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ABSTRACT

The United States Employment Service (USES) Specific Aptitude Test Battery (SATB) for Refinery Operator is evaluated from three points of view: (1) technical adequacy of the research; (2) fairness to minorities; and (3) usefulness of the battery to Employment Service staff and employers in selecting individuals for training in refinery operator positions. Research demonstrated a statistically significant and useful relationship between proficiency as refinery operators and the SATB. The SATB can be expected to produce a useful increase in the proportion of highly proficient workers. When the SATB was applied to the validation sample, composed of individuals who were employed and therefore considered competent, an increase from 62 percent to 72 percent in the proportion of highly proficient workers was found. Similar results were found for the cross-validation sample. A greater increase can be expected when the battery is used with applicants, as the range of relevant abilities is wider among applicants than among employed workers. The report includes: (1) research summary; (2) procedure; (3) analysis; and (4) validity of the battery. Descriptive statistics for subgroups of the validation sample; descriptive rating scale; and job description are contained in the appendices. (Author/PN)

Refinery Operator (petrol. refin.) 549.260-010

Development of USES Specific Aptitude Test Battery S-68R82

U.S. Department of Labor
Employment and Training Administration
U.S. Employment Service
1982

S-68R82

DEVELOPMENT OF USES SPECIFIC APTITUDE TEST BATTERY

for

REFINERY OPERATOR (petrol. refin.) 549.260-010

S-68R82

Developed in cooperation with the California, Kansas, Kentucky, Louisiana, Michigan, New Mexico, New York, Ohio, South Carolina, and Texas State Employment Services

Analysis and Report

by

Northern Test Development Field Center

Detroit, Michigan

U.S. DEPARTMENT OF LABOR

Employment and Training Administration
United States Employment Service

1982

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GATB Study No. 3066

DEVELOPMENT OF USES SPECIFIC APTITUDE TEST BATTERY S-68R82

for

REFINERY OPERATOR (petrol. refin.) 549.260-010

SUMMARY

This report is designed to provide the information required to evaluate the Specific Aptitude Test Battery (SATB) for Refinery Operator from three points of view: (1) technical adequacy of the research; (2) fairness to minorities; and (3) usefulness of the battery to Employment Service staff and employers in selecting individuals for training in Refinery Operator positions.

Research demonstrated a statistically significant and useful relationship between proficiency as Refinery Operators and the following Specific Aptitude Test Battery:

Aptitudes	Cutting Scores
N - Numerical Aptitude	85
S - Spatial Aptitude	90
P - Form Perception	85

Two samples were used in the research. The validation sample, on which the SATB was developed, consisted of 194 employed workers (including 41 blacks) from 10 states. Data were collected during 1974-1980. The tests used were those of the General Aptitude Test Battery (GATB). Job proficiency was measured by supervisory ratings.

A second sample confirmed or cross-validated the SATB. This sample consisted of 63 Refinery Operators. The same experimental tests were used; the criterion, or measurement of job proficiency, consisted of supervisory ratings. The data were collected in 1954.

No evidence of differences in validity between blacks and nonminorities was found. The SATB was found to be fair to blacks and nonminorities using several definitions of fairness. Additional information is presented in the Validity of the Battery section and in Appendix 1.

The SATB can be expected to produce a useful increase in the proportion of highly proficient workers. When the SATB was applied to the validation sample, composed of individuals who were employed and therefore considered competent, an increase from 62% to 72% in the proportion of highly proficient workers was found. Similar results were found for the cross-validation sample. A greater increase can be expected when the battery is used with applicants, as the range of relevant abilities is wider among applicants than among employed workers.

Procedure

A concurrent design was used (test and criterion data were collected at about the same time). Data for the validation sample were collected during 1974-1980.

Job Analysis

A job analysis was performed by observing the Refinery Operators' performance on the job and by consulting with the Refinery Operators' supervisors. On the basis of the job analysis, a job description was prepared which was used to select an experimental sample of Refinery Operators who were performing those job duties and choose an appropriate criterion or measure of job performance.

