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Operations Analysis Department
Research Memorandum
OAD RM 106

LINCOLN SHELTER UTILIZATION STUDY

Volume II—A Shelter Assignment Procedure

Prepared for:

DEPARTMENT OF DEFENSE
OFFICE OF CIVIL DEFENSE
WASHINGTON, D.C.

CONTRACT OCS-OS-62-135

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ABSTRACT

This report is Vol. II of a report entitled LINCOLN SHELTER UTILIZATION STUDY. Vol. I is entitled "A Review of the Requirements of Shelter Utilization Planning." This second report deals specifically with a step-by-step process of assigning the population of Lincoln, Nebraska to fallout shelters. The techniques developed herein can readily be applied to numerous cities having characteristics similar to those of Lincoln, Nebraska.

This report describes a method by which large census tract maps can be designed and used in assigning blocks of people to shelters. The report further describes methods of developing day and nighttime population data for any given city.

A technique of putting the shelter assignment on data-processing cards for information retrieval is discussed. Various examples are presented of methods of sorting punched cards into useful shelter assignment reports.

Considerable attention is given to demonstrating the numbers of people who would be sheltered under three separate warning times. Certain rules, based on the natural behavior of people, are developed as an aid in the assignment process.

Estimates of cost and effort expended are provided as a guide to any CD official who would desire to use the techniques described herein.

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This report was prepared under the guidance and administration of Mr. Rogers S. Cannell, Director of SRI's Operations Planning Research Center. Rear Admiral A. G. Cook (Ret.), USN, who recently retired as Director, Disaster Council and Corps, City and County of San Francisco, acted as a general consultant.

I INTRODUCTION

The assignment of people to shelter is one of the more difficult tasks in the shelter program. In cities lacking sufficient shelter spaces to accommodate the whole population, the problem of deciding who shall be assigned and who shall not, can become formidable.

In order to be able to accept the principle of an orderly assignment of those in the population who can be sheltered and frankly informing those who cannot, it is necessary to imagine the situation that would probably develop if no such provisions were made.

The public appears to be only partly informed as to the shelter situation. There is general awareness of the presence of shelter in most areas and there is some knowledge that supplies are being put into shelters. The result is an apathetic and somewhat complacent attitude that shelter has been provided, and if disaster strikes, shelter will be available.

In this situation public recognition of a sudden real emergency might touch off a wild scramble for safety which by itself would leave a large portion of the citizenry out in the streets at a time when it was vital to their safety that they be under cover. Furthermore, the insufficient shelter now available could cause actions that could lead to a large increase in casualties, both inside and outside the shelters. Such casualties would develop out of attempts to overcrowd shelters and would occur as groups of panic stricken people ran from shelter to shelter trying to find space.

An orderly assignment program which puts the appropriate number of people into the available shelters, and dissuades those remaining from leaving their localities, but arranges for them to provide for themselves, would seem to be the most practical at the present time. Those assigned would have some confidence that their move to shelter would be

the best action to take, and those not assigned would understand in advance the position and, according to their beliefs, could prepare as they saw fit.

In the following assignment program the aim has been to arrive as closely as possible to a practical situation as stated above. Many considerations have been studied; often decisions have had to be taken between conflicting requirements. Alternatives have been weighed and are included herein if it appears that different localities and situations could require them.

II CONCLUSIONS AND RESULTS

As long as there is a shortage of shelters in most of the cities, towns, and communities in the United States, a program of assigning a part of the population to the available shelters presents severe difficulties.

In the work covered by this report, an effort has been made to find the best compromise available today.

It has been found necessary to draw a distinction between those who can be accommodated in the existing shelters and those who cannot, whether due to shortage of actual shelters, or distance of the people from the shelter. It is recommended that people who cannot be accommodated in shelters be so advised, and whatever assistance that can be given to them to provide for themselves should be given. The assignment process developed clearly identifies areas where no assignment is possible.

The assignment can be done in such a way that it conforms closely to the people's natural behavior, and by the application of certain rules, it is considered that assignment need not be dependent upon everyone knowing what their assignment is. Strangers to the locality and those who ignored the assignment information, could, in the emergency, still find their way to shelter.

It has been determined that two assignments are necessary, covering the substantially different distribution of the population by day and by night. However, the requirement for people to be cognizant of their assignment applies only to them while they are at home. When people are away from home the assignment depends upon their location, and provisions are included for informing them or leading them to shelter wherever they may be.

The assignment is designed to create population movements towards a center or centers of shelters, and thereafter to follow as closely as

possible the natural action people would take. This is to minimize the public indoctrination required to put this program into effect.

The assignment process takes into account the time taken for people to get into shelter. It is for local decision to determine, based upon targeting theory concerning that locality, how much warning time is most likely; then to apply the resulting warning time to the assignment, based upon a 3-mile-per-hour rate of movement of the people.

In the case of Lincoln, Nebraska, used as illustration in this report, three warning times were used to show the effect. Table I summarizes the numbers of people assigned to shelter under the various warning times.

Table I

COMPARISON OF ASSIGNMENTS FOR THREE WARNING TIMES--
NIGHTTIME ASSIGNMENT--
LINCOLN, NEBRASKA

Population and Shelter Categories		Warning Time		
		Ample	60 Minutes	30 Minutes
Population	Total	128,521	128,521	128,521
	Assigned	120,328	91,816	51,915
	Unassigned	8,193	36,705	76,606
Shelter Spaces (Categories 2-8)	Total	122,850	122,850	122,850
	Assigned	120,328	91,816	51,915
	Unassigned	3,222	31,347	71,225
	Overassigned	700	313	290

A detailed illustrated method of doing the assignment is included in this report.

The assignment process developed herein depends upon an accurate assessment of the population by day and by night. The methods used for determining this distribution are developed in the report. However, population distributions are not static, and with new building, and the

growth of the population, it becomes necessary to update the population data at regular intervals, such as annually. In putting the program into effect, an updating procedure should be budgeted for at the same time. As time passes, more shelter will become available and the assignment should be redistributed accordingly.

III RECOMMENDATIONS FOR FUTURE PROGRAM

In an assignment task of this type, the substantial effort required places a large burden of responsibility upon the personnel doing the assignment, the possibility of doing the assignment centrally by computers would be attractive if it could be done effectively.

Such assignments would have the advantage of uniformity in the method, and would place less burden on the local CD officials.

Some thoughts on how such assignments by computer could be done are presented here, drawn from the experience gained in doing these assignments manually.

Ideally, the results from a computer assignment should be almost the same as the results of a manual assignment done by a thoroughly competent assigner.

The method would be to start from the census records, and produce a map of blocks and population. The map would then be covered by a grid which would enable conversion of the block location into grid coordinates. The block populations and corresponding grid coordinates could be transferred to computer tape. The shelters would be treated the same way. The center or centers of shelter would be found by an examination of the map. This could be computed, but in many cases it could be done by inspection, and its coordinates determined. The computer would then be programmed to assign blocks and shelters always working in the direction towards the center of shelter.

Assignment would start with the shelters farthest away from the center and work in towards the center.

The coordinate location system permits measurement of distance, and this would also be listed beside assignments.

Depending upon the city or community being assigned, the computer could be programmed to assign all shelters to capacity, or to limit

assignment to encompass areas of limited distance away from shelter, depending upon the predicted probable warning time for that area.

Several special effects would need development, such as programming to account for existing natural barriers and to avoid making people cross them.

It is considered that a workable program could be developed to remove the needs for manual assignment.

IV THE ASSIGNMENT PROCESS

In making an assessment of the process by which people can be assigned to shelter, a major consideration has been to evaluate the natural course of action people would take, and to fit the plan to suit this. The aim is thus to reduce the amount of public indoctrination needed to make the program work. An example of this is to arrange for people to travel in the same direction to shelter, and to avoid crossing paths. A person not knowing the plan, but in an assigned area, would tend to be naturally carried along in the main stream and to get to the assigned shelter by following the crowd. Even if only 50 percent of the population in assigned areas knew the plan, it seems reasonable to suggest that, by the methods described below, all the population would get into its assigned shelters.

A. Selection of Assignment Personnel

It is important to determine who shall make the actual assignments. In making this decision, there is a choice between the person very familiar with an area, who would avoid mistakes such as directing people to cross impassable barriers (e.g., high fences), but at the same time knows many people and becomes involved in deciding who shall have shelter and who shall not; and the person who is totally unfamiliar with anyone who lives in the area, and can assign in a dispassionate manner guided only by the rules.

The emotional response of a number of persons to the concept of assignment to shelter with its attendant responsibilities has been observed, and it is considered that assignment will be accepted more readily by local authorities if the work is done by a competent outside consultant acting in concert with the local civil defense director.

A step-by-step description follows of the actual assignment process that was developed using Lincoln, Nebraska as the model. Certain minor variations might be found desirable in other localities, depending upon

how the Architect-Engineer firm that did the shelter survey presented their results. It is intended, though, that the assignment method and the presentation of results shall be applicable to all communities regardless of size, except that small communities of about 10,000 or less would not need the services of the data-processing equipment discussed in this report.

B. Assignment by Area

The principle that is used is to assign people by areas. This means that assignment is not done by name, but by the occupants of an area, whether they be resident, at place of work or transient, visiting, or shopping. The smallest unit of area considered in Lincoln was the city block, which averages 400 feet square (about 3.7 acres), bounded by streets. Using this principle, it becomes necessary to determine as closely as possible the number of people that will be occupying a block at any time. For convenience, two periods were chosen: day and night. Day consists of the period from 7:30 AM to 5:30 PM, and night is the rest of the 24 hour period.

The determination of the distribution of the population at night was done using the census report HC(3) Number 236, "Housing" 1960. This gives nighttime population by blocks.

For daytime population distribution a computation was necessary and is described in Sec. V.

C. Preparation of Assignment Maps

Special maps were prepared in order to carry out the process of assignment. In order to prepare these maps the following steps were taken.

It was found that the A & E report for Lincoln included 8-inch-to-the-mile maps, divided into groups of tracts on 24-by-28-inch sheets. These were used as the basis for drawing the working assignment maps.

A typical map is shown in Fig. 1.



FIG. 1 SECTIONAL MAP OF LINCOLN SHOWING CENSUS TRACTS

The first step was to lay a sheet of tracing paper on the map (Fig. 2).



FIG. 2 PREPARING THE OVERLAY

Next, the tracts (Fig. 3), and blocks (Fig. 4) were outlined. The census tract data map which gives the block location (Fig. 5) was used for this. The blocks are numbered in the top left-hand corner of each block.



FIG. 3 DRAWING THE CENSUS TRACT BOUNDARIES

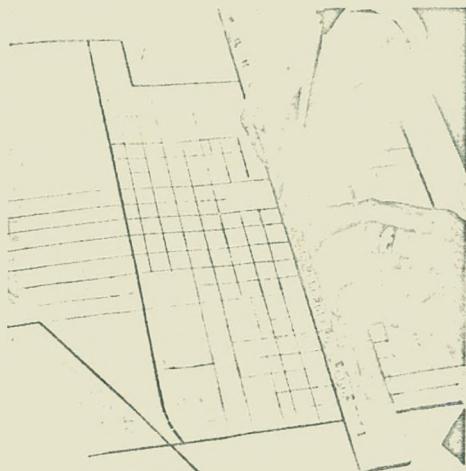


FIG. 4 DRAWING THE CENSUS BLOCK BOUNDARIES

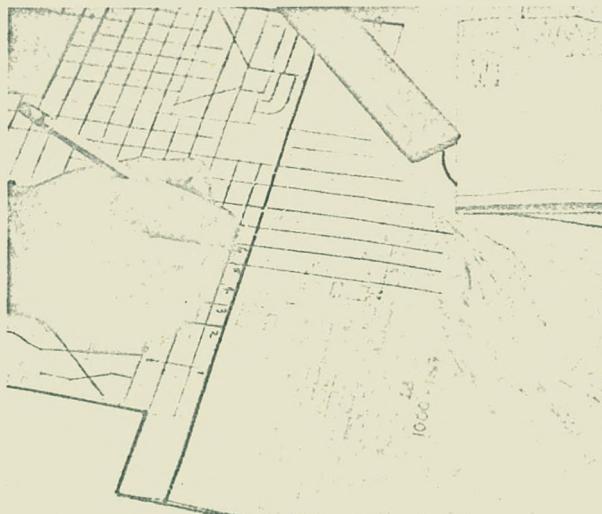


FIG. 5 ENTERING THE BLOCK NUMBERS

Next, the "Housing" census report HC(3) No. 236 was used. The block population was filled in as shown in Fig. 6.

