CHAPTER 6:

PERFORMANCE RATING

Performance Rating

- Rating and "allowances" are the two most controversial aspects of time study.
- Most time studies in industry are used to determine standard times for setting workloads and as a basis for incentive plans.
- Rating (the assessment of a worker's rate of working) and the allowances to be given for recovery from fatigue and other purposes are still, however, largely matters of judgment and therefore of bargaining between management and labour.
- Different jobs require different human abilities. For example, some demand mental alertness, concentration, visual acuity; others physical strength; most, some acquired skill or special knowledge.
- A qualified worker is one who is accepted as having the necessary physical attributes, who possesses the required intelligence and education, and has acquired the necessary skill and knowledge to carry out the work in hand to satisfactory standards of safety, quantity and quality.
- Whatever job he selected for study, he would find only properly qualified workers performing it.

Experienced Worker

- The acquisition of skill is a complicated process.
- It has been observed that among the attributes which differentiate the experienced worker from the inexperienced are the following.
- The experienced worker achieves smooth and consistent movements;
- Acquires rhythm;
- Responds more rapidly to signals;
- Anticipates difficulties and is more ready to overcome them;
- Carries out the task without giving the appearance of conscious attention, and is therefore more relaxed.

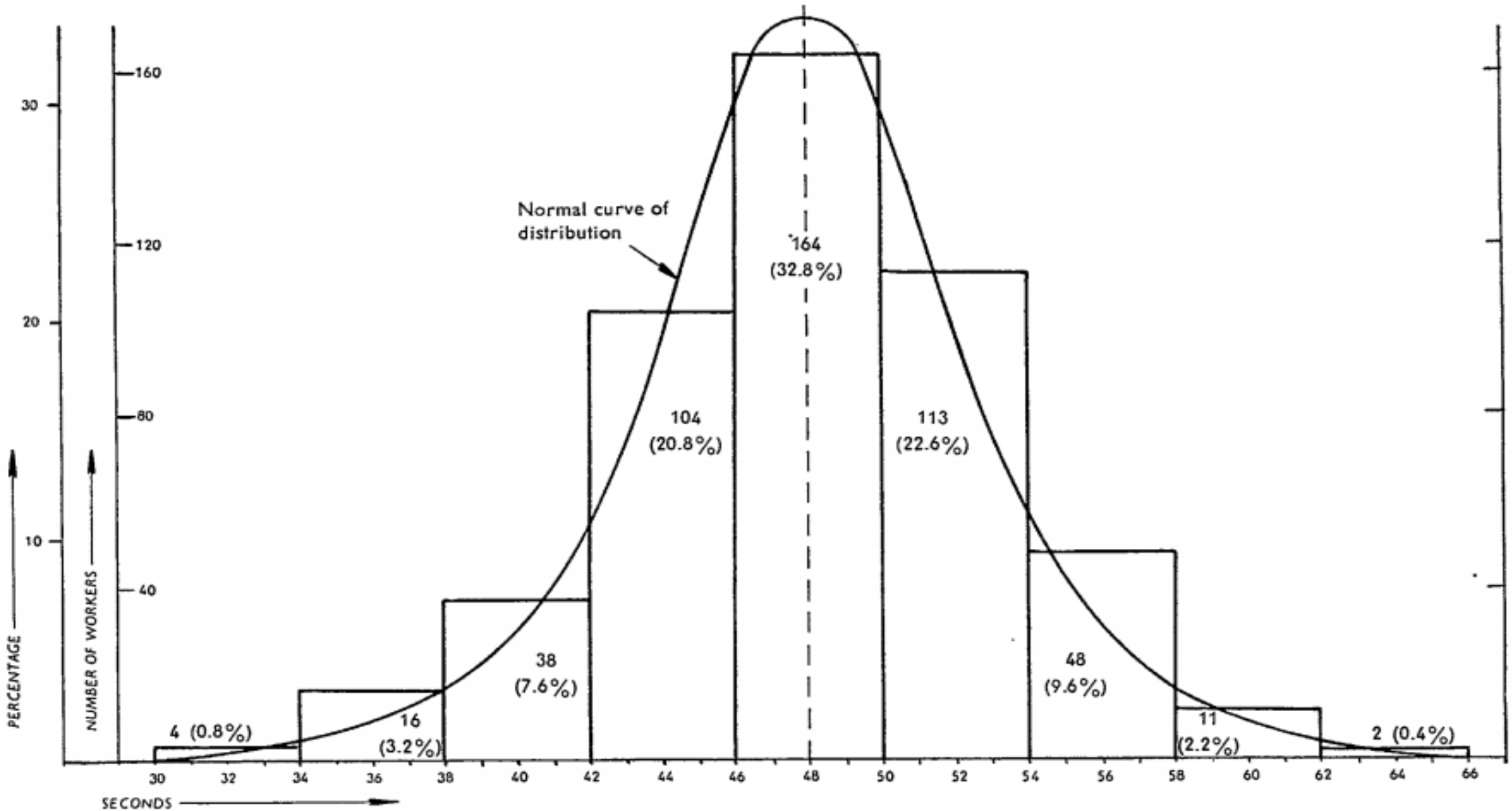
Average Qualified Worker

- The concept of a standard time is, at root, that it is a time for a job or operation that should normally be attainable by the average qualified worker, working in his ordinary fashion, provided that he is sufficiently motivated to want to get on with the job.
- A representative worker is defined as one whose skill and performance is the average of a group under consideration. He is not necessarily a qualified worker.
- In theory, therefore, the time study man should be looking for the average qualified worker to study.

Time group (sec)	Number of workers (out of 500)	Percentage of total workers	
30—34	4	0.8	
34—38	16	3.2	*32.4*
38—42	38	7.6	
42—46	104	20.8	
46—50	164	32.8	*32.8*
50—54	113	22.6	
54—58	48	9.6	*34.8*
58—62	11	2.2	
62—66	2	0.4	
	500	100.0	*100.0*

Illustration

- We should therefore be justified in saying that for this group of 500 workers the average time taken to perform this operation was between 46 and 50 sec (say 48 sec).
- We could call 48 sec the time taken by the average qualified worker to do this job under these conditions


Normal curve of distribution
164 (32.8%)
104 (20.8%)
113 (22.6%)
38 (7.6%)
48 (9.6%)
16 (3.2%)
11 (2.2%)
4 (0.8%)
2 (0.4%)
PERCENTAGE
NUMBER OF WORKERS
SECONDS
30
32
34
36
38
