • Tubing • Insulation •Manufacturer and product names of key hardware components produced by third parties, such as: • Engines • Processors • Robotics components • Power supplies

Typical Examples – Specifications of Physical products

Type of Specification	Examples and Notes
Resistance to common environmental conditions for your products	•Water and particulate matter (typically listed in International Protection codes, such as IP68) •Temperature •Scratching •Physical impact •UV •Chemicals and corrosives •Atmospheric pressure •Any other typical exposures your product may meet in use

Typical Examples – Specifications of Physical products

Type of Specification	Examples and Notes
Operational qualities	•Operating temperature output (how hot the product gets while in use) •Sound-pressure levels (how loud the product is while in use)
Resource consumption	•Power •Water •Raw materials
Capacities	•Consumable resource storage • Paper trays • Fuel tanks •Byproduct holding tanks • Sewage • Runoff • Dust • Trash

Typical Examples – Specifications of Physical products

Type of Specification	Examples and Notes
Performance characteristics	•Measurement conditions and margins of errors for performance metrics •Details on durability, longevity, tolerances, and failure rates •Key metrics, such as: • Speed • Power • Displacement • Tensile strength • Hardness • Mechanical, chemical, or electrical properties that impact performance and utility • Output quality and speed (especially for items like printers, manufacturing equipment, etc.) • Duty cycle • Runtime

Classification of materials

- Variety of items are used by organization.
- Some of the items **have relatively longer life** – buidings, plants, equipments, machines, furnitures etc
- Some of the items in a **rather large number spend shorter time with organization** – materials, components, tools, stationeries etc. Focus is on parts and materials
- Several departments of the organization require **information about the materials**. Requirements of each department is usually different – for example, for a single material.
  - Receipt
  - Storage
  - Inspection
  - Design
  - Engineering inventory
  - Accounts
  - Marketing

Classification of materials (2)

- Some departments are interested in the **size, volume, shape, some in engineering properties,** some in **financial aspects** while some in the **commercial value of the material.**
- It is quite likely and perhaps sometimes purposeful for **an item** to get **identified** by **different names** by **different departments** of the **organisation**.
- A **dustbin** may be known as **refuse container**, **rubbish-box**, etc.
- These result in **confusion** and **tend to duplicate ordering** or **overstocking.**
  - The problem could really explode beyond dimension when the number of items is very large (as usually it is)
  - several external organisations, suppliers, wholesalers, retailers, customers etc. who prefer to call an item by different names: such as brand name, manufacturer reference number, engineering name or by serial number.
- Quite often, a good number of **products** or **parts may differ very marginally** or **insignificantly** from each other in **dimensional** or some similar characteristics.
- The **functional requirements** will be **equally well served** if **all such parts are made** to the **same common specifications**. This is called **standardisation.**
- The process of **standardisation** logically leads **to reduction in the number of part**, variety that an **organisation handles**.

Classification of Materials (3)

- When there are numerous items handled by an organization, their **planning and coordination** becomes **extremely difficult**, **if not impossible**, if each one of them is handled separately.
- **Classification** of materials involves grouping of items according to **some criteria**.
- For example, familiar classification of our domestic articles into clothes, kitchenware, electric appliances, electronic gadgets, furniture, professional articles, entertainment articles, groceries, consumables, non-consumables etc.
- An item may **belong to more than one class** depending on the criteria used.
- For example, **a radio set** is an **electronic gadget** as well as **a non-consumable** and **entertainment article**.

Major objectives of classification

i) To devise procedures of planning and control for materials in a class.

ii) To devise purchase procedures, inspection methods, and storing and issuing procedures, common to all materials in a class.

iii) To devise accounting and evaluation procedures common to all materials in a class.

On the Basis of Nature of Materials

a) **Raw Materials:** Raw materials include **all those materials** which are **purchased from** the **original producer** or **other manufacturers** and are used **directly in producing**, the **firm's product.**

For example, **cotton and yarn** are **raw materials** for **cotton textile mills** for they help in producing the **final product cloth**.

Cotton is purchased from **the original producer**, i.e., cotton grower, whereas **yarn** is procured from other manufacturers, i.e., **spinners**.

The product in one trade may become the raw material for the other trade.

b) Machinery and Equipment: All the machinery, both **power** and **hand-driven**, such as, **presses**, **lathe machines**, **typewriters**, **electric motors**, **fans**, and **other machine**s used in the **production** and **other departments**, is classified as such.

Tools also come under this category, and they are **issued on loan basis** to the **various departments** for a **definite period**, generally till their life-time.

On the Basis of Nature of Materials – (2)

c) **Consumable Items:** Those materials used in the manufacturing process

- which cannot be used for the second time for the same purpose since their utility for the purpose in question has ceased, and
- the shape changed are referred to as consumable items.
- Few examples - Coal, coke, mineral oil, lubricants, cotton waste, paints, varnishes, oxygen, stationery items like pencil, paper, carbon papers, ink, etc.

d) **Chemicals:** Substances obtained **after undergoing certain processes** in chemistry according to a formula devised for the purpose may be known as chemicals.