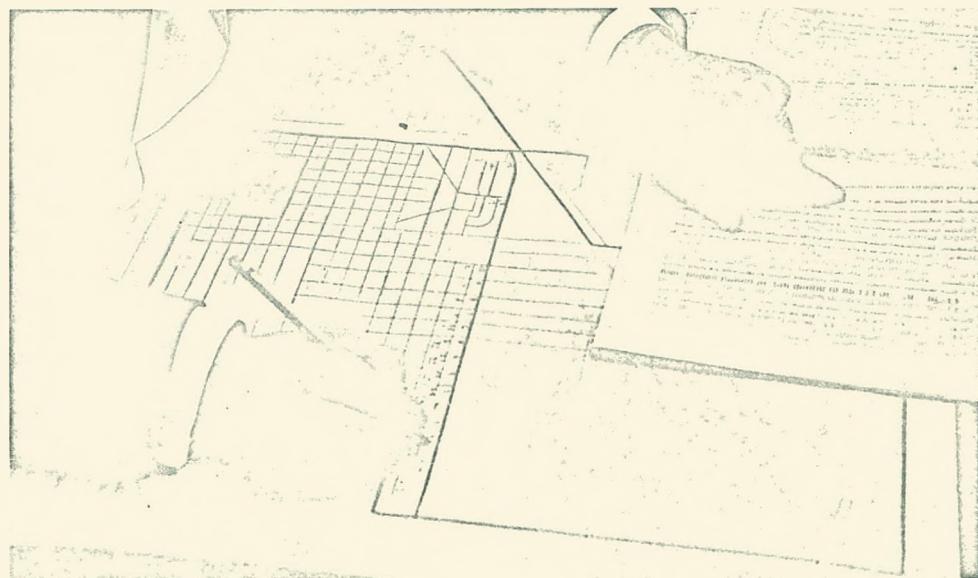


FIG. 6 ENTERING THE BLOCK POPULATIONS

In order to distinguish population figures from block numbers, the population figures were always underlined (Fig. 7).

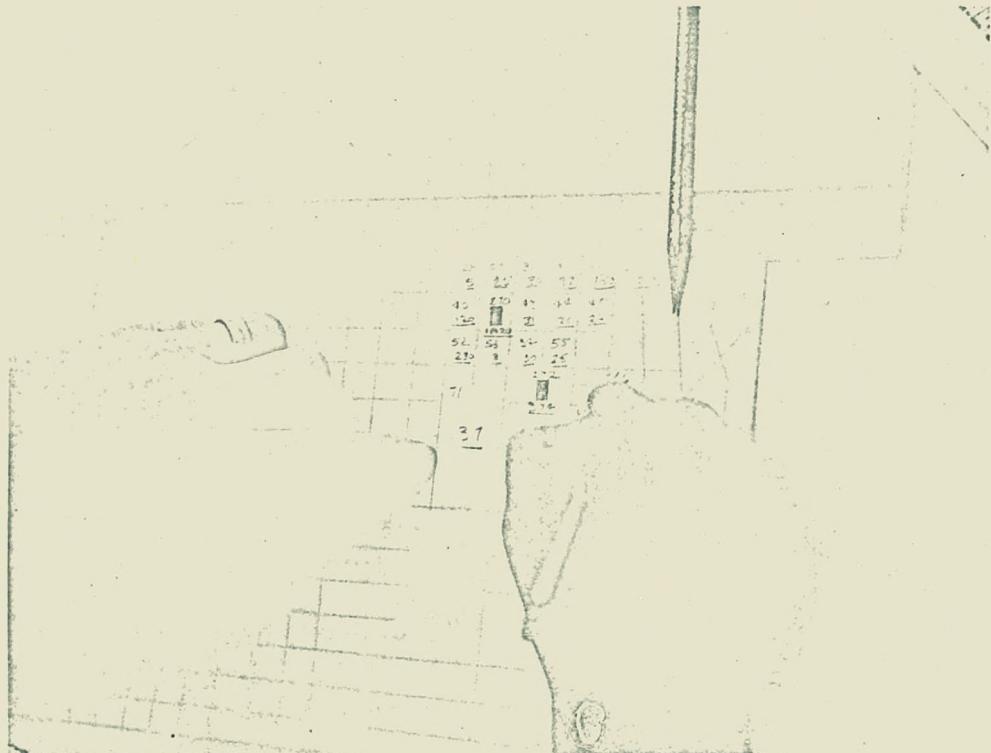


FIG. 7 METHOD OF DENOTING BLOCK POPULATIONS

Next, the shelters were entered. They are listed in the shelter survey Phase II reports provided by the Corps of Engineers. In Lincoln the Category 4 to 8 protection factor shelters were listed in a separate report from the Category 2 and 3 protection factors. It is important to note that the same shelter (facility) number often appears in each report, indicating shelters of Category 4 and Categories 2 and 3 in the same building. These are treated as separate shelters for assignment.

For easy reference and to avoid errors, the Category 4 to 8 list was duplicated black on white and the Category 2 and 3 in white on black (Fig. 8).

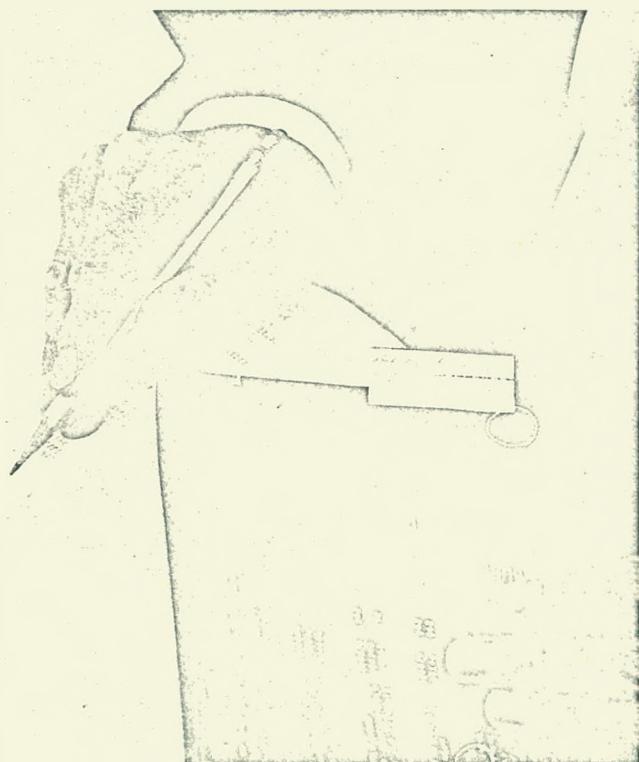


FIG. 8 SHELTER DATA AS FURNISHED BY THE FEDERAL GOVERNMENT

The shelters were entered on the map using the following procedure. The shelter was represented by a rectangle or square, and the facility number was entered above it. The capacity was written under the shelter and underlined. Category 4 to 8 shelters were marked by coloring the rectangle red, and Category 2 and 3, yellow. In the case of a shelter with both Category 4 and Category 2 and 3 shelters, the rectangle was divided, color coded, and the capacities written side by side underneath. The red or Category 4 part was always on the left (Fig. 9).



FIG. 9 ENTERING THE SHELTER DATA

The sections of the city were next cut out and Scotch taped together (Fig. 10), and the composite map set up on the wall (Fig. 11).

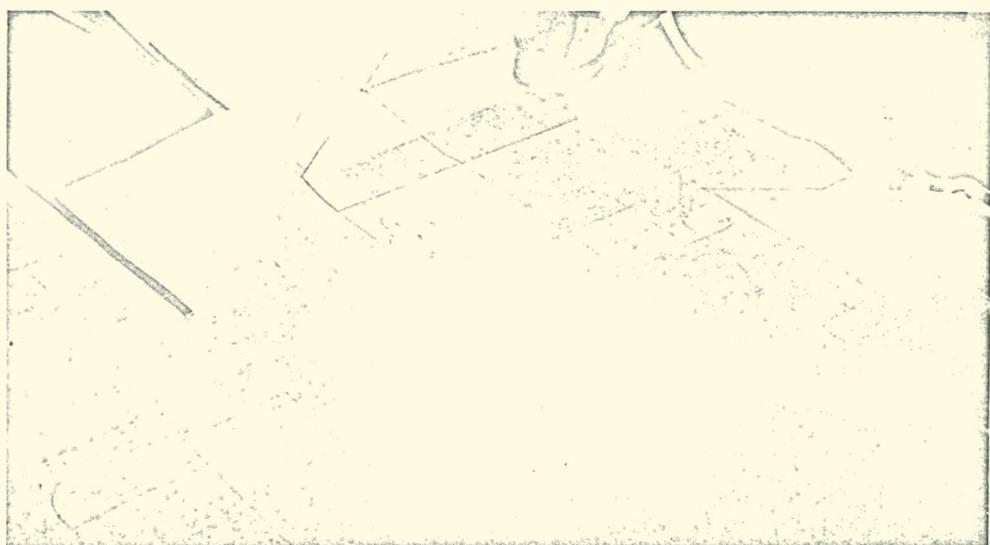


FIG. 10 ASSEMBLING THE COMPLETE MAP FROM SECTIONAL PIECES

ANCASTER COUNTY
LITAN AREA

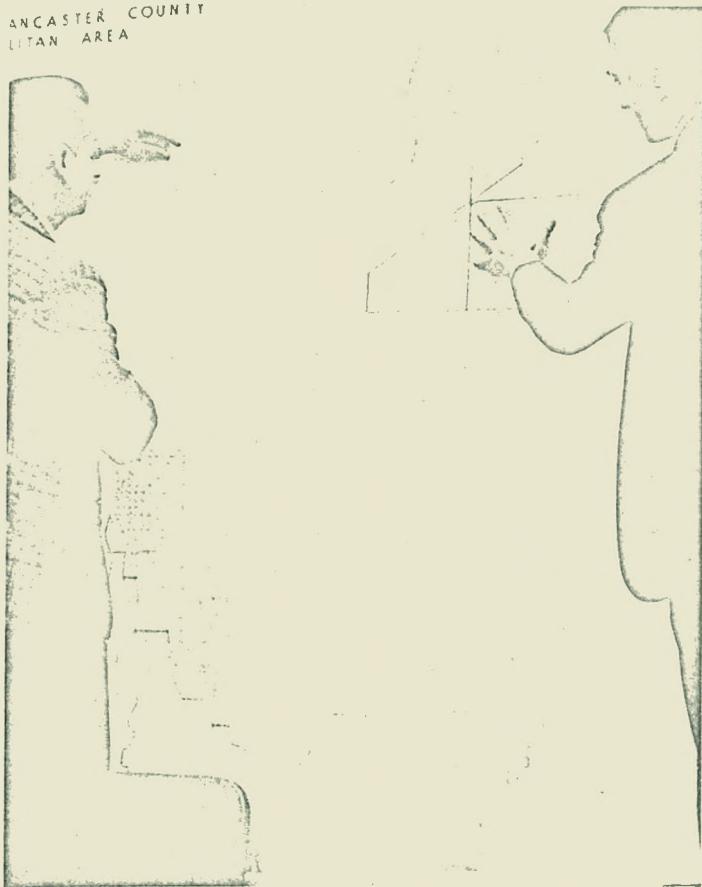


FIG. 11 MOUNTING THE MAP FOR ASSIGNMENT

NOTE: In the photograph the composite map is shown mounted on a large-scale 8-inch-to-the-mile map. This is not essential but it is important that the composite map be mounted over a white surface, otherwise the figures may be hard to see (Fig. 11).

In the downtown area (Tract 19) it was impractical, due to the large numbers of shelters, to use a map of the same scale as the rest of the city.

The Architect-Engineers had prepared a larger-scale map for this one tract and this was used (Fig. 12), and the data entered in a similar fashion (Figs. 13 and 14).