40
42
44
46
48
50
52
54
56
58
60
62
64
66
10
20
30
40
80
120
160

Rating

- Rating is the assessment of the worker's rate of working relative to the observer's concept of the rate corresponding to standard pace.
- By definition, rating is a comparison of the rate of working observed by the work study man with a picture of some **standard level** which he is holding in his mind.
- This standard level is the **average rate** at which qualified workers will naturally work at a job, when using the correct method and when motivated to apply themselves to their work.
- This rate of working corresponds to what is termed the standard rating, and is denoted by 100 on the rating scale.
- If the standard pace is maintained and the appropriate relaxation is taken, a worker will achieve standard performance over the working day or shift.
- There will of course be different standard paces (or speeds of movement) for different activities, according to the complexity or difficulty of the element making up the activity (among other things).
- So that working at the standard rate will not always mean moving the hands or limbs with the same speed.

Standard Performance

- Standard performance is the rate of output which qualified workers will naturally achieve without overexertion as an average over the working day or shift provided they know and adhere to the specified method and provided they are motivated to apply themselves to their work.
- This performance is denoted as 100 on the standard rating and performance scales.
- Standard performance on the part of the average qualified worker will probably only show as such over several hours.
- Standard performance is achieved by working over the shift at paces which average the standard rate.
- it is of course quite possible and indeed normal for him to exceed this rate of working if he wishes to do so
- It is common for workers to work faster at some periods of the day than they do during others, so that the standard performance is achieved as the result of the cumulative outcome of periods of work at varying paces.

Optimum Pace (Speed)

- The purpose of rating is to determine from the time actually taken by the operator being observed the standard time which can be maintained by the average qualified work.
- What the study man is concerned with is therefore the speed with which the operator carries out the work, in relation to the study man's concept of a normal speed.
- The only thing that counts is the effective speed of the operation.
- unskilled operator may move extremely fast and yet take longer to perform an operation than a skilled operator who appears to be working quite slowly.
- Judgment of effective speed can only be acquired through experience and knowledge of the operations being observed.
- The optimum pace at which the worker will work depends on

➢The physical effort demanded by the work.