At each location listed under ACKNOWLEDGMENT, the job duties were compared with the job description and found to be essentially the same. If minor differences were found, the job description was modified. The job description shown in Appendix 3 is the result of this process and may be used to provide information on the applicability of the test battery resulting from this research.

In the job analysis, each job duty was rated for frequency of performance, percentage of time spent, and level of difficulty. Critical job duties were identified on the basis of these ratings.

At each location at least one analyst rated the aptitudes as irrelevant, important or critical to the performance of the job duties. A synthesis of these ratings and their rationale follows:

G - General Learning Ability	Required to learn and understand principles and procedures of refinery operation. Required to perceive relevant data present in specifications and readings in order to diagnose and correct trouble.
P - Form Perception	Required to continuously observe instruments and recording devices for deviations from specifications. Required to prepare and insert graph paper into recording instruments and to accurately adjust knobs, dials and levels. Required to make visual comparisons of product with charts.
Q - Clerical Perception	Required to accurately observe and record readings on instruments and recording devices, and to accurately compare tabular data given in logs and tables.
M - Manual Dexterity	Required to manipulate knobs, buttons, switches and levers on control panels. Required to insert and adjust charts, graph paper and tapes used in recording devices. Required to manually operate valves and manual controls on units and auxilliary equipment.

Experimental Test Battery

The experimental test battery consisted of all 12 tests of the GATB, B-1002B. Information on the composition and developmental research of the GATB may be found in the Manual for the General Aptitude Test Battery, Section III, Development, available from the Government Printing Office.

Validation Sample Description

The validation sample consisted of 194 Refinery Operators (12 females and 182 males) employed in companies in the North, South and West (see ACKNOWLEDGMENT). A total of 55 were minority group members (41 blacks, 8 Hispanics, 3 Orientals, 2 French Canadians, and 1 American Indian) and 139 were nonminority group members. The means and standard deviations for age, education and experience of sample members are shown in Table 1.

Two employers participating in the research used tests in their selection process. The Basic Occupational Literary Test, a measure of basic reading and math skills was used by one employer. The second employer used two tests, the Survey of Mechanical Insight and the California Capacity Questionnaire, but did not use the obtained scores to automatically eliminate any applicant. The remainder of the sample was not test selected. All Refinery Operators had at least 6 months experience on a job which has duties similar to those found in the job description in Appendix 3. Descriptive statistics for blacks and nonminority subgroups are shown in Appendix 1.

Cross-validation Sample Description

The cross-validation sample consisted of 63 male refinery operators employed in the North. Data for this study were gathered in 1954, prior to the requirement of providing minority group information. Therefore, ethnic group composition of the sample is unknown. The means and standard deviations for age, education and experience of sample members are shown in Table 1a.

Criterion for Validation Study

The criterion for the validation sample consisted of supervisory ratings. The immediate supervisor rated each worker. The ratings were obtained by means of personal visits by State test development analysts who explained the rating procedure to the supervisors. Two ratings were obtained from each supervisor with an interval of at least two weeks between the ratings. Since sample members' test scores are confidential, supervisors had no knowledge of the test scores of workers.

A descriptive rating scale was used. The scale (see Appendix 3) consists of six items. Five of these items cover different aspects of job performance. The sixth item is a global item on the Refinery Operators' "all-around" ability. Each item has five alternative responses corresponding to different degrees of job proficiency. For the purpose of scoring the items, weights of 1 to 5 were assigned to the responses. The total score on the rating scale is the sum of the weights for the six items. The possible range for each rating is 6-30.

A review of the job description indicated that the subjects covered by the rating scale were directly related to important aspects of job performance. A summary of these relationships follow:

A - Quantity of Work: A Refinery Operator must work quickly and efficiently to make timely manipulations of valves, levers, and other control devices.