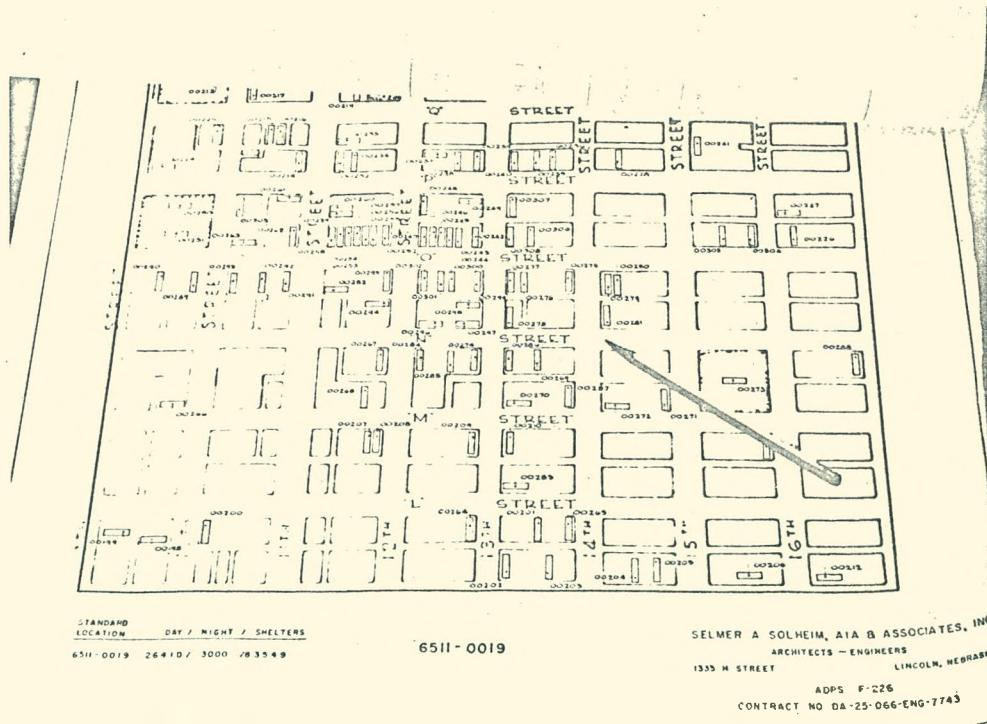


FIG. 12 LARGE SCALE MAP OF THE CENTRAL BUSINESS DISTRICT

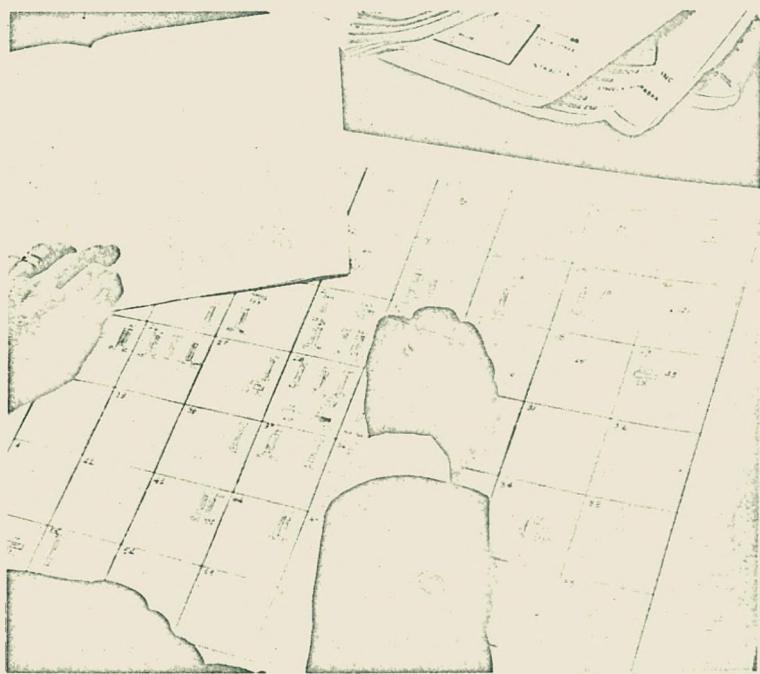


FIG. 13 ENTERING BLOCK POPULATIONS IN THE CENTRAL BUSINESS DISTRICT MAP

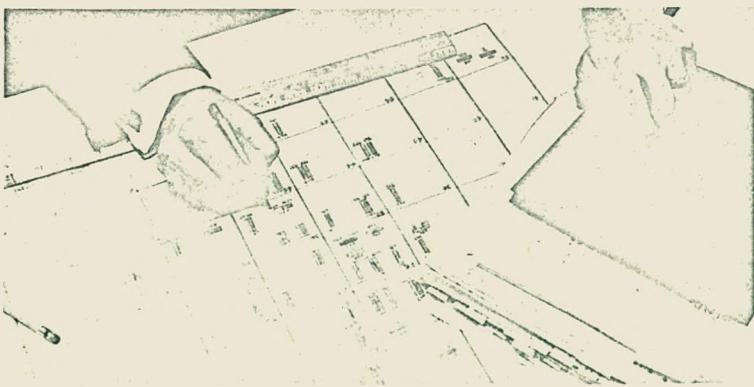


FIG. 14 ENTERING SHELTERS IN THE CENTRAL BUSINESS DISTRICT MAP

Block 23 in Tract 19 has a nighttime population of 63 people (Fig. 15).

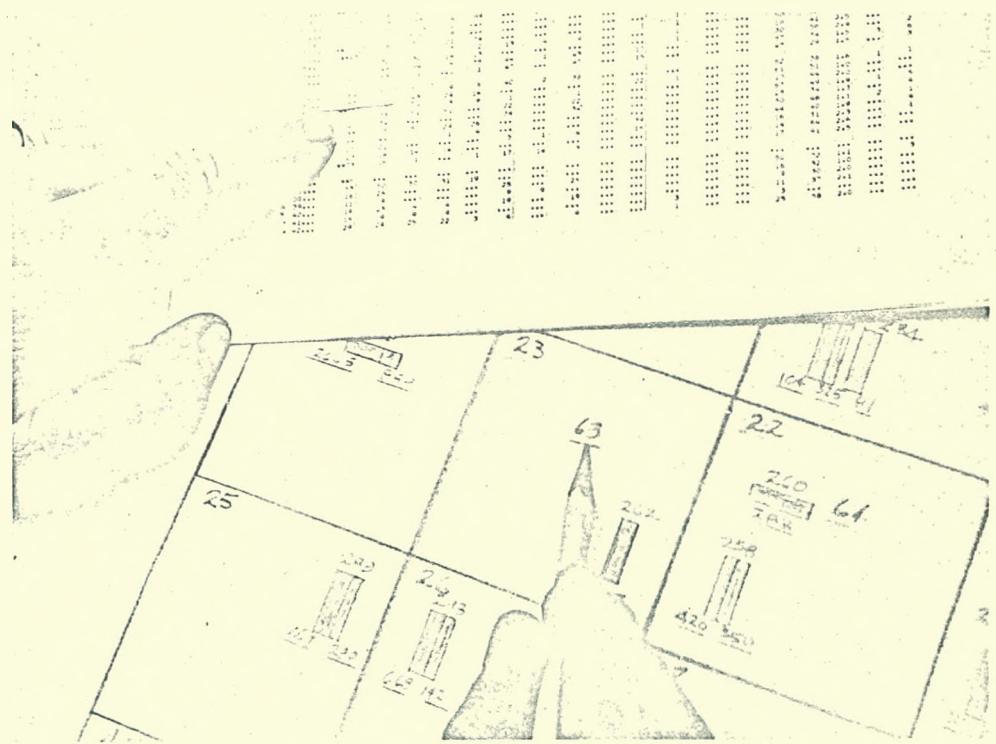


FIG. 15 DATA SOURCE DEMONSTRATION

The large-scale downtown area map was mounted beside the city composite map for ready reference (Fig. 16).

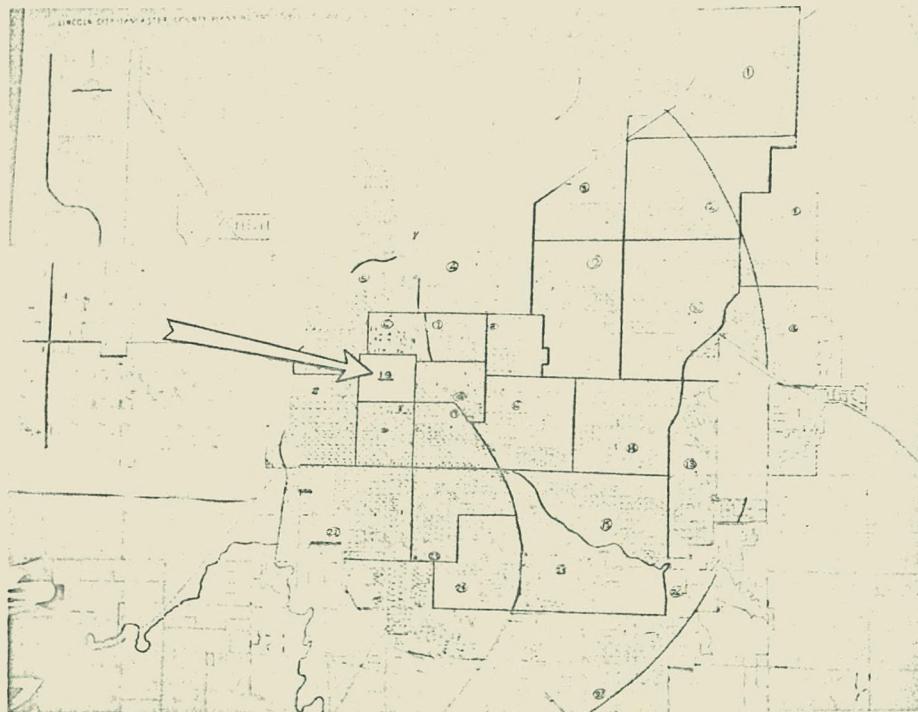


FIG. 16 SEPARATE ASSIGNMENT MAP SHOWING RELATIONSHIP OF
CENTRAL BUSINESS DISTRICT

D. Method of Assignment

The complete assignment process was done three times for the city of Lincoln. During each assignment many lessons were learned and the knowledge gained was tried out in a subsequent assignment.

The results of this work have given rise to a preferred method, including some alternatives, which is described below.

An inspection of the map indicated that most of the shelters were concentrated in a central area that covered one tract (19). Consequently it was easy to establish radial movement patterns of the population to the center of shelter. Once this was established, then the population was assigned so that everyone would move toward this center. This then is the first rule:

Rule 1--Establish a center or centers of shelters and arrange population movement only in the direction of center of shelter.

In Lincoln there is only one major center of shelter. In other cities there might well be two or more.

The objective here is to create a situation where definite streams of population movement are established that will carry along those who do not know or have forgotten their assignment. Since the assignment is designed to accommodate all the occupants of a block at any time, if enough people on a block know where to go they will take with them by "the following-the-crowd effect" those who do not know.

The next task is to establish zones or sectors in the city with boundaries that are not to be crossed by anyone going to shelter. Each zone or sector is to contain enough shelter for the occupants of the zone.

The division into zones will vary from city to city, and for small cities this step may not even be necessary.

In Lincoln it was found convenient to divide the city into four quadrants by using two very well known streets as the dividing lines.

If the dividing lines are well known, public indoctrination becomes much easier, since it is easy to inform people that to reach their assignment regardless of where they are they must "go toward the center of town," and "not cross 'O' street or 10th street." In Lincoln, these are the two streets which are the dividing lines, both of which are very well known (Fig. 17).

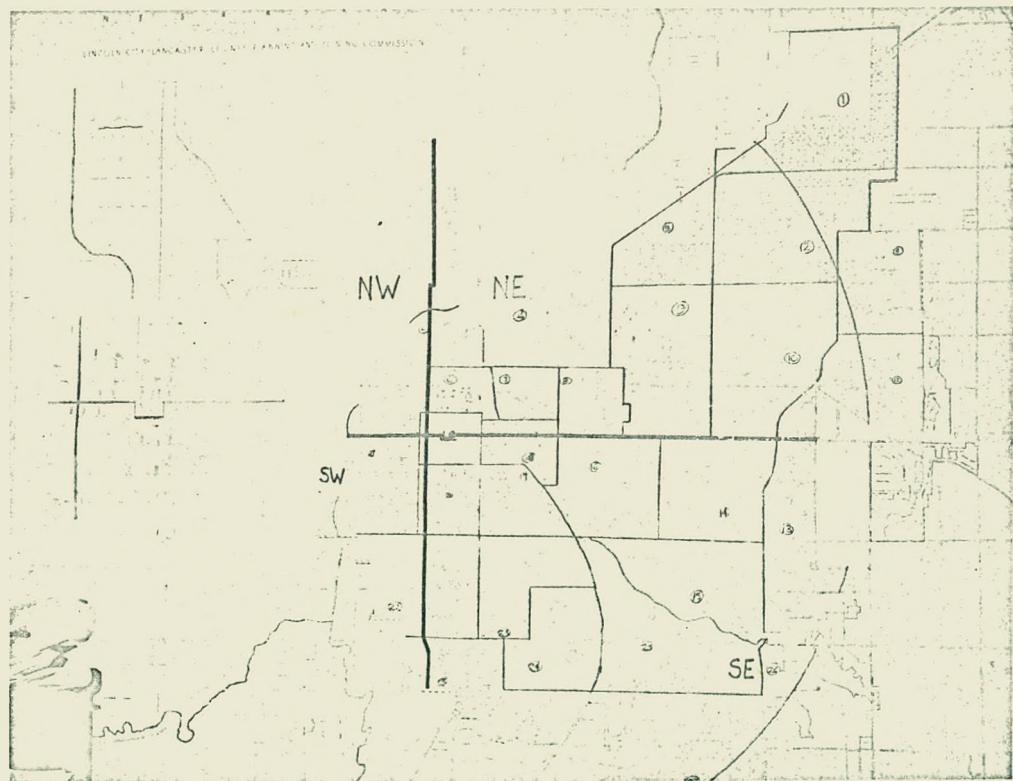


FIG. 17 QUADRANT DIVISIONS TO FACILITATE ASSIGNMENT

Before these dividing lines can be set it is necessary to make some trial computations to ensure that each sector or quadrant does contain sufficient shelter for the population of that quadrant. This must be checked for both day and night population distribution, and to establish the boundaries some judgment is necessary. In Lincoln, where there is insufficient shelter, it was decided that those areas which could not be assigned should logically be those areas farthest away from the shelters, since those people would be the least likely to reach them in time. These areas turned out to be in the northeast and southwest quadrants.