➢The care required on the part of the worker.

➢His training and experience.

FACTORS AFFECTING RATE OF WORKING

- Variations in actual times for a particular element may be due to factors outside or within the control of the worker.
- Those outside his control may be

➢Variations in the quality or other characteristics of the material used, although they may be within the prescribed tolerance limits.

➢Changes in the operating efficiency of tools or equipment within their useful life.

➢Minor and unavoidable changes in methods or conditions of operation.

➢Variations in the mental attention necessary for the performance of certain of the elements.

➢Changes in climatic and other surrounding conditions such as light, temperature, etc.

➢These can generally be accounted for by taking a sufficient number of studies to ensure that a representative sample of times is obtained.

Factors within his control may be

- Acceptable variations in the quality of the product.
- Variations due to his ability.
- Variations due to his attitude of mind, especially his attitude to the organization for which he works

- The factors within the worker's control can affect the times of similarly described elements of work by affecting

- The pattern of his movements.
- His working pace.
- Both, in varying proportions.

- The study man must therefore have a clear idea of the pattern of movement which a qualified worker should follow, and how this pattern may be varied to meet the range of conditions which that worker may encounter.

SCALES OF RATING

- In order that a comparison between the observed rate of working and the standard rate may be made effectively, it is necessary to have a numerical scale against which to make the assessment.
- The rating can then be used as a factor by which the observed time can be multiplied to give the basic time.
- Basic time is the time it would take the qualified worker, motivated to apply himself, to carry out the element at standard rating.
- There are several scales of rating in use, the most common of which are those designated

➢ The 100-133 scale, the 60-80,

➢ The 75-100,

➢ The British Standard scale u (essentially a restatement of the 75-100 scale) which is the 0-100 scale.

- In the 0-100 scale, 0 represents zero activity and 100 the normal rate of working of the motivated qualified worker; that is, the standard rate.

Scales				Description	Comparable walking speed*	
60-80	75-100	100-133	0-100 Standard		(mi/h)	(km/h)
0	0	0	0	No activity.		
40	50	67	**50**	Very slow; clumsy, fumbling movements; operator appears half asleep, with no interest in the job.	2	3.2
60	75	100	**75**	Steady, deliberate, unhurried performance, as of a worker not on piecework but under proper supervision; looks slow, but time is not being intentionally wasted while under observation.	3	4.8
80	100	133	**100 (Standard Rating)**	Brisk, businesslike performance, as of an average qualified worker on piecework; necessary standard of quality and accuracy achieved with confidence.	4	6.4
100	125	167	**125**	Very fast; operator exhibits a high degree of assurance, dexterity and co-ordination of movement, well above that of an average trained worker.	5	8.0
120	150	200	**150**	Exceptionally fast; requires intense effort and concentration, and is unlikely to be kept up for long periods; a "virtuoso" performance only achieved by a few outstanding workers.	6	9.6

FIGURE: EXAMPLES OF VARIOUS RATES OF WORKING ON THE PRINCIPAL RATING SCALES

HOW THE RATING FACTOR IS USED

- The figure 100 represents standard performance.
- If the study man decides that the operation he is observing is being performed with less effective speed than his concept of standard he will use a factor of less than 100, say 90 or 75 or whatever he considers represents a proper assessment.
- If, on the other hand, he decides that the effective rate of working is above standard, he gives it a factor greater than 100: say 110, 115 or 120.
- It is the usual practice to round off ratings to the nearest multiple of five on the scale.

