

for true elements rather than for associated groups of several elements were observed and recorded; (4) detached cycles were studied independently rather than as they occur, as part of a complete job.

The following is copied from another time study, showing the elementary times in a series of ten observations.

ITEM	OBSERVATION										STANDARD TIME (In Min.)	
	1	2	3	4	5	6	7	8	9	10		
A	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02	.02
B	.02	.02	.02	.08	.02	.04	.03	.02	.02	.03	.03	
C	.05	.05	.05	.06	.05	.05	.06	.05	.05	.05	.05	
D	.02	.02	.01	.01	.01	.01	.01	.01	.01	.01	.01	
E	.04	.04	.04	.03	.04	.05	.06	.04	.05	.04	.04	
F	.05	.05	.05	.06	.04	.06	.04	.06	.06	.05	.05	

The process described by Messrs. Lowry, Maynard and Stegemerten, to which I have previously referred, I believe justifies the authors' statement that "the leveling method is the most scientific and accurate method yet devised" as a means of grading workers. It confines the factor of human judgment to a number of classified elements each of which is weighed independently rather than subjected to an over-all appraisal. As described, however, its purpose does not appear to be concerned in the main with the selection of the basic elementary time from a series of observations, but with the modification of such selected units to conform to the performance ability of an "average" worker. Under scientific management this plan would seem to have its greatest value in selection of workers and in the establishment of extra allowances over standard task time for inexperienced workers during training. These allowances should be regarded as temporary and individual if the management's aim is so to select, train and serve the workers that all will attain the production standard of the first class. They should, therefore, be added to standard task time for jobs to be done rather than be included in standard elementary unit times.

Percentages of Allowance in Addition to Standard Elementary Times

No feature of present methods-study technique is so open to unfavorable criticism as the fixing of the amount which, in setting tasks for specific jobs, must be added to the sums of the component elementary unit times. In a study of the existing literature relating to time study and the setting

of tasks, one is struck by the contrast between the hazy manner in which this subject is treated and the comparatively clean-cut handling of others.

Apart from "unavoidable delays," which term covers a multitude of sins, these allowances should provide for, as may be required: (1) the worker's personal needs; (2) fatigue; (3) the lag or pause, often imperceptible, between the performance of one elementary operation and another; (4) variations in machine running time.

In my opinion it is erroneous, in most instances, to provide, as is sometimes advocated, for preparatory or incidental operations by including them in a percentage of allowance. They should be treated wherever possible exactly as are the elementary operations directly constituting the work to be done and the stages at which they occur, as well as their unit times, should be shown on instruction cards for the jobs in which they may occur.

These additions are all commonly embraced in the term "percentages of allowance." As an example, in Taylor's "A Piece-Rate System" we find as the last item of a rate for a machine operation, "Add — per cent for unavoidable delays."⁸ Later, as a result of studies of heavy, laborious work, such as handling pig iron and shoveling, fatigue as a factor was recognized. This is indicated by Taylor's statement in "Shop Management": "The elements of the art which at first appear most difficult to investigate are the percentages which should be allowed, under different conditions, for rest and for accidental or unavoidable delays. These elements can, however, be studied with about the same accuracy as the others."⁹

The two terms "unavoidable delays" and "fatigue," as they were used in the past and to some extent even today, covered anything or everything for which it was considered proper to allow time in excess of the actual time required to perform the operation in question on the material being worked. As standardization became more complete and as the quality of management and its mechanisms improved, it was found that "unavoidable" delays became more and more rare. It may be stated as a rule that time for unavoidable or unusual delays should not be included as a part of the predetermined task time, which should be the time required to

⁸p. 871.

⁹Pp. 167-168.

perform the task under standard conditions. The occurrence of such delays is irregular and the time that they consume is usually variable. While there may be exceptions to such a rule, I have found that in most cases "unusual delays" or "unusual work" may best be taken care of by the allowance of proper additional time upon the completion of the task. Generally, the accordance of such allowances would be based upon the investigation and report of the shop-methods supervisor. The necessity for taking extra cuts or for running at reduced speeds on account of the hardness of material is typical of causes for allowing extra time in machine-shop work. The breakage of yarn in weaving, mentioned in an earlier part of this paper, and the necessity for soldering ends of wire together in winding small magnet coils from enameled wire, because of breaks or burned sections, are other instances. The breaks that I have in mind here were due to unstandardized material, which, it was believed, might in the course of time be improved if not eliminated. The breaks varied greatly in frequency with different lots of material. Any allowance based on an average occurrence per job would be too high in certain cases and in others so low that the operator would lose his or her bonus. To meet the needs of such a situation we adopted the plan of providing a supplementary "job-time card" on which the operator made a mark as each break occurred. This slip was turned in at the completion of the job. The methods men then multiplied the number of breaks reported by the standard unit time for repairing a break and added the result to the standard time for the job.

Whether or not a bonus should be paid on time for delays due to breakdowns or faulty equipment is an open question. Personally, I feel that it is a sound policy to pay bonus, that is to say, to allow proper extra time, for any delay for which the operator is in no way responsible.

Time for Operators' Personal Needs

This may best be determined on a basis of common sense, to suit the particular class of work and the surrounding working conditions. That this allowance should vary in what it provides for is well brought out by Mr. Neele E. Stearns in his paper "Computation of Allowances" published in the BULLETIN OF THE TAYLOR SOCIETY of June, 1928:

Though the items which come under this heading are

limited in number, they are influential enough to warrant attention. In its baldest and most usual interpretation the term personal allowance covers only the worker's physical organ activities as influenced by his toil. In my mind, this percentage factor should vary according to the nature of the job at hand. For example, when a man leaves work at the end of the day dripping with perspiration as a result of his work in a rubber-mill room, it is good hygiene that he be permitted to bathe before leaving. The fact that thousands of workers still do otherwise does not lessen the hazard but only stresses the importance of our guarding our employees' health. Time spent in this way is not chargeable to fatigue, but has a direct bearing upon personal care. It should, therefore, not be a loss to the worker but should be allowed, together with his other average physical requirements, as a condition of his task and added to the calculated standard time in the form of a scientifically determined constant percentage. I cite the above as an example to point out the possible variations encountered in determining allowances. Most specialized tasks need only a body-care factor, and in that event the needs of the normal person should be determined and considered a constant percentage of the standard allowance time."¹⁰

The particular example cited, however, may not be the best, as time for washing up at the end of a day might better be allowed apart from time set for the operator's work. It, nevertheless, forcibly illustrates the point.

Lichtner in his book "Time Study and Job Analysis" points out another cause for variation in this class of allowances as follows:

The amount of time to be allowed for the necessities of life varies considerably with the character of the operation, and in some cases even with the season of the year. In construction work, for example, which has to be done out in the sun without any shelter overhead, the workmen will require a great deal larger allowance in hot weather for taking many drinks of water, wiping off perspiration, and so on, than they will require in cooler weather. Thirty-three and one-third per cent was found to be the amount required on a construction job for these necessities of life whenever the men had to work out in the hot sun and the temperature was over 90 degrees.¹¹

While I believe it would not be difficult to classify occupations and variable conditions, through the co-operation of methods men in various industries, and to establish uniform allowances for personal needs, my feeling is that accuracy in allowances for other purposes is in most cases of more importance and should first receive a treatment at least equal in quality to that accorded directly productive operations.

¹⁰p. 150.

¹¹p. 208.