B - Quality of Work: The work of a Refinery Operator must be of high quality to insure that the products and processes under his/her control meet strict quality and safety specifications.

C - Accuracy of Work: The work of a Refinery Operator must be precise in the measure of many process variables in order to prevent loss of product or the creation of hazardous working conditions.

D - Job Knowledge: The work of a Refinery Operator requires the acquisition and use of knowlege of the mechanical and chemical processes that are initiated and monitored in the manufacture of refinery products.

E - Job Versatility: The work of a Refinery Operator requires the capacity to perform a variety of duties involved in the safe and effective operation of a refinery.

F - "All-around" Job Ability: A Refinery Operator's value to the employer involves a combination of the aspects of job performance listed above.

A reliability coefficient of .83 was obtained between the initial ratings and the reratings, indicating a significant relationship. Therefore, the final criterion score consists of the combined scores of the two ratings. The possible range for the final criterion is 12-60. The actual range is 25-60. The mean is 42.1 with a standard deviation of 7.9. The relationship between the criterion and age, education and experience is shown in Table 1, below.

Table 1

Means, Standard Deviations (SD) and Pearson Product-Moment Correlations with the Criterion (r) for Age, Education, and Experience

	Mean	SD	r
Age (years)	34.3	11.4	.07
Education (years)	12.6	1.7	.01
Total Experience (months)	85.8	101.3	.19**

**Significant at the .01 level

For the purpose of analysis, the criterion distribution was dichotomized so as to include, approximately one-third of the sample in the low criterion group and two-thirds in the high criterion group. This is the standard procedure for SATB studies. The criterion cutting score was set at 39 which placed 38% in the low criterion group and 62% in the high criterion group.

Criterion for the Cross-validation Study

The criterion used in the cross-validation study consisted of supervisory ratings in rank order. For computational purposes the ratings were converted to linear scores and then averaged. The relationship between the criterion and age, education and experience is shown in Table 1a.

TABLE 1a

Means, Standard Deviations (SD), and Pearson Product-Moment Correlations with the Criterion (r) for Age and Education

Cross-validation Sample
N=63

	Mean	SD	r
Age (years)	46.4	4.5	-.142
Education (years)	10.1	2.4	.236
Experience (months)	169.7	53.9	.148

ANALYSIS

The intitial step in the analysis is to identify those aptitudes which show some evidence of validity and job relatedness. This evidence can be:

1. Statistical evidence of the correlation (r) between the test and the criterion.
2. Content validity as evidenced by a rating of "critical" based on the job analysis, or
3. Any combination of the following:

   high mean

   low standard deviation (SD)

   rating of "important" based on the job analysis

Statistical results for the validation sample are shown in Table 2.

TABLE 2

Statistical Results for Validation Sample
N=194

Aptitude	Mean	SD	r
G - General Learning Ability	102.7	16.8	.23**
V - Verbal Aptitude	99.6	13.8	.07
N - Numerical Aptitude	101.4	17.4	.22**
S - Spatial Aptitude	106.3	18.5	.21**
P - Form Perception	108.1	19.4	.10
Q - Clerical Perception	112.4	15.6	.19**
K - Motor Coordination	103.6	19.5	.06
F - Finger Dexterity	94.0	22.5	.11
M - Manual Dexterity	118.3	24.2	.06

**Significant at the .01 level

Table 3 summarizes the qualitative analysis and statistical results shown in Table 2 and shows the aptitudes considered for inclusion in the battery.

TABLE 3

Summary of Qualitative and Quantitative Data for Validation Sample

	Aptitudes								
Type of Evidence	G	V	N	S	P	Q	K	F	M
Job Analysis Ratings									
Critical									
Important	X				X	X			X
Irrelevant									
Statistical Evidence									
High Mean					X	X			X
Low SD		X							
Significant r	X		X	X		X			
Aptitudes Considered for Inclusion in the Battery	X		X	X	X	X			X

The information in Table 3 indicates that the following aptitudes should be considered for inclusion in the battery: G, N, S, P, Q and M. The objective is to develop a battery of 2, 3 or 4 aptitudes with cutting scores at the point (a) where about the same percent will meet the cutting scores as the percent placed in the high criterion group and (b) which will maximize the relationship between the battery and the criterion.