Due to the concentration of shelter in the downtown area it was certain that the dividing lines should cross or meet in the downtown area.

The boundaries were arbitrarily set using a north-south street, and an east-west street, and the shelter and population in each quadrant added up. It was found that there was a surplus of shelter in one quadrant and an unnecessary shortage in the other. The boundaries were then shifted to equalize the situation, and the population-shelter relationship was rechecked. When a satisfactory relationship was reached, the boundaries were fixed.

An inspection of the map (Fig 17) shows that if the population converges on the downtown area and stays within its own quadrant, the streams of people are naturally guided into their correct shelter area, and the problem of direction into a specific shelter is made easier. It will be shown later how specific assignment will be arranged so that people will fill the shelters in their natural order of arrival, thereby promoting an orderly procedure.

Even if the local Civil Defense authority decided not to make specific assignments, the division of the city into quadrants and public information about this would substantially ease the situation of people finding shelter at random.

Rule 2--Divide the city into sectors or quadrants which are designed so that:

- (a) Each sector or quadrant will contain shelter for the population that is to be sheltered within a specific quadrant.
- (b) The dividing lines would be well known streets or natural boundaries that would best facilitate communication to the population.

A separate assignment is to be done for both the night and daytime distribution of the population. Much consideration has been given to trying to arrange for a single assignment regardless of time of day.

The nighttime assignment places families together in shelters in the business district. Maintaining the same assignment during the day, the head of the family is already working near his assignment and proceeds to it, and his family would join him there. This would be an attractive idea if it could be made to work.

Unfortunately, there are too many variations from this ideal and severe difficulties are introduced in trying to carry it out.

The division of the city into quadrants for easier population control would have to be abandoned, since there is no assurance that people work in the same quadrant as they live. The quadrant technique is considered a vital element in the orderly passage of people and children, especially insofar as it assists people to find their proper shelter.

A further difficulty would be the large amount of additional traffic in and out of buildings, generated while people change buildings to get to their assigned shelter. Many buildings do not have sufficient stairway or doorway space to permit this kind of traffic, and confusion would occur with people going in all directions within the business district. Thus, the concept of everyone moving in one direction toward the center of shelter also would have to be abandoned.

As a result of these considerations, two assignments are recommended.

The assignment should be done by two persons--one, the assignor, working at the map, selects the shelters and the blocks of people to be

assigned to each shelter; the other, the recorder, writes down the assignments as they are made and, using an adding machine, keeps a running total of the number of people as they are assigned (Fig. 18).

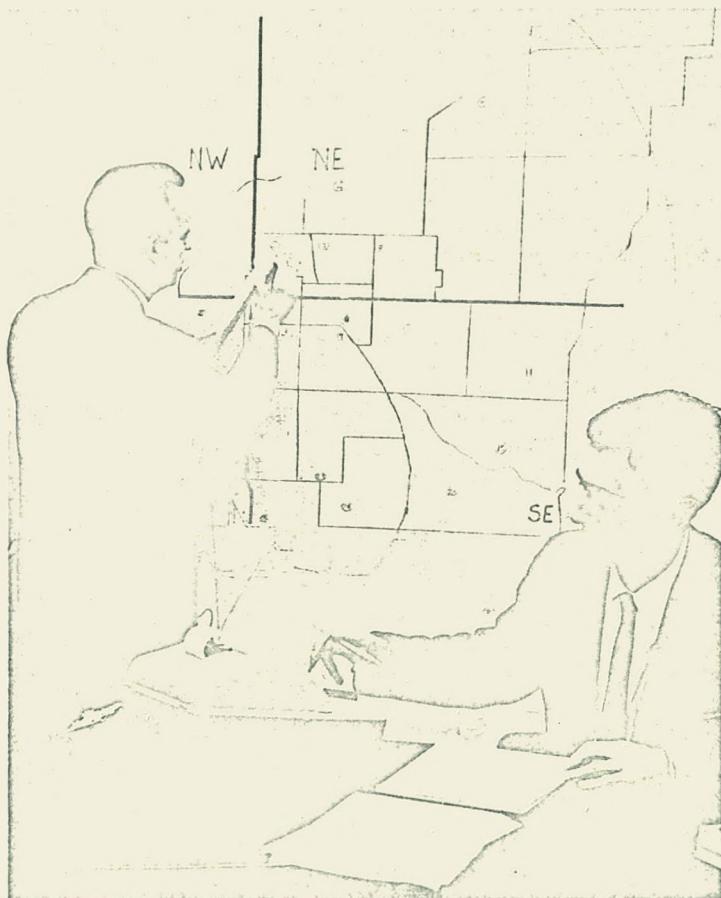


FIG. 18 THE ASSIGNMENT PROCESS

The method of recording shelter is shown in Fig. 19.

The two left-hand columns indicate tract (underlined), shelter number and the capacity of the shelter. In the left-hand margin the protection factor of the shelter is written in the appropriate color. (red for Category 4 and yellow for Categories 2 and 3).

The third through eighth columns are devoted to assignment of blocks. The third column shows the location of the tract from which the assignment is made, and the remaining columns record numbers in sets, such as "49-58." The first number, 49, is the block number, and the second number, 58, is the population in that block.

Occasionally, it becomes necessary to split a block between two shelters so as to avoid substantial over- or under-assignment of one of the shelters. In such a case, only the number of people allocated to that assignment is entered after the block number; also a (p) is drawn after the population to indicate partial assignment.

A partial assignment looks like this: 43-71 (p) (see Fig. 19).

Partial assignment should only be done when the parts of the block are assigned to the two parts of a single shelter facility (such as the Category 4 part and the Category 2 and 3 part), or to shelters that are very close to one another. This will facilitate people staying in groups and moving to shelter in the same direction.

The last two columns show totals. The last column is the total assigned to a shelter, and the next to last column shows the remaining unassigned spaces. If the shelter has been over-assigned by a few people a negative sign (-) is entered by the number. As a check, the sum of the totals equals the shelter capacity.

In selecting the shelters for assignment, there are more rules to be followed.

Rule 3--Assign shelters in the outlying areas and away from the central district first. Start in the fringe areas and work in toward the center of the shelters.

FIG. 19 THE ASSIGNMENT RECORD (Manual)

By the process determined by Rule 3, the assignment follows the trend of people going in one general direction and naturally filling shelter as they reach it. Those nearest can be expected to reach shelter first. People reaching a full shelter should continue toward the center until they find empty shelter. By following the rule the actual assignment would closely follow the natural situation.

Rule 4--Always assign first, the occupants of a block in which the shelter is situated. Then assign from the direction from which people will be coming.

Those in the same block as a shelter can be expected to know about and reach the shelter first, so it is logical to so assign them. After that (if there is room) people are taken from neighboring blocks from which they will be coming.

Rule 5--Assign blocks in groups to any one shelter so that those assigned to a shelter will find themselves leaving their homes, shops, offices, and work places as groups, and travel to shelter in groups.

This rule is to avoid confusion caused by people taking off in different directions. The aim is always to make the transfer to shelter as orderly as possible and provide for a proportion of the population who won't know what to do.

When all the shelters outside the central area have been assigned, the shelters in the central area can be assigned. Some of these are quite large, and will accommodate larger portions of the city. The rules for assignment remain the same.

In Lincoln the distance people would have to travel assumed importance at this stage, and it became necessary to measure this.

For the purpose of establishing distance limits several warning times were considered. These were:

- (1) Half an hour warning time
- (2) One hour warning time
- (3) Ample warning time.

In terms of distance to shelter a 3-mile-per-hour travel rate was assumed. This was represented by:

- (1) Up to 1-1/2 miles
- (2) Up to 3 miles
- (3) Over 3 miles.

Assignments were marked on the record sheet with a "1" in red for distance between 1-1/2 to 3 miles, and "11" in green for over 3 miles.

The measurement of the distance to travel was determined by one of two methods. The simplest was to use a piece of string with knots in it at appropriate points representing 1-1/2 miles and 3 miles from one end. It was found simplest to attach a thumbtack at the end and press that into the shelter. Then the string is held out over the area being assigned and indicates the direct distance from the shelter (Fig. 20).

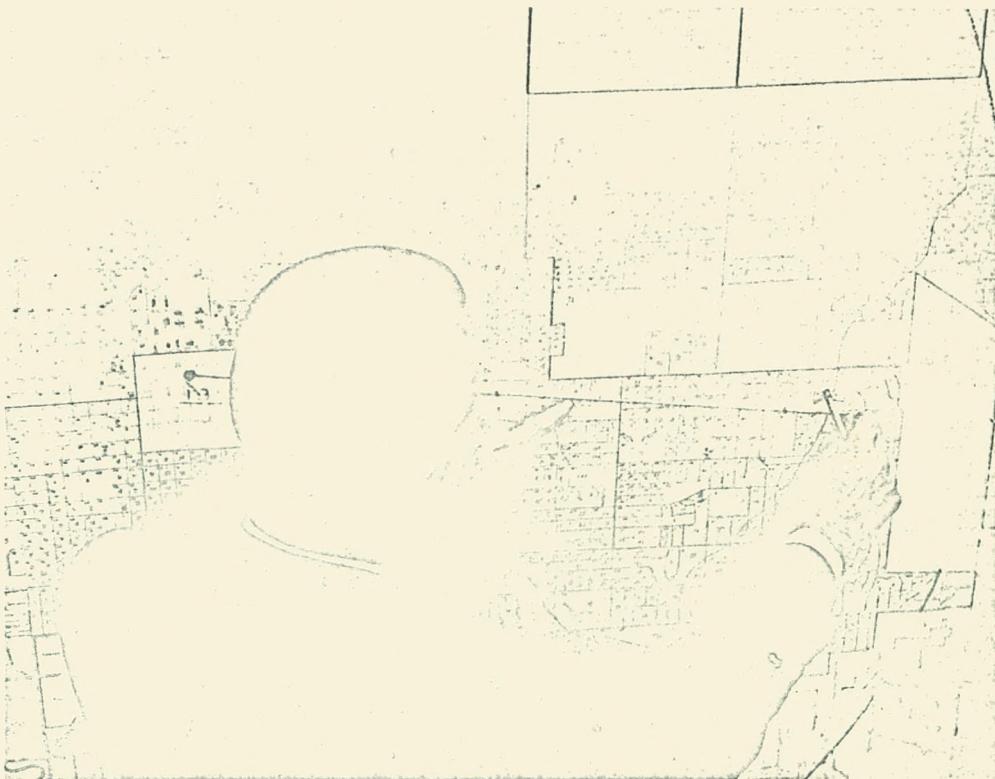


FIG. 20 DIRECT DISTANCE MEASUREMENT

In the case of Lincoln where the streets are predominantly north and south and east and west people cannot follow a direct path, but must follow the streets. To meet this, a plastic isosceles right-angle triangle was made and used (Fig. 21).

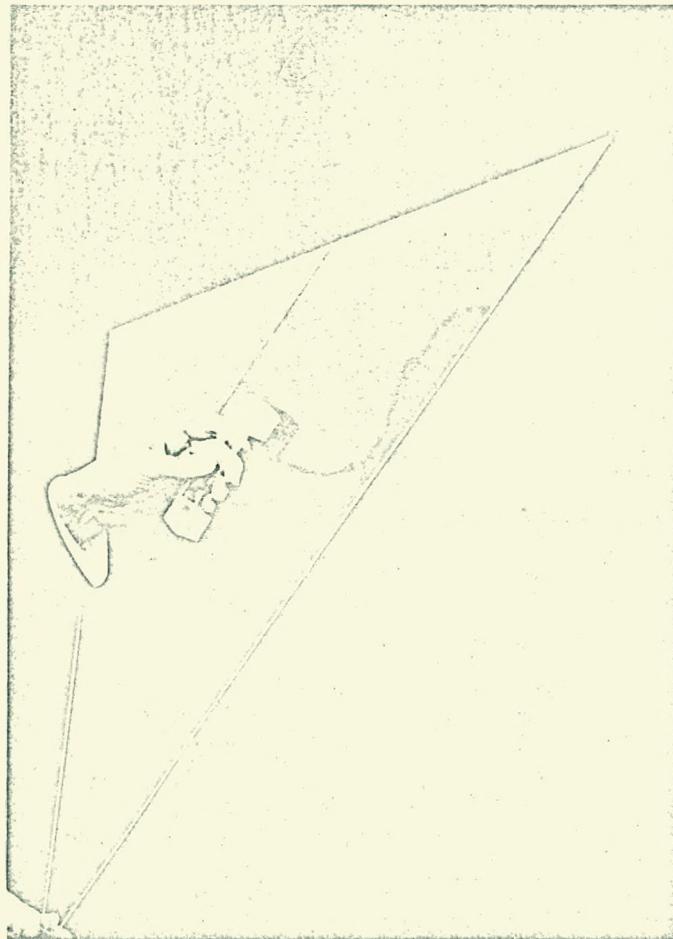


FIG. 21 SPECIAL RIGHT SQUARE USED FOR DISTANCE MEASUREMENT

It will be seen that if the sides adjacent to the right angle are made the equivalent of 3 miles long, then the distance from any point on the hypotenuse to the tip of the right angle is always 3 miles, provided one travels in directions parallel to the sides adjacent to the right angle. The sketch in Fig. 22 illustrates this. Distance from A to O, via B, D, or E are all the same and equal to the distance OX.