- should be stored, preserved and issued very cautiously after a careful scrutiny and proper analysis since their use involves risk even to life.
- Items like carbide, acids, etc., can be classified under the head.

On the Basis of Nature of Materials – (3)

e) **Inflammable Items:** Items highly susceptible to fire,

- such as petrol, kerosene, films, dopes and paints, fall under the category.
- generally stored as far away as possible from the main building with complete fire-fighting arrangements standing by.

f) **Fuel Stock:** These are also **consumable** items. But there is a **slight difference** between the two in respect of their uses.

- When an item is **directly used for production** and is a **fuel for the furnac**e, oven, etc., it is classed as **fuel stock**.
- **Necessary** item for **completing**, **rather starting**, the **manufacturing process** and of course **one of the important items** in a manufacturing unit, but it **can never constitute the finished product.**
- However, **sometimes** it may rightly be taken as a **raw material. Coal** is a **fuel stock** but is also **a raw material** for an **iron and steel industry.**

On the Basis of Nature of Materials – (4)

g) **Furniture: Movable contents of a house** or a room like chairs, tables, almirahs, benches, stools, etc., are furniture items.

- Repairs, renewals and replacements also **require proper maintenance of records,**
- **Issued temporarily** on loan basis.

h) **Scrap Materials:**

- On **the expiry of life** of a particular item, **the residue** is called the **scrap**.
- Such **material as is left over as waste** in the **process of production** is also known as **scrap**.
- The scrap is sold out in the market so as to fetch some value out of it. Kabadis are the best purchasers of scrap in this country.

On the Basis of Nature of Materials – (5)

i) Packaging Materials: Includes

- all kinds of wrapping materials, such as paper wood carvings, sawdust, straw, etc.,
- containers like boxes, crates, drums and bottles,
- protective coatings, such as, wax, grease, as also plastic cans, bags, etc.

j) **General Items:** This category **include all those items which do not fall under any of the above categories** of items.

In a large undertaking, **general stores section** is separated from other stores under **an independent incharge** since they cover a large number of items,. which, although **not directly linked with the production processes**, are **required for day-to-day smooth** and **efficient running** of **the enterprise**.

Cleaning materials like soap, brasso, **brooms**, **uniforms** for the staff, **stationery** and all other items of general use are handled in the general stores department

On the Basis of Usability of Materials

a) Serviceable, Unserviceable and Obsolete Items:

- **Serviceable items** are those items which go temporarily out of order. After repairing and replacement they may become serviceable again and their **usable life may thus be extended** for some more time.
- **Unserviceable items** are those items which have **outlived their life.** No amount of **repairs, renewals** or **replacements** can **bring them back to their usable life**. They are thus **fit only for disposal as scrap.**
- **Obsolete items** are those items which have gone **out of date** because of new inventions in design, use, etc., and which cannot profitably be used again.

b) Finished and Semi-finished Items:

- **Finished items** are those goods which **have been manufactured in complete form** by the **production department** and are **ready for sale.**
- **Semi-finished items** are those which have not **yet been manufactured completely** and **need some further processing** before they can be **put to sale** in the market. They are thus **taken back** by the **production department** for turning them into a **final product.**

On the Basis of Usability of Materials (2)

c) Dead Stock Items: This term is generally used in government departments.

- Furniture, equipments, machinery and **other items which have some definite life** and which **cannot be written off before the expiry date** of their life are classed as dead stock items.
- They are **issued temporarily** on **loan basis** to **their users**.

d) Unused Items: These are **not stock items** in **the real sense** of **the term.**

- These cannot be used in **the production unit**, because, being defective, damaged beyond use, or **because of some other reason** they **have been rendered unusable**.
- Sometimes **unused stocks** are **mistaken for scrap** and **unserviceable materials**. But this is not the real position.
- **Scraps** are generally **left out items** from **the production unit.** They cannot be used, as either they are **less in quantity** or **less in measurement**, **weight**, etc.
- But **unserviceable items** are **movable items** which have been **rendered unserviceable** by **constant use** and are **now beyond repair**.

Examples of Codification

- **PIN Codes** used by **Post and Telegraph Department** to uniquely and concisely identify **various regions** of the country.
- Codification of **National Highways.**
- **Train Number** by **Indian Railways.**
- The number of digits in a code may typically be somewhere between **eight** and **thirteen**.

Typical Example of coding system based on fundamental principle

Digits	Details of the item
1-2	major group (raw materials, spare parts, subcontracted items, hardware items, packing material, tools, oil, stationery, etc.),
3-4	subgroup (ferrous, non-ferrous, etc.),
5-7	dimensional characteristics (length, width, head diameter, etc.),
8	minor variations,
9	location of storage,
10-11	user departments of the organisation,
12	products or product lines requiring the item,
13	any other information (related to inventory accounting, purchasing etc.).