The cutting scores are set at about one standard deviation below the mean aptitude scores of the sample, with the deviations at five point intervals above and below these points to achieve the objectives indicated above.

A number of aptitude cutting score combinations were valid; therefore, the norms associated with Occupational Aptitude Pattern-30 (OAP-30) were chosen. The OAPs are based on data for 460 SATBs. Information on the developmental research of the OAPs may be found in the Manual for the General Aptitude Test Battery, Section II-A, Development of the Occupational Aptitude Pattern Structure, available from the Government Printing Office.

The selected battery is:

Aptitudes	Cutting Scores
N - Numerical Aptitude	85
S - Spatial Aptitude	90
P - Form Perception	85

VALIDITY OF THE BATTERY

Criterion Related Validity

Table 4 shows the criterion related validity of the battery for the total sample, blacks and nonminorities.

TABLE 4

Validity of Battery

Sample	N	High Criterion Group		Low Criterion Group		Chi Square	Significance Level p/2<	Phi Coefficient
		Below Cutting Scores	Meeting Cutting Scores	Below Cutting Scores	Meeting Cutting Scores			
Total	194	28	93	37	36	15.5	.0005	.28
Black	41	5	8	21	7	3.7*	.025**	.30
Non-minority	139	21	78	16	24	5.1	.025	.19
Cross-validation	63	28	15	17	3	1.8*	.05**	17

*Yates' corrected
**Computed using Fisher's Exact Probability Test

Multiple regression analysis was conducted between aptitudes N, S and P and the criterion. A multiple correlation of .27 (significant at the .01 level) was obtained.

Effectiveness of the Battery

The level of validity shown in Table 4 indicates it will be useful in selection. In the total validation sample, 62% were considered to be highly competent. Of those who met the cutting scores, 72% were highly competent, which is an increase of 10 percentage points over the existing selection method. These findings are shown in Table 5.

TABLE 5

Effectiveness of the Battery

SELECTION SYSTEM	NUMBER SELECTED	COMPETENT (HIGH CRITERION GROUP)		MARGINAL (LOW CRITERION GROUP)	
		N	%	N	%
VALIDATION SAMPLE					
Without Tests	194	121	62	73	38
With Tests	129	93	72	36	28
Cross-Validation Sample					
Without Tests	63	43	68	20	32
With Tests	18	15	83	3	17

The research sample consisted of employed workers on whom some selection had already taken place; presumably those workers who lacked the required abilities had quit, been fired, or had been transferred. Therefore, a greater increase over existing selection methods in the proportion of competent workers is to be expected when the battery is used for selection, as the range of relevant abilities is almost certainly greater among applicants than among employed workers.

Subgroup Analysis

No difference in the validities for blacks and nonminorities was found for this battery; the difference between phi coefficients for blacks and nonminority group members for the validation sample is not statistically significant (CR=.62).

The battery is fair to blacks since the percent of both blacks and nonminorities who met the cutting scores approximated the percent who were in the high criterion groups; 37% of the blacks met the cutting scores and 32% were in the high criterion group; 73% of the nonminorities met the cutting scores and 71% were in the high criterion group.

Prior Battery

The previously validated norms for Refinery Operator S-68 were tested on this validation sample. The original battery, validated in 1955, is G-85, P-65, K-70, M-65. This battery is valid for the total validation sample (Phi=.29).