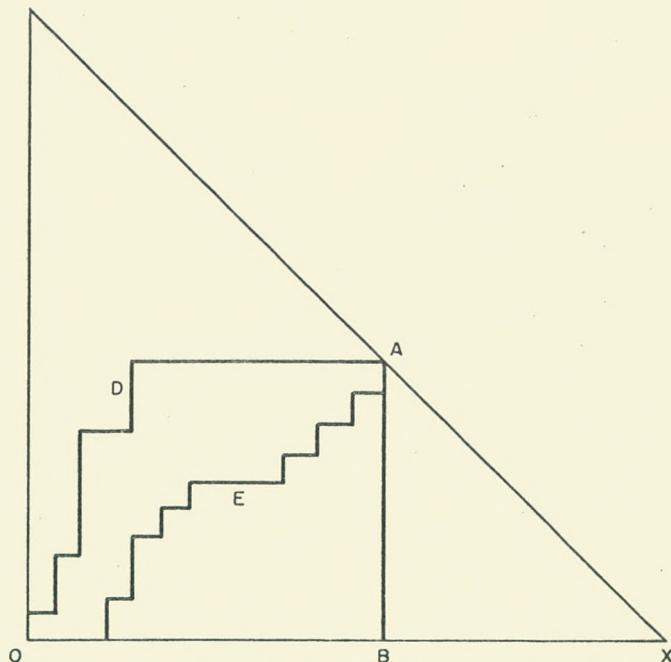


FIG. 22 APPLICATION OF COORDINATES TO DEMONSTRATE DISTANCE TO SHELTER

Undoubtedly there are a few diagonal streets that will permit a more direct approach for a few people but for the purpose intended this method is considered accurate enough to determine the distance people have to travel to reach shelter.

Referring to Fig. 21, the triangle used has an additional line scribed which divides the sides adjacent to the right angle. The scribed line encloses an area within 1-1/2 miles of the apex, and the whole triangle encloses an area within 3 miles of the apex (see Fig. 23).

The use of this 45° triangle is illustrated in Fig. 24. The assigner is pointing to a block that is outside the 1-1/2 mile area and within 3 miles from shelter.

Rule 6--In assigning shelters note the distance that each assigned block is from the shelter. If there are direct or nearly direct roads to the shelter area from the direction of assignment, use direct-distance measurement.

If the people must follow a street pattern that is north-south and east-west or similar, then use a 45° triangle to establish distance boundaries.

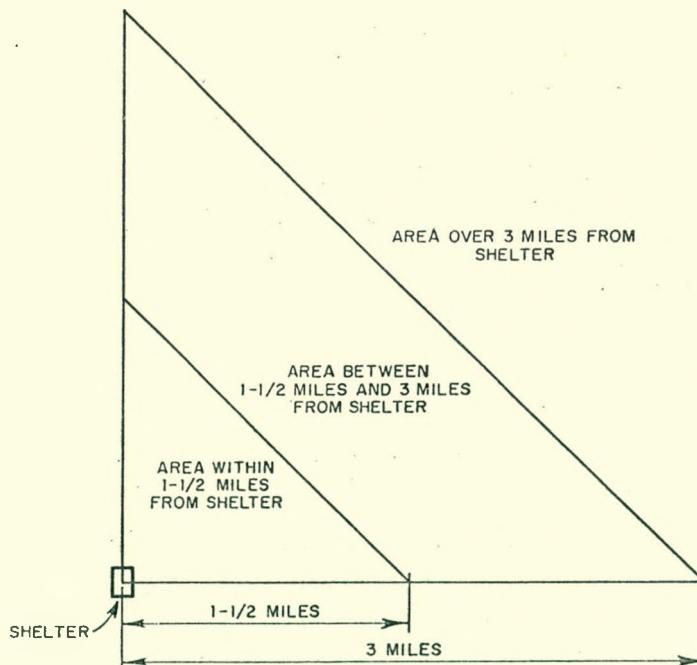


FIG. 23 AREAS ENCLOSED BY 1½ AND 3 MILE MEASUREMENT

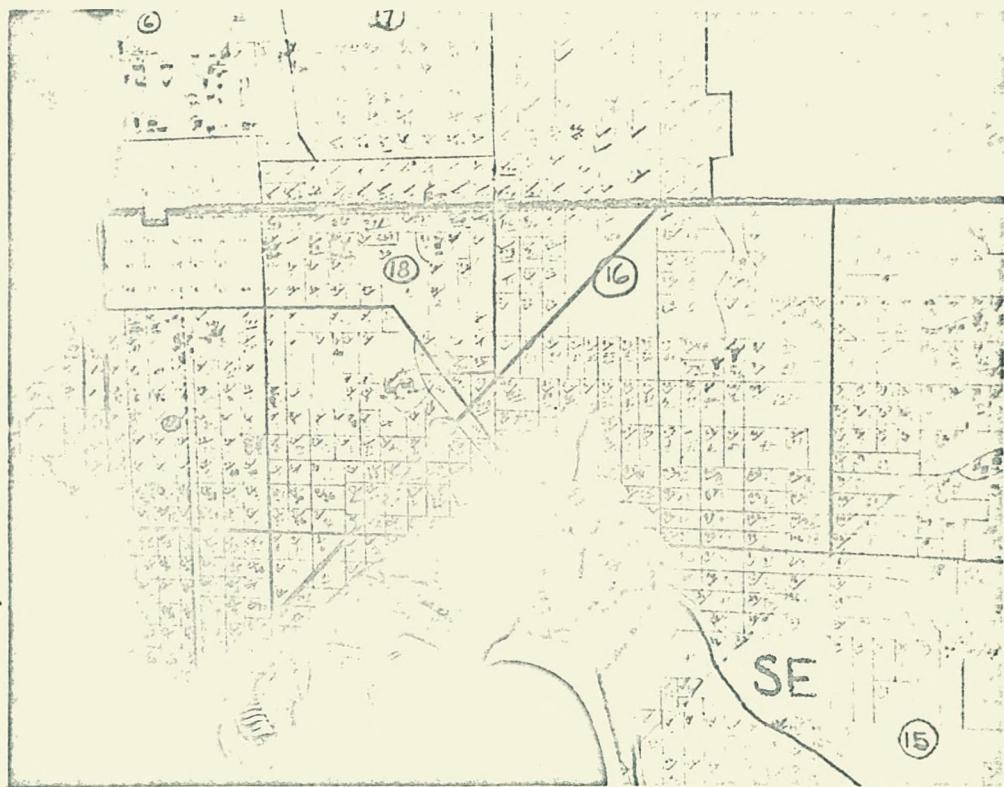


FIG. 24 USE OF THE RIGHT SQUARE IN ASSIGNMENT

Upon completion of the assignment the map was colored and marked to show the distance of all assigned blocks from shelters. The blocks assigned and within 1-1/2 miles were left unmarked. Those in the area between 1-1/2 and 3 miles were shaded red and those outside 3 miles were shaded green. In addition, blocks that were within the assignment area, but had no population were shaded brown, and those unassigned in the outlying areas were shaded blue.

A convenient method of doing this is to use colored chalk as shown in Fig. 25.

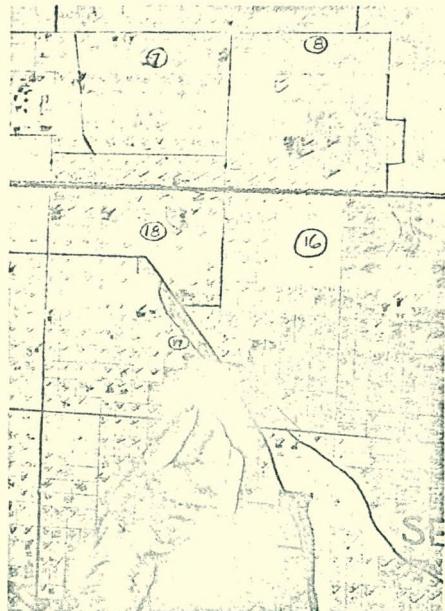


FIG. 25 SHADING OF THE DISTANCE BOUNDARIES

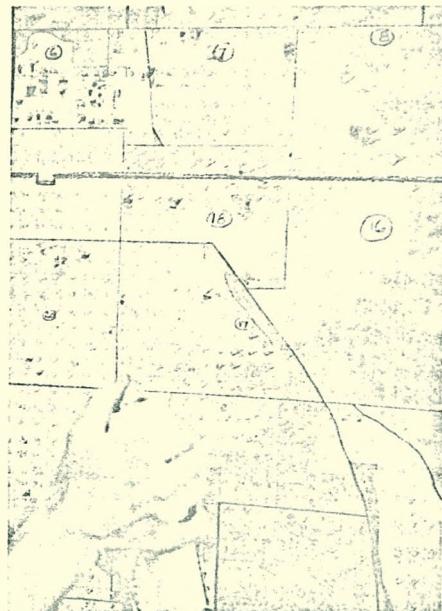


FIG. 26 SEALING THE CHALKED SURFACE

In order to avoid smearing, the chalk can then be covered with an adhesive fixative, such as hair spray* (see Fig. 26).

The resulting map is shown in Fig. 27.

* A special product, KRYLON Workable FIXATIF N° 1306 is marketed especially for this process.

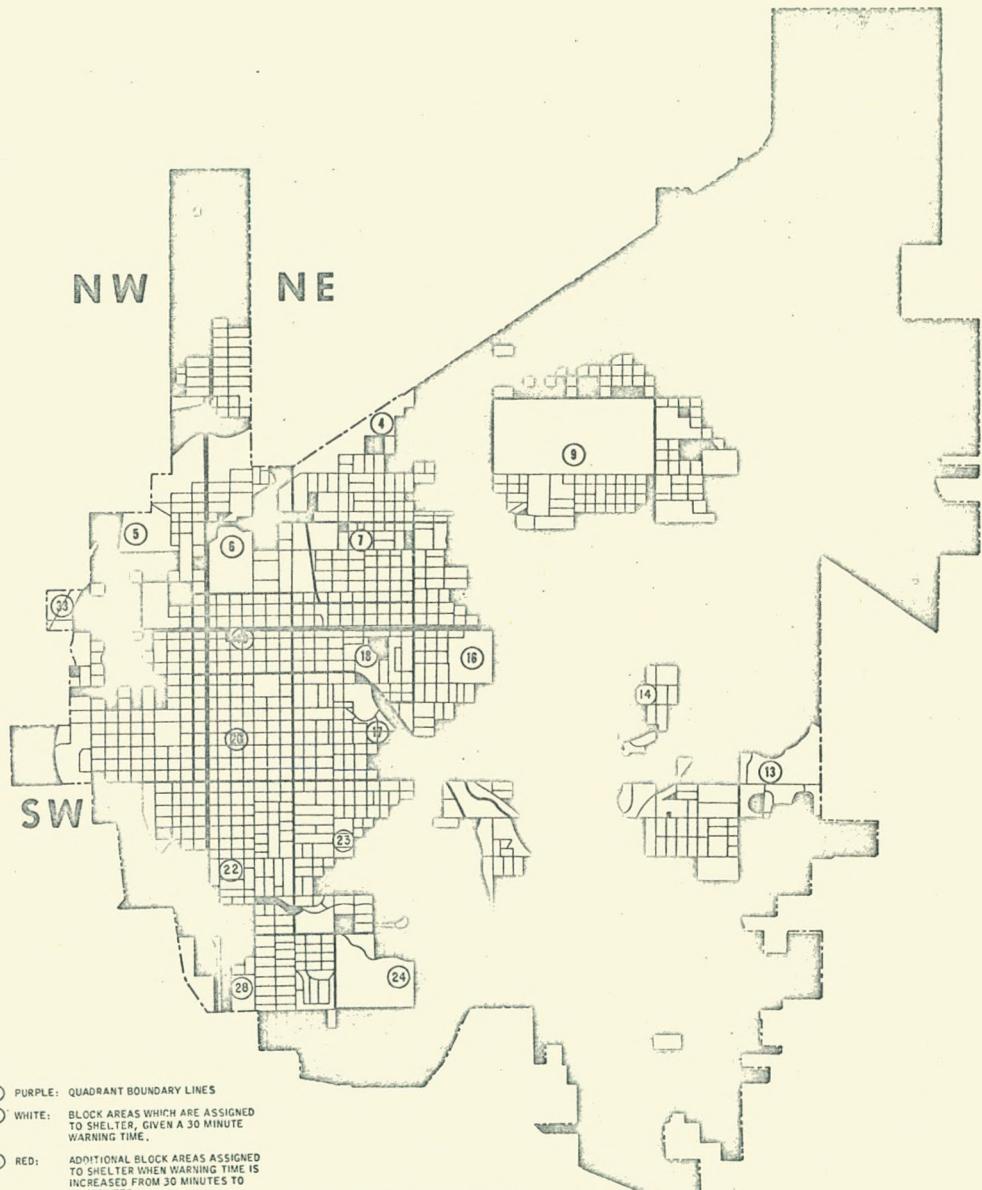


FIG. 27 THE COMPLETED ASSIGNMENT MAP

The boundary lines dividing the city into quadrants were marked with purple. It will be seen that there is a discontinuity in the east-west boundary in the central business district. It was found necessary to introduce this to provide an adequate amount of shelter in the north-east quadrant to house the population.