BASIC TIME

- If the study man's ratings were always impeccable, then however many times he rates and times an element the result should be **A constant**

Observed Time x Rating = **A Constant**

$$\textbf{Rating} = \frac{\textit{Rating}}{\textit{Standard Rating}}$$

- Numerical illustration

Cycle	*Observed time (decimal minutes)*		*Rating*		*Constant*
1	0.20	×	100	=	0.20
2	0.16	×	125	=	0.20
3	0.25	×	80	=	0.20

Basic Time

- In the case of the 100 standard this makes it a percentage which, when multiplied by the observed time, produces the constant known as the **"basic time"** for the element.

$$\text{Observed Time X } \frac{\boldsymbol{Rating}}{\boldsymbol{Standard\ Rating}} = \text{Basic Time}$$

- For example

$$0.16 \text{ min X } \frac{\mathbf{125}}{\mathbf{100}} = 0.2\text{min}$$

- This basic time (0.20 min in the example) represents the time the element would take to perform (in the judgment of the observer) if the operator were working at the standard rate, instead of the faster one actually observed.
- If the operator was judged to be working slower than the standard, then a basic time less than the observed time would be arrived at,
- For example

$$0.25 \text{ min X } \frac{\mathbf{80}}{\mathbf{100}} = 0.2\text{min}$$

STANDARD TIME

1. SUMMARISING THE STUDY

- The study man has completed his observations at the workplace.
- works up the study taken and enters the results obtained on the analysis of studies sheet for the operation.
- The study man enters the rating under the column headed "R.“ and the watch reading in the next column, that headed "W. R.“
- It should be made a working rule that none of these pencil entries may ever be erased and replaced.
- Occasionally a study may contain a very obvious error which is of a sort which may be corrected without invalidating the study.
- Whenever there is an error about which there is doubt as to how it should be corrected that part of the study should be ignored.

2. PREPARING THE STUDY SUMMARY SHEET

- Much of the work necessary before the study summary sheet can be completed consists of quite simple routine calculation
- Any error should be investigated and corrected before the work of extension is undertaken.
- On the body of the study summary sheet the study man next lists in order all the repetitive elements observed, in order of their occurrence.
- Variable elements are therefore listed below the full list of repetitive elements.
- Study man next lists any occasional elements observed
- Below these again are listed any foreign elements and ineffective time.
- When these entries have been made the sheet should provide for a summarized record of everything that has been observed during the study.

➢Enter Frequencies

- The next step is to enter against each element listed on the study summary sheet the frequency with which that element occurred.
- Repetitive elements, by definition, occur at least once in every cycle of the operation so the entry to be made against a repetitive element will read 1/1, or 2/1, etc
- Occasional elements may occur only once every 10 or 50 cycles, when the entry would be 1/10, 1/50;
- The entries are made in the column headed "F" on the study summary sheet.