Brisch System of Codification

- The **Brisch system** is based on numbers from **0 to 9** and consists of **blocks (typically three)** separated by **decimal points.**
- The blocks are assigned **specific classification** of the materials.
- The **first** (left most) **block** represents the **major classification** (such as raw materials, packing materials, finished materials, etc.),
- The **second block** represents the **next level classification** (such as nature, use, quality, characteristics, etc.) while the **third block** represents **the lowest level classification** (such as quality of the material, its components; its facial appearance, price, availability, source of supply, marketability, frequency of use, etc.).
- General structure: code for major group. Code for group. Code for subgroup;
- The codes are assigned in **three blocks** separated by **decimal points**. Total **number of digit could be any as per convenience** but a general figure is 7.

Item Particulars	CODES			
	Main	Subcode I	Subcode II	Full Code
Stationery	63			
Pencil		01		63.01
Pen		02		63.02
Paper		03		63.03
Ink	..	04	..	63.04
Pencil	..	..	..	
Black	..	..	41	63.01.41
Blue			42	63.01.42
Red			43	63.01.43
Blue Red			44	63.01.44
Pen				
Ball-point			51	63.02.51
Fountain			52	63.02.52
Holder			53	63.02.53
Inkstand			54	63.02.54
Paper				
White			35	63.03.35
Brown			36	63.03.36
Typing			38	63.03.38
Duplicating			39	63.03.39
Ink				
Blue		..	12	63.04.12
Black			14	63.04.14
Red			15	63.04.15
Duplicating		..	17	63.04.17

Example - The **major item stationery** is classified into **four groups** based on **the nature of each item** and each group in turn is divided into further subgroups.

Kodak System

- Developed by Eastman Kodak Co. of New York, USA
- A very **comprehensive** system.
- It consists of **10 digits of numerical code**.
- The basis of the major or **first level grouping** is **source of supply**.
- All materials are divided into **100 basic classifications** based on **purchase and procurement considerations**.
- For instance, **a bolt** is listed as **hardware item** if this is listed in **hardware catalogue**s and available with **hardware suppliers**.
- If this bolt, however, is available only as part of the machine, it will be available **under maintenance**.
- Each class is divided into **10 sub-classes**. For example, if class **20** represents **cutting tool**, then **200 represents drills, reamers, counter bars**, etc.

Example of Kodak system

Step I: Major (First Level) Classification (based on purchase and procurement consideration)

First Two Digits class code	Materials
00-20	Raw Materials
21-35	Machine and Mechanical Equipments
36-40	Mechanical Products and Loose Tools
41-49	Electrical Products and Electrical Equipments
50-52	Laboratory Equipments
53-68	Chemicals, Equipments, and Miscellaneous Chemical Products
69-78	Office Equipments and Other Misc. items.
79-83	Furniture and Fixtures
84-87	Fuel Stock
88-93	Semi-finished and Finished Product Miscellaneous
94-99	Miscellaneous

Step II: Sub (Detailed) Classification of materials in class code say 53-68 (Chemicals, Equipments and Miscellaneous Chemical products).

Second two Digits Sub-class code	Materials
53	Tanks
54	Pumps
55	Mixers
56	Packaging Machines
57	Plastic Materials
58	Paints
59	Lubricants
60	Acids
61	Solvents
62	Phosphorus
63	Sulphur

Step III: Further Sub-classification indicating kinds in a particular sub-class of materials say 60 (acids).

Third Digit (0-9) Sub-sub-class code	Materials
600	Carbonic Acid
601	Sulphuric Acid
602	Sulphurous Acid
603	
604	
605	
606	Unassigned
607	
608	
609	

Step IV: The kind of the materials may further be divided into different types. For example 601 indicating sulphuric acid may further be classified indicating the type of the sulphuric acid. For example, one may classify the types of sulphuric acid as,

86	Type	A
87		B
88		C
89		D
90		E
91		F

This level has two digits while the previous level had only one digit. This is possible. There is no strict pattern to be followed about the number of digits and the level of the classification. The two digit code in Step IV indicates suitably the percentage of acid content.

The process of classification and sub-classification may continue to accommodate subsequent levels of variations. The code may have some digits left unutilised for future expansion. For example a code 601-87-XX XXX indicates chemical product (53-68 group) and in that acid (60), and in that sulphuric acid (1) and in that Type B (87). The digits XX-XXX are left for future expansion.

Colour Coding Systems

- **Colour Coding Systems:** Sometime colour codes are used to identify the items.
- Common instances are, red, blue and green in an electric cable, red and green in electric switches, and so on.
- Some organisation use the codes locally such as to identify the steam, water and other pipes while there exist some national or international colour coding system.
- The limited number of colours available narrows the scope. Nevertheless, this is quite an effective system providing easy identification.