APPENDIX 1

Descriptive Statistics for Black and Nonminority Subgroups

	Black (N=41)			Nonminority (N=139)		
Variable	Mean	SD	Range	Mean	SD	Range
Aptitude G	88.2	14.0	67-138	106.8	15.4	55-148
Aptitude V	90.4	11.7	65-123	102.2	13.2	68-137
Aptitude N	89.4	14.4	65-123	104.7	17.0	54-159
Aptitude S	94.0	15.9	68-127	109.6	18.0	58-160
Aptitude P	100.4	16.6	61-130	110.2	20.1	60-153
Aptitude Q	109.6	13.7	81-138	112.8	15.9	79-179
Aptitude K	105.3	15.6	60-155	102.4	20.9	25-146
Aptitude F	89.0	18.0	37-147	93.9	23.3	31-147
Aptitude M	107.6	20.3	57-189	108.5	25.8	32-190
Criterion	37.3	4.7	25-48	43.4	8.3	25-60
Age	29.3	5.8	19-45	36.3	12.3	19-62
Education	13.3	1.5	12-17	12.3	1.7	6-18
Experience (Months on current job)	38.6	35.8	8-168	71.7	77.4	6-361
Total Experience (months)	50.4	56.0	8-264	102.3	111.2	6-420

APPENDIX 2

U.S. DEPARTMENT OF LABOR • MANPOWER ADMINISTRATION

DESCRIPTIVE RATING SCALE

SCORE _____

RATING SCALE FOR _____

D.O.T. Title and Code

Directions: Please read the "Suggestions to Raters" and then fill in the items which follow. In making your ratings, only one box should be checked for each question.

SUGGESTIONS TO RATERS

We are asking you to rate the job performance of the people who work for you. These ratings will serve as a "yardstick" against which we can compare the test scores in this study. The ratings must give a true picture of each worker or this study will have very little value. You should try to give the most accurate ratings possible for each worker.

These ratings are strictly confidential and won't affect your workers in any way. Neither the ratings nor test scores of any workers will be shown to anybody in your company. We are interested only in "testing the tests." Ratings are needed only for those workers who are in the test study.

Workers who have not completed their training period, or who have not been on the job or under your supervision long enough for you to know how well they can perform this work should not be rated. Please inform the test technician about this if you are asked to rate any such workers.

Complete the last question only if the worker is no longer on the job.

In making ratings, don't let general impressions or some outstanding trait affect your judgment. Try to forget your personal feelings about the worker. Rate only on the work performed. Here are some more points which might help you:

1. Please read all directions and the rating scale thoroughly before rating.

2. For each question compare your workers with "workers-in-general" in this job. That is, compare your workers with other workers on this job that you have known. This is very important in small plants where there are only a few workers. We want the ratings to be based on the same standard in all the plants.

3. A suggested method is to rate all workers on one question at a time. The questions ask about different abilities of the workers. A worker may be good in one ability and poor in another: for example, a very slow worker may be accurate. So rate all workers on the first question, then rate all workers on the second question, and so on.

4. Practice and experience usually improve a worker's skill. However, one worker with six months' experience may be a better worker than another with six years' experience. Don't rate one worker as poorer than another merely because of a lesser amount of experience.

5. Rate the workers according to the work they have done over a period of several weeks or months. Don't rate just on the basis of one "good" day, or one "bad" day or some single incident. Think in terms of each worker's usual or typical performance.

6. Rate only the abilities listed on the rating sheet. Do not let factors such as cooperativeness, ability to get along with others, promptness and honesty influence your ratings. Although these aspects of a worker are important, they are of no value for this study as a "yardstick" against which to compare aptitude test scores.

MA 7-66
Apr. 1973

NAME OF WORKER (Print) (Last) (First)

SEX: MALE_____ FEMALE_____

Company Job Title: _____

How often do you see this worker in a work situation?

- ☐ All the time.
- ☐ Several times a day.
- ☐ Several times a week.
- ☐ Seldom.

How long have you worked with this worker?

- ☐ Under one month.
- ☐ One to two months.
- ☐ Three to five months.
- ☐ Six months or more.

A. How much can this worker get done? (Worker's ability to make efficient use of time and to work at high speed.) (If it is possible to rate only the quantity of work which a person can do on this job as adequate or inadequate, use #2 to indicate "inadequate" and #4 to indicate "adequate.")