3. EXTENSION: THE CALCULATION OF BASIC TIME

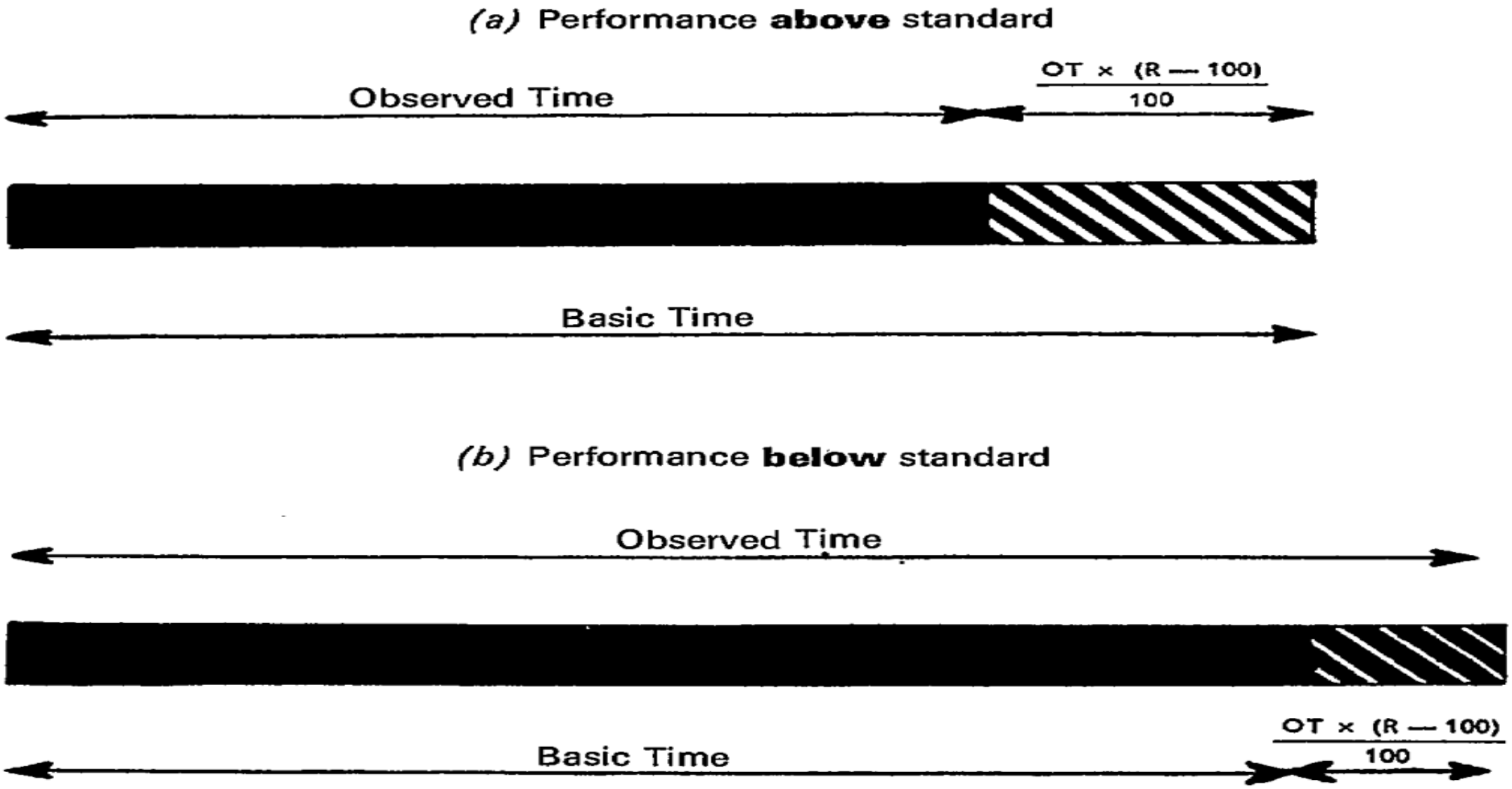
- If fly back timing has been used the study man may proceed direct to extension.
- When using cumulative timing, however, it is first necessary to subtract each watch reading from the one following it in order to obtain the observed time for each element.
- "observed time" is used to connote both directly observed and subtracted times.
- The next step is to convert each observed time to a basic time, entering the result in the column headed "B.T." on the time study sheets.
- Basic Time is the time for carrying out an element of work at standard rating, i.e

$$\text{B.T} = \frac{\text{Observed Time x Observed Rating}}{\text{Standard Rating}}$$

- Extension is the calculation of basic time from observed time, i.e

$$\text{Observed time x } \frac{\text{Observed Rating} - 100}{100}$$

Figure: The Effect Of Extension On The Time Of An Element



4. THE SELECTED TIME

- The selected time is the time chosen as being representative of a group of times for an element or group of elements.
- These times may be either observed or basic and should be denoted as selected observed or selected basic times.
- It is necessary to select from all the basic times which have been entered on the time study sheets a representative time for each element
- Selecting the representative basic time for a constant element is done by making a straight average of the element times arrived at, adding all the computed basic times together and dividing the total by the number of occasions on which the element was recorded.
- Many more observations will be necessary of a variable element than of a constant element before reliable representative basic times can be established.