Some special traffic direction would be necessary in this area. This could be done by police action or temporary fencing which would be erected as soon as the emergency develops.

E. Summary of Assignment Rules

For convenience and reference, the Six Rules of Assignment given in the text are restated here:

Rule 1--Establish a center or centers of shelters and arrange population movement only in the direction of center of shelter.

Rule 2--Divide the city into sections or quadrants on the basis of (a) each section or quadrant to contain the shelter for all the population to be sheltered in that quadrant, and (b) the dividing line should be well known streets or natural boundaries to facilitate communication to the population.

Rule 3--Assign shelters in the outlying areas and away from the central district first. Start in the fringe areas and work in toward the center of shelters.

Rule 4--Always assign first, the occupants of a block in which the shelter is situated. Then assign from the direction from which people will be coming.

Rule 5--Assign blocks in groups to any one shelter so that those assigned to a shelter will find themselves leaving their homes, shops, offices, and work places as groups, and travel to shelter in groups.

Rule 6--In assigning shelters note the distance that each assigned block is from the shelter. If there are direct or nearly direct roads to the shelter area from the direction of assignment, use direct-distance measurement. If the people must follow a street pattern that is north-south and east-west or similar, then use a 45° triangle to establish distance boundaries.

F. Processing the Data and Presentation of Results

The use of data-processing procedures was found to be desirable to reduce the manual work and avoid error.

In developing the system using punched cards, the aim was to keep it as simple as possible using only equipment that is generally available in most communities throughout the nation. The system was also developed so as to keep cost to a minimum.

The programming procedure, card layouts, and a cost breakdown are described in detail in Appendix A to this report. A typical punched card is shown in Fig. 28.

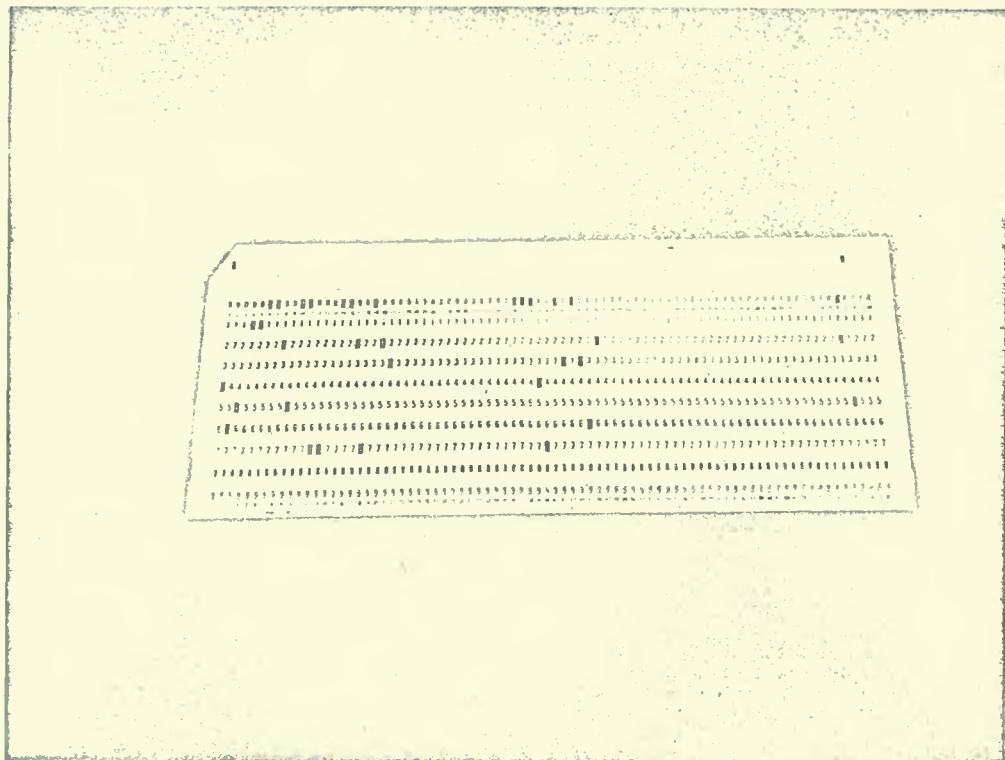


FIG. 28 A TYPICAL PUNCHED CARD

After the cards were punched, verified, and sorted, printouts were produced in various forms.

It was determined that the data should be presented for ready reference in a number of forms:

- (1) Numerical Block list showing shelter assignment.
- (2) Shelter assignment under three conditions of warning time (ample, one hour, half hour), and the list of blocks unassigned in each case.
- (3) Name and address list combining Category 2 and 3 shelters with Category 4 shelters.

The Block list shows every block in the city, including those with no population and those unassigned. It provides a very easy checklist to ensure that every block was accounted for (Figs. 29 and 30).

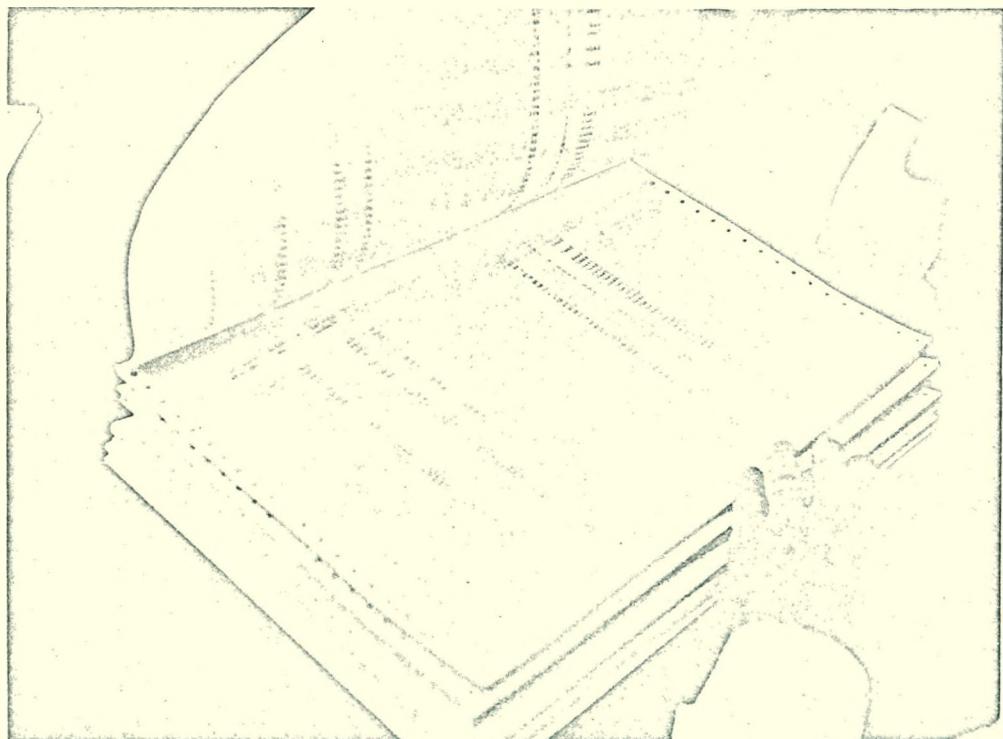


FIG. 29 BLOCK LISTING PRINTOUT

TRACT CONE No.	BLOCK No.	P.	SHELTER NUMBER	PF	BLOCK POPULATION	DC	DATE SURVEY
44110017	44	267	23		65		
	44	267	23		79	1	0460
	57	267	23		67	1	0460
	44	267	23		51	1	0462
	51	259	23		54	1	0462
	79	259	23		21	1	0462
	71	259	23		49	1	0462
	72	259	23		59	1	0462
	73	259	23		59	1	0462
	74	259	23		85	1	0462
	75	259	23		82	1	0462
					44654		724
44110018	1	287	04		74	1	0460
	1	317	23		93	1	0462
	1	276	04		92	1	0462
	1	276	04		42	1	0462
	6	295	04		79	1	0462
	6	295	04		49	1	0462
	7	276	04		38	1	0462
	8	276	04		22	1	0462
	9	241	23		59	1	0460
	10	227	04		44	1	0460
	11	279	04		32	1	0460
	12	279	04		15	1	0462
	13	279	04		73	1	0463
	14	279	04		48	1	0462
	15	358	23		18	1	0463
	16	249	23		26	1	0460
	17	272	23		30	1	0460
	18	312	23		23	1	0462
	19	277	23		14	1	0462
	20	277	23		23	1	0462
	21	287	04		23	1	0462
	22	319	23		6	1	0460
	23	325	23		45	1	0460
	24	269	23		73	1	0460
	25	269	23		78	1	0460
	26	279	04		76	1	0460
	27	279	04		76	1	0460
	28	279	04		124	1	0462
	29	322	23		146	1	0463
	30	322	23		76	1	0463
	31	322	23		64	1	0460
	32	322	23		7	1	0460
					44654		724
44110019	42	237	04		27	1	0460
	42	325	23		5	1	0460
	43	276	23		3	1	0460
	44	276	23		217	1	0460
	45	276	23		193	1	0460
	47	272	23		44	1	0460
	48	272	23		34	1	0460
	49	276	23		93	1	0460
	50	319	23		73	1	0460
	50	319	23		70	1	0460
	51	279	04		120	1	0461
	52	279	04		71	1	0461
	53	279	04		63	1	0460
	54	272	23		30	1	0460
	55	308	04		55	1	0460
	56	353	23		38	1	0462
	57	279	04		117	1	0463
	58	279	04		34	1	0462
	59	328	04		85	1	0460
	60	328	04		15	1	0460
	61	272	04		45	1	0461
	62	374	23		5	1	0460
	63	325	23		10	1	0460
					44654		724
44110020	1	241	23		114		
	2	241	23		192		
	3	241	23		121		
	4	263	04		98		
	5	285	04		45		
	6	279	04		44		
	7	279	04		3		
	8	295	04		3		
	9	295	04		3		
	10	295	04		3		
	11	295	04		3		
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	164	295	04		3		
	165	295	04		3		
	166	295	04		3		
	167	295	04		3		
	168	295	04		3		
	169	295	04	</td			

Since the list is in numerical sequence in tract and block, the Block list is a reference list to provide easy answers to inquiries as to assignment of particular streets and location.

The shelter assignment list, plus the corresponding list of unassigned blocks, shows the whole situation, and is a working document. The assigned and the unassigned lists were produced for three conditions of warning time: (1) ample time (everyone assigned reaches shelter); (2) 1-hour warning time (everyone up to 3 miles from shelter is accommodated); and (3) half an hour warning time (only those within 1-1/2 miles get into shelter).

Figures 31 and 32 show part of a typical Assignment List, and Figure 33 shows a list of unassigned blocks.