- ☐ 1. Capable of very low work output. Can perform only at an unsatisfactory pace.
- ☐ 2. Capable of low work output. Can perform at a slow pace.
- ☐ 3. Capable of fair work output. Can perform at an acceptable pace.
- ☐ 4. Capable of high work output. Can perform at a fast pace.
- ☐ 5. Capable of very high work output. Can perform at an unusually fast pace.

B. How good is the quality of work? (Worker's ability to do high-grade work which meets quality standards.)

- ☐ 1. Performance is inferior and almost never meets minimum quality standards.
- ☐ 2. Performance is usually acceptable but somewhat inferior in quality.
- ☐ 3. Performance is acceptable but usually not superior in quality.
- ☐ 4. Performance is usually superior in quality.
- ☐ 5. Performance is almost always of the highest quality.

C. How accurate is the work? (Worker's ability to avoid making mistakes.)

- ☐ 1. Makes very many mistakes. Work needs constant checking.
- ☐ 2. Makes frequent mistakes. Work needs more checking than is desirable.
- ☐ 3. Makes mistakes occasionally. Work needs only normal checking.
- ☐ 4. Makes few mistakes. Work seldom needs checking.
- ☐ 5. Rarely makes a mistake. Work almost never needs checking.

D. How much does the worker know about the job? (Worker's understanding of the principles, equipment, materials and methods that have to do directly or indirectly with the work.)

- ☐ 1. Has very limited knowledge. Does not know enough to do the job adequately.
- ☐ 2. Has little knowledge. Knows enough to get by.
- ☐ 3. Has moderate amount of knowledge. Knows enough to do fair work.
- ☐ 4. Has broad knowledge. Knows enough to do good work.
- ☐ 5. Has complete knowledge. Knows the job thoroughly.

E. How large a variety of job duties can the worker perform efficiently? (Worker's ability to handle several different operations.)

- ☐ 1. Cannot perform different operations adequately.
- ☐ 2. Can perform a limited number of different operations efficiently.
- ☐ 3. Can perform several different operations with reasonable efficiency.
- ☐ 4. Can perform many different operations efficiently.
- ☐ 5. Can perform an unusually large variety of different operations efficiently.

F. Considering all the factors already rated, and only these factors, how good is this worker? (Worker's all-around ability to do the job.)

- ☐ 1. Performance usually not acceptable.
- ☐ 2. Performance somewhat inferior.
- ☐ 3. A fairly proficient worker.
- ☐ 4. Performance usually superior.
- ☐ 5. An unusually competent worker.

Complete the following ONLY if the worker is no longer on the job.

G. What do you think is the reason this person left the job? (It is not necessary to show the official reason if you feel that there is another reason, as this form will not be shown to anybody in the company.)

- ☐ 1. Fired because of inability to do the job.
- ☐ 2. Quit, and I feel that it was because of difficulty doing the job.
- ☐ 3. Fired or laid off for reasons other than ability to do the job (i.e., absenteeism, reduction in force).
- ☐ 4. Quit, and I feel the reason for quitting was not related to ability to do the job.
- ☐ 5. Quit or was promoted or reassigned because the worker had learned the job well and wanted to advance.

RATED BY	TITLE	DATE
COMPANY OR ORGANIZATION	LOCATION (City, State, ZIP Code)	

GPO 863-716

MA 7-66
Apr. 1973

S-68R82

APPENDIX 3

JOB DESCRIPTION

Job Title

Refinery Operator (petrol. refin.) 549.260-010 4th Edition DOT code

Guide for Occupational Exploration (G.O.E.) Code 06.01.03 Machine Set-Up and Operation.

Job Summary

Performs and may direct others to perform the work entailed in the safe and continuous operation of one or more batteries of refining and processing units in which natural gas, crude or other oil is distilled and processed into such products as gasoline, kerosene, fuel and lubricating oils, and liquified or gaseous natural gas, hydrogen and carbon monoxide.