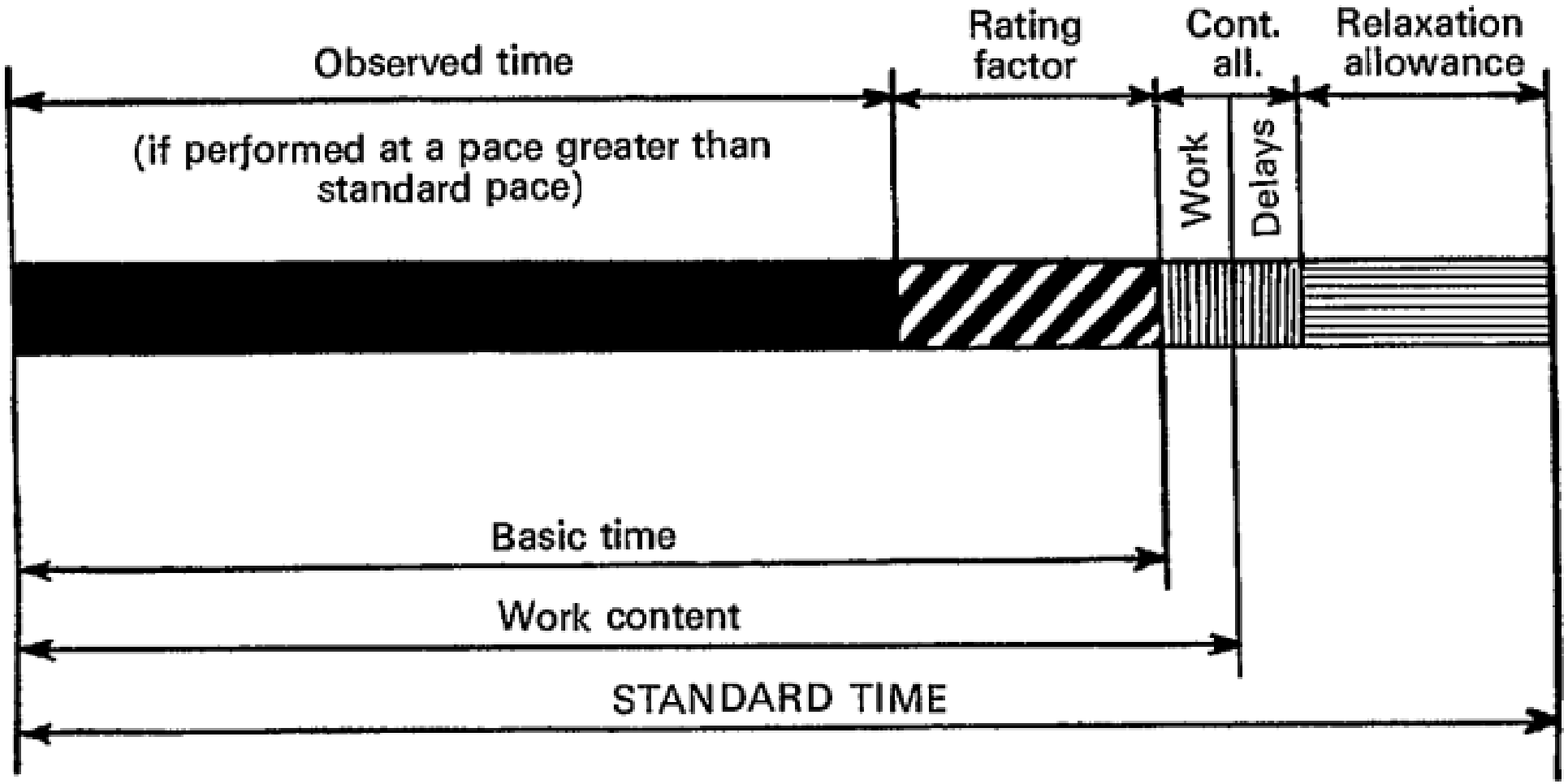
5. WORK CONTENT

- “Work" is in time study include not only the physical labors performed but also the proper amount of relaxation or rest necessary to recover from the fatigue caused by those labors.
- *The work content of a job or operation is defined as: basic time + relaxation allowance + any allowance for additional work - e.g. that part of contingency allowance which represents work.*

6. STANDARD TIME

- *Standard time is the total time in which a job should be completed at standard performance - i.e. work content, contingency allowance for delay, unoccupied time and interference allowance, where applicable.*
- *Standard Time = basic time + relaxation allowance + contingence allowance*
- Standard time considered to attract only the two allowances which have so far been discussed in detail: contingency allowance and relaxation allowance.
- The standard time for the job will be the sum of the standard times for all the elements of which it is made up.
- The contingencies and relaxation allowances are still, however, percentages of the basic time, even though it is less than the observed time
- The standard time is expressed in standard minutes or standard hours.
- *SMV or SAM*

- Figure: The standard time may be represented graphically as follows:



In the case where the observed time is rated at less than standard pace, the rating factor will, of course, be shown inside the observed time.