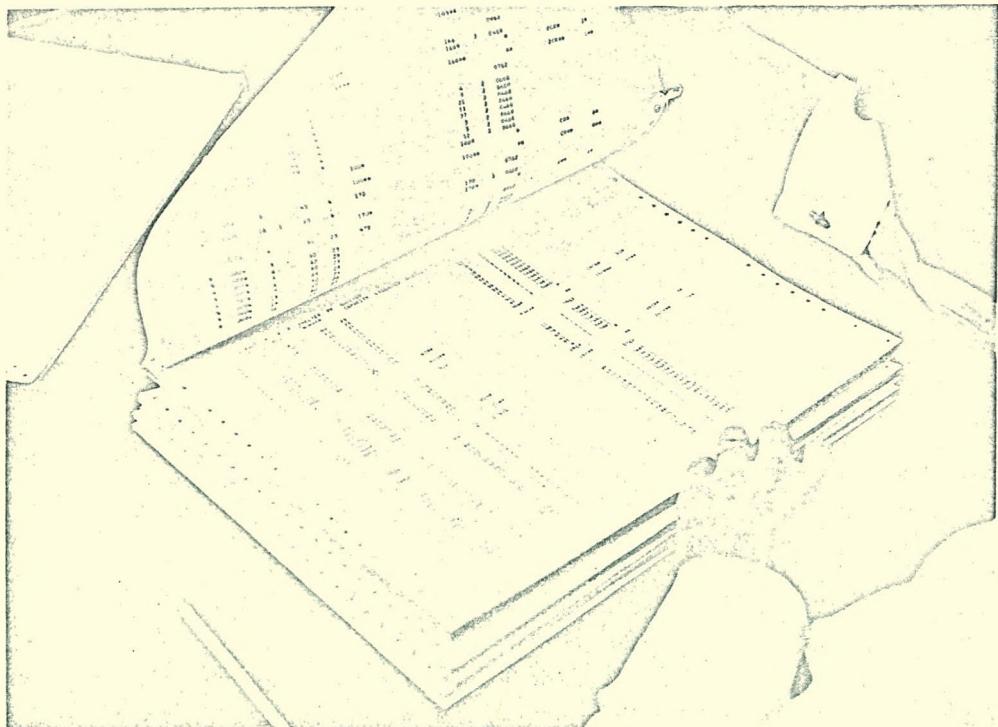


FIG. 31 SHELTER ASSIGNMENT PRINTOUT

TRACT LINE No.	BLOCK No.	P NUMBER	SHelter CAPACITY	DATE LICENSED	DATE STOCKED	BLOCK POPULATION	DC	DATE SURVEY	
0018	100	243	19			35	2	0460	
0018	53	243	29			41	2	0460	
0018	53	243	29			66	2	0460	
0018	53	243	29			81	2	0460	
0018	61	243	29			97	2	0460	
0018	69	243	29			113	2	0460	
0018	70	243	29			99	2	0460	
0018	88	243	29			45	2	0460	
0018	81	243	29			74	2	0460	
0018	97	243	29			61	2	0460	
0018	93	243	29			81	2	0460	
				1+0500		0854	4	4508	154
				1+2100		0844	4	4508	154
1 45100019	21	247	6	119				0762	
0023	47	247	6			58	2	0460	
0023	46	247	6			57	2	0460	
				119		3154	4	4508	29
1 69110019	21	247	29	1+750				0982	
0023	3	247	29			85	2	0460	
0023	9	247	29			65	2	0460	
0023	21	247	29			65	2	0460	
0023	47	247	29			64	2	0460	
0023	79	247	29			64	2	0460	
0023	50	247	29			11	2	0460	
0023	21	247	29			20	2	0460	
0023	46	247	29			56	2	0460	
0023	46	247	29			50	2	0460	
0023	46	247	29			86	2	0460	
0023	50	247	29			79	2	0460	
0023	60	247	29			79	2	0460	
0023	62	247	29			19	2	0460	
0023	53	247	29			57	2	0460	
0023	61	247	29			76	2	0460	
0023	67	247	29			79	2	0460	
0023	67	247	29			20	2	0460	
0023	67	247	29			19	2	0460	
0023	68	247	29			41	2	0460	
0023	69	247	29			46	2	0460	
0023	80	247	29			52	2	0460	
				1+8699		1+8699	4	4508	3144
1 45100019	21	248	6	2+520				0762	
0023	4	248	6			105	2	0460	
0023	7	248	6			41	2	0460	
0023	6	248	6			49	1	0460	
0023	7	248	6			62	1	0460	
0023	8	248	6			61	1	0460	
0023	9	248	6			166	1	0460	
0023	10	248	6			83	1	0460	
0023	11	248	6			84	1	0460	
0023	12	248	6			125	1	0460	
0023	13	248	6			118	1	0460	
0023	16	248	6			86	1	0460	
0023	17	248	6			84	1	0460	
0023	18	248	6			87	1	0460	
0023	17	248	6			55	1	0460	
0023	18	248	6			53	1	0460	
0023	19	248	6			81	2	0460	
0023	20	248	6			82	2	0460	
0023	21	248	6			65	2	0460	
0023	37	248	6			57	2	0460	
0023	37	248	6			71	2	0460	
0023	38	248	6			52	1	0460	
0023	38	248	6			49	1	0460	
0023	37	248	6			49	1	0460	
0023	38	248	6			189	1	0460	
0023	39	248	6			189	1	0460	
0023	41	248	6			87	1	0460	
0023	41	248	6			87	1	0460	
0023	42	248	6			172	1	0460	
0023	42	248	6			89	1	0460	
0023	47	248	6			85	2	0460	
0023	47	248	6			91	2	0460	
0023	47	248	6			91	2	0460	
				1+9219		2+138	4	4508	3144
				2+5210		2+5210	4	4508	3144
1 69110019	21	249	29	129				0762	
0023	4	249	29			48	1	0460	
0023	19	249	29			71	1	0460	
				129		129	4	4508	29
				12949		12949	4	4508	29

FIG. 32 SHELTER ASSIGNMENT PRINTOUT (Closeup)

LOC	104C1	BLDG	P	BLDG	POPULATION
	LOC	104C1			
#	65110010	125			0
					0
#	65110011	1			1
#	65110012	1			1
#	65110013	9			9
#	65110014	9			9
#	65110015	5			5
#	65110016	7			7
#	65110017	8			8
#	65110018	10			10
#	65110019	11			11
#	65110020	12			12
#	65110021	13			13
#	65110022	14			14
#	65110023	16			16
#	65110024	19			19
#	65110025	19			19
#	65110026	26			26
#	65110027	27			27
#	65110028	33			33
#	65110029	36			36
#	65110030	57			57
#	65110031	39			39
#	65110032	59			59
					712*
					712*
#	65110033	1			1
#	65110034	1			1
#	65110035	27			27
#	65110036	29			29
#	65110037	29			29
#	65110038	29			29
#	65110039	49			49
#	65110040	55			55
#	65110041	55			55
#	65110042	58			58
#	65110043	58			58
#	65110044	59			59
#	65110045	60			60
#	65110046	61			61
#	65110047	65			65
					753*
					753*
#	65110048	22			22
#	65110049	26			26
#	65110050	72			72
#	65110051	73			73
#	65110052	95			95

LOC & TRACT	BLOCK #	BLOCK POPULATION
CODE No.	No.	
65110016	103	0
65110016	104	0
65110016	107	0
65110013	9	0
65110013	12	0
65110013	19	0
65110013	91	0
65110016	46	0
65110016	67	22
65110016	78	36
65110016	92	17
65110017	11	4
65110017	13	0
65110017	15	0
65110017	26	0
65110017	37	0
65110017	41	0
65110017	42	0
65110017	43	0
65110017	64	4
65110017	66	25
65110017	89	26
65110017	90	149
65110018	96	0
65110018	93	0
65110019	8	0
65110019	23	0
65110019	26	6
65110019	28	9
65110019	29	9
65110019	38	8
65110019	46	5
65110019	47	5
65110020	9	0
65110020	24	6
65110020	29	8
65110020	34	8
65110021	8	0
65110021	11	0
65110021	13	0
65110021	23	0
65110021	27	0
65110021	37	0
65110021	47	0

FIG. 33 UNASSIGNED BLOCK LIST

The Name and Address List is a convenient way of relating shelter number to shelter address. The printouts provided by the Federal Government do this also, but for Lincoln there were two lists, one for each protection factor category. In practice it is more convenient to have this list consolidated. Figures 34 and 35 show the Name and Address List.

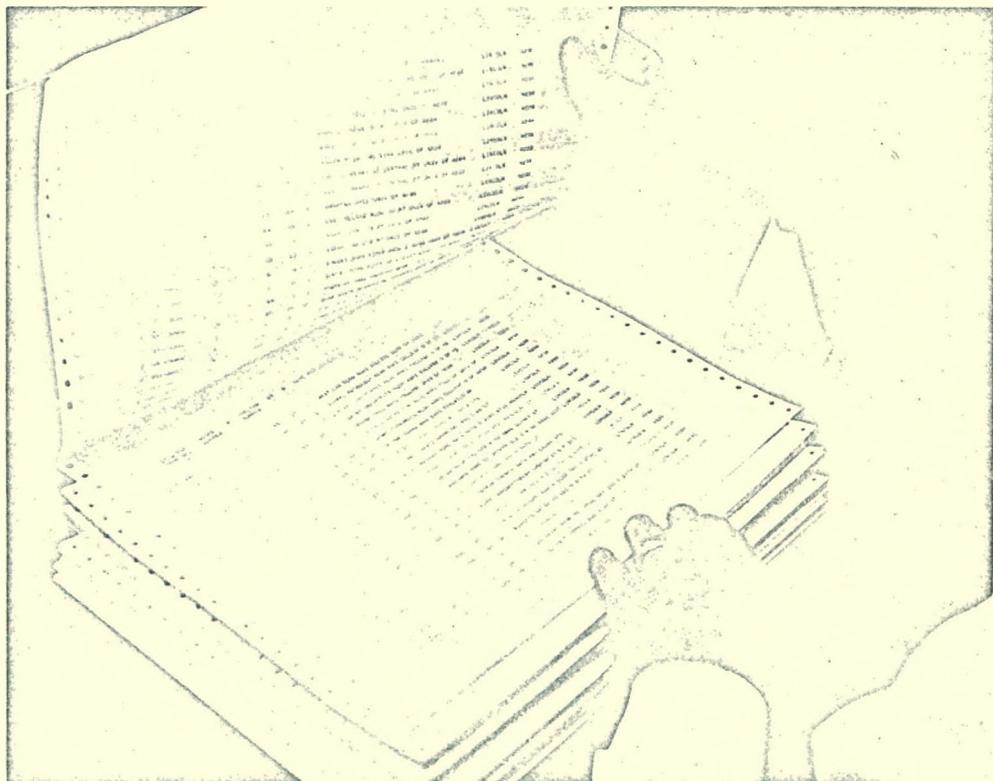


FIG. 34 NAME AND ADDRESS LIST

TRACT CODE NO.	BLOCK NUMBER	P	SHELTER NUMBER	PR	R	NAME AND ADDRESS OF SHELTER	LINCOLN	NEBR
2	65110519	39	271	23	0	CLINCHER TEL & TEL CO 2400 N 4 ST	LINCOLN	NEBR
2	65110519	35	272	4	0	OSCAR POWERS CO 240 3 16TH ST	LINCOLN	NEBR
2	65110519	36	273	4	0	PERKINS MUNICIPAL AUDITORIUM 15TH & N STS	LINCOLN	NEBR
2	65110519	36	273	21	0	PERKINS MUNICIPAL AUDITORIUM 15TH & N STS	LINCOLN	NEBR
2	65110519	37	274	4	0	CHARIN PLDZ 1241 N ST	LINCOLN	NEBR
2	65110519	29	275	23	0	HISTER STORE 1195 0 ST	LINCOLN	NEBR
2	65110519	28	276	4	0	FEDERAL SECURITIES 1100 120 5 19TH ST	LINCOLN	NEBR
2	65110519	29	276	23	0	FEDERAL SECURITIES 1100 120 5 19TH ST	LINCOLN	NEBR
2	65110519	30	279	4	0	CONAWAY'S PUBLIC POWER 1100 120 0 ST	LINCOLN	NEBR
2	65110519	30	281	23	0	BENNETT MARTIN PUBLIC LIBRARY 14TH & N STS	LINCOLN	NEBR
2	65110519	37	284	6	0	FIRST CONTINENTAL NATIONAL BANK 1201 N ST	LINCOLN	NEBR
2	65110519	37	284	23	0	FIRST CONTINENTAL NATIONAL BANK 1201 N ST	LINCOLN	NEBR
2	65110519	36	286	4	0	SHARP BUILDING 206-210 50 19TH ST	LINCOLN	NEBR
2	65110519	28	286	23	0	SHARP BUILDING 206-210 50 19TH ST	LINCOLN	NEBR
2	65110519	35	287	4	0	OLD LINCOLN TELEPHONE BUILDING 1342 N ST	LINCOLN	NEBR
2	65110519	36	287	23	0	OLD LINCOLN TELEPHONE BUILDING 1342 N ST	LINCOLN	NEBR
2	65110519	29	289	4	0	TERMINAL BUILDING 9TH & 0 STREETS	LINCOLN	NEBR
2	65110519	29	289	23	0	TERMINAL BUILDING 9TH & 0 STREETS	LINCOLN	NEBR
2	65110519	26	291	4	0	GOLD & CO 11TH & 0 STREETS	LINCOLN	NEBR
2	65110519	26	291	23	0	GOLD & CO 11TH & 0 STREETS	LINCOLN	NEBR
2	65110519	26	292	4	0	W T GRAY CO 1027-1029 0 ST	LINCOLN	NEBR
2	65110519	26	293	4	0	LINCOLN BUILDING 1201 0 STREET	LINCOLN	NEBR
2	65110519	26	293	23	0	LINCOLN BUILDING 1201 0 STREET	LINCOLN	NEBR
2	65110519	27	294	4	0	CADWALLADER & RUS 1249 SOUTH 47 ST	LINCOLN	NEBR