Work Performed

*Receives specifications and instructions in both verbal and written form from supervisor and operators from the previous shift. Reads log sheets, log books, records and test results and sets knobs, valves, switches and lever arms on the control panel of automatic regulators so the proper combination of flow temperature, pressure, vacuum, time, catalyst, chemical and other process variables will product the quantity and quality of product stipulated. Makes some simple arithmetic computations, occasionally figures a percentage or ratio and calls upon knowledge of and experience with plant operation in order to set controls properly to achieve desired result. Turns, presses or throws knobs, buttons and switches on control panels which control motor-actuated valves located on the flow line of a unit in order to build up or shut down the unit. Manually operates valves on a unit or auxiliary equipment controls under certain conditions and with certain equipment before, during and after unit operation. Inspects unit or section of unit after shutdown; enters units such as stills or vessels and uses experience and portable gages to make sure a condition exists that is safe from explosion, fumes, acid, heat and burns so that repair, maintenance, cleaners and other non-operating personnel may proceed to work in or around it.

*Determines the presence and cause of trouble in automatic operation of a unit: Observes continuously the reading of the instruments so that temperatures, flows and pressures are always in balance according to specifications. Obtains check point readings from meters connected with fixed type gages such as thermometers and pressure gages at hundreds of different points throughout the units. Determines the location of

trouble by using experience and knowledge to mediate between the indications on the control panels and the actual physical points of trouble in the units. Action rapidly follows a trouble determination and in some instances requires immediate movement through a unit, up ladders or steps and along catwalks to manually operate valves controlling flows affected by the trouble. Determines the reason for the trouble which might be: leaks, blockages or faulty valves in a unit; failure of pumps, compressors, pre-heaters or other auxiliary equipment; volume, temperature, pressure or characterisitcs of flows entering one unit from another unit. Corrects conditions causing trouble when this can be accomplished by routine methods not requiring repair or maintenance. May discover trouble by the automatic operation of signal lights on the control panel or the sounding of horns connected to the equipment. Reports all conditions requiring even minor repair or maintenance to the supervisor so that he/she may check the condition and order a work permit.

Performs related clerical activities: Observes and records, at stated time intervals, the readings of all instruments on a daily log sheet. Makes some entries in a log book which is maintained on a permanent basis. Enters results of unit tests and laboratory tests on the daily log sheet. May prepare rolls, tapes, discs and charts of graph paper used in the recording instruments, some of which require lines to be drawn, figures entered and starting points indicated. Inserts prepared roll, tape, disc or charts into recording instruments so that inking points are in the proper position to start recording. Reviews log sheets, log book and notes when starting to work so that continuity of operation will be maintained. Reads and studies diagrams and sketches when hook-ups are changed or new processes or equipment are added.

Patrols units regularly to check operations: Maintains close contact with, and may direct or coordinate work of, Firer, Gager, Still-Pump Operator, Toper and other helpers. May perform or assist in the work of changing or to change over pumps; oiling, greasing, and packing equipment, and standing watch at the small control boards in the furnace area and compressor room. Makes sure that safety regulations are observed at all times and that the entire unit is always in safe operating condition.

*Tests products at prescribed intervals: Opens bleeder valves located at certain points in the units, stills, tanks and on flow lines and withdraws samples of liquid or gas into containers designed for particular products. Weighs gas for specific gravity on an analytical scale, and liquid for specific gravity with a hydrometer. Observes color of liquid products and compares with charts to determine whether processing is proceeding properly with respect to important factors measurable by color. Forwards these and other samples to laboratory at prescribed intervals during the day. Receives results of some of the laboratory analyses within a short time period the same day so that adjustments in the process may be made immediately in order to prevent waste of time and product.

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*These job duties were designated as critical job duties because they must be performed competently if the job is to be performed in a satisfactory manner. Refinery Operators spend about 75% of their working time performing these duties.

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