TRACT CODE NO.	BLOCK NUMBER	P	SHELTER NUMBER	PR	R	NAME AND ADDRESS OF SHELTER	LINCOLN	NEBR
2	65110619	27	294	23	0	CADWALLADER FURS 129 SOUTH ST	LINCOLN	NEBR
2	65110619	27	295	4	0	KREISIG 12TH & 0 STREETS	LINCOLN	NEBR
2	65110619	28	296	4	0	GAS CO BUILDING 152-164 50 12TH ST	LINCOLN	NEBR
2	65110619	28	297	4	0	SEARS ACERBUCK CO 137H 6 4 STREETS	LINCOLN	NEBR
2	65110619	29	297	23	0	SEARS ROEBEL CO 137H 6 4 STREETS	LINCOLN	NEBR
2	65110619	28	298	23	0	MILLER & PAINE 1247-1249 0 ST	LINCOLN	NEBR
2	65110619	28	299	4	0	MILLER & PAINE 1247-1249 0 ST	LINCOLN	NEBR
2	65110619	29	300	4	0	REN SHOMS & SONS 1215-1227 0 ST	LINCOLN	NEBR
2	65110619	28	300	23	0	REN SHOMS & SONS 1215-1227 0 ST	LINCOLN	NEBR
2	65110619	28	302	4	0	MADIES CLOTHING CO 12TH & 0 STREETS	LINCOLN	NEBR
2	65110619	29	302	4	0	STUART BLDG 13TH AND P STREETS	LINCOLN	NEBR
2	65110619	29	317	23	0	STUART BLDG 13TH AND P STREETS	LINCOLN	NEBR
2	65110619	30	308	4	0	J C PENNEY CO 19 4 0 STS	LINCOLN	NEBR
2	65110619	30	308	23	0	J C PENNEY CO 19 4 0 STS	LINCOLN	NEBR
2	65110620	36	327	4	0	EVERETT JR HIGH SCHOOL 1212 0 ST	LINCOLN	NEBR
2	65110620	36	327	23	0	EVERETT JR HIGH SCHOOL 1212 0 ST	LINCOLN	NEBR
2	65110620	49	328	23	0	PALISADE APARTMENTS 1219 1 15TH ST	LINCOLN	NEBR
2	65110620	49	328	4	0	PALISADE APARTMENTS 1219 1 15TH ST	LINCOLN	NEBR
2	65110620	32	330	23	0	NEBR STATE EDUCATION BLDG 13TH & 0 STS	LINCOLN	NEBR
2	65110620	42	346	4	0	NEBR STATE LIBRARY 20 4 0 STS	LINCOLN	NEBR
2	65110620	42	347	4	0	NEBR STATE CAPITOL 12 4 0 STS	LINCOLN	NEBR
2	65110620	32	347	23	0	NEBR STATE CAPITOL 12 4 0 STS	LINCOLN	NEBR
2	65110621	32	349	4	0	NEBR STATE LIBRARY 4TH AND V STS	LINCOLN	NEBR
2	65110621	36	352	4	0	SECOND FLOOR 20 4 0 STS	LINCOLN	NEBR

FIG. 35 NAME AND ADDRESS LIST (Closeup)

The reports should be put into an appropriate folder and tabbed for ready reference.

A number of uses of this data is given below:

1. To determine the assignment of anyone who inquires.

Method

- (a) Determine where inquirer lives
- (b) Find location on a master map and read off tract and block number relating to that location
- (c) From the Block Listing, read out the shelter assignment and the distance code.
- (d) From Name and Address List, read out the name and address of the shelter.

2. To determine the state of assignment of any one shelter. Look up the shelter assignment record.
3. Upon receipt of information concerning stocking of shelters. Write in the stocking date in the place provided in the assignment record.
4. Upon information of changes in population distribution affecting a few blocks. Revise the Block Listing, and the Shelter Assignment listing. Determine if assignment must be changed. If so, write in changes in all the affected lists.
5. Upon information of new shelters available, adjust the assignment records to suit and mark up all affected lists.

Periodically (such as annually) the marked lists should be examined, all changes entered in the cards and new cards punched as necessary. Following this, a new set of listings should be printed providing an up-to-date record.

The significance of date licensed, stocked, and surveyed in the listings is to have a record of how long it has been since these things were done.

It is simple, for example, to run the punched cards through a sorter so that all shelters with supplies more than one year old are separated out. Routine shelter inspection also is simplified using the same method.

Surveys of population distribution should be done periodically, such as once every two years. Sorting the punched cards will provide an immediate list of areas needing resurvey.

It was not intended and would be most confusing to attempt to present to the public the three levels of assignment resulting from three warning times. The separation was done in this report to illustrate how distance from shelter is equally important as numbers of shelters available. In any further shelter building or improvement program, there would be little gained by increasing the capacity in the business district in the city of Lincoln.

For the purpose of better understanding the shelter system, however, such an analysis of the effects of warning time is most useful. Each community should analyze its own most probable warning time, and then base the assignment on this.

G. Using the Data

The printouts provided by the data processing procedures comprise the permanent record for the use of the CD Director and his staff. The whole series of printouts is shown in Figure 36.

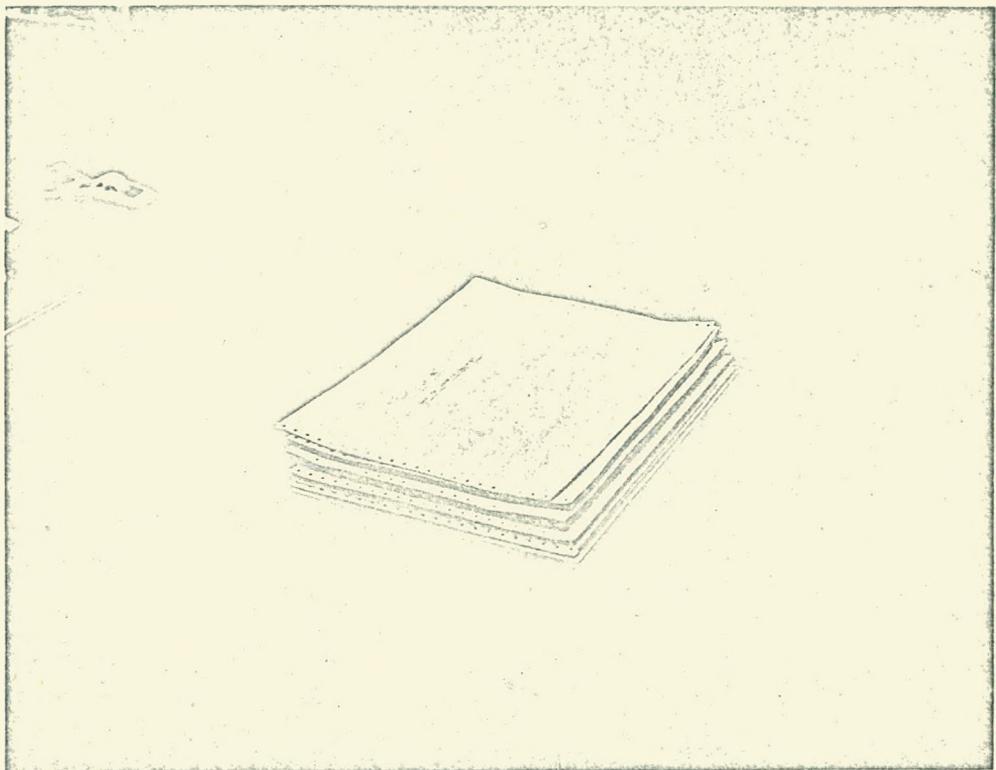


FIG. 36 COMPLETE SET OF PRINTOUTS

V COMPUTATION OF THE DAYTIME POPULATIONS BY CENSUS BLOCK

It was determined that a separate daytime assignment of people was necessary as well as a nighttime assignment. It thereby results that many citizens in Lincoln have two shelter assignments, one for the daytime hours of approximately 7:30 AM to 5:30 PM and one for the nighttime hours of approximately 5:30 PM to 7:30 AM. Some of the population have no shelter assignments either day or night because of the lack of shelter space. Others who have shelter assignments at night have no assignment in the day because of the people who come into Lincoln from the surrounding areas in the daytime and use up some of the shelter space.

A. Population Statistics

According to the A&E's survey, Lincoln has about 122,850 shelter spaces with a protection factor in the category of 2 or better for a daytime population of approximately 142,521. This daytime total is about 14,000 greater than the nighttime resident population of 128,521 reported by the Bureau of the Census for 1960. This 11 percent increase in daytime population is the net result of people entering the city to reach their place of employment.

The daytime population on a typical weekday is a dynamic, mobile one. Over 51,000 of the citizens leave their houses to go to work. Over 34,000 individuals are enrolled in school, from the level of kindergarten up through college. Many others leave home during the day to go shopping and for various other reasons. The problem of assigning this shifting population to shelters is compounded further by the large number of people who come into the city to work, as mentioned in the previous paragraph.

B. Procedure for Determining the Daytime Population by Block

There are numerous ways by which the daytime population of Lincoln, by census block, can be determined. Several techniques were studied, out of which a method was developed that was considered satisfactory for assignment purposes.

The basic procedure used in this report for determining the daytime population by census block is outlined below:

- (1) Prepare a large census block map (scale 8" = 1 mile) of Lincoln, complete with the shelters located and tracts and blocks numbered as shown in Fig. 17. (This map is basically a duplicate of the map used in making the nighttime assignments.)
- (2) Compute the daytime, resident population data and record these data by block on the large census map (described in Sec. V-C, below).
- (3) Locate by census block the key employment centers and determine the numbers of people working in each, and record these data on the large census map (see Sec. V-D, below).
- (4) Using Land Use maps, determine the industrial and commercial areas of the city (refer to Sec. V-E, below). Figure by census block the numbers of people located in the commercial and retail areas and record these data on large census map.
- (5) By census block, total the numbers resulting from Steps 2 through 4 above and record on the large census map in the appropriate blocks

For this report various documents were consulted in order to progress through Steps 1 through 5 mentioned above. In cities where these documents are not available, it would appear that similar data could be generated.

The main sources of information cited in order to progress through Steps 1 through 4 are listed below:

- (1) U.S. Census of Population and Housing. 1960, Final Report PHC(1)-79, Census Tracts, Lincoln, Nebraska, as prepared by the Bureau of the Census (see Fig. 37 and 38).
- (2) U.S. Census of Housing: 1960, HC(3), No. 236, City Blocks Lincoln, Nebraska as prepared by the Bureau of the Census.
- (3) Comprehensive Regional Plan for the Lincoln-Lancaster County Metropolitan Area, Nebraska, April 12, 1961, as prepared by Harland Bartholomew and Associates, St. Louis, Missouri.
 - (a) "Principal Employment Centers," as found on Plate 5.*
 - (b) "Diagrammatic Land Use, 1960," as found on Plate 5.**
 - (c) "Major Elements of the Regional Center," Plate 18.***
 - (d) Air Photographs of Lincoln.†
- (4) "Lincoln, Nebraska Fallout Shelter Survey," by Selmar A. Solheim Associates, March 1, 1962 (see Fig. 1). (Sheet 1 of these maps contained the census tract daytime population estimates used in this report.)

C. Computing the Daytime Resident Population by Block

It was determined that by using the data generated by the Bureau of Census in 1960 as published in U.S. Census of Housing PHC(1)-79 and its report HC(3) No. 236, reasonable data could be gathered to establish Lincoln's daytime population by census block. The U.S. Census of Housing, 1960, Report HC(3) No. 236 has already been mentioned. The U.S. Census, 1960, Report PHC(1)-79 is shown in Figs. 37 and 38. Figure 37 shows data describing the General Characteristics of the

* Fig. 39

** Fig. 40

*** Fig. 43

† Figs. 41 and 42

U.S. CENSUSES OF POPULATION
AND HOUSING : 1960
Final Report PHC(1)-79

CENSUS TRACTS

Table P-1.—GENERAL CHARACTERISTICS OF THE POPULATION, BY CENSUS TRACTS 1960

(Unesco. * denotes statistics based on 25 percent sample. Population per household not shown where less than 20 percent incomplete. Median is shown where less than 20 percent incomplete.)

SUBJECT	Census Tracts										
	Lancaster County			Lipman							
	TOTAL	LINCOLN	BALANCE (TRACTED)	BALANCE (TRACTED)	TRACT 0001	TRACT CODE	TRACT 0002	TRACT 0004	TRACT 0005	TRACT 0007	TRACT 0008
PLACE AND COUNTRY OF BIRTH											
TOTAL POPULATION	159,272	128,521	18,828	11,928	9,876	10,667	3,003	9,338	1,978	8,406	9,332
WHITE	132,984	128,270	19,192	11,773	9,973	10,567	3,000	9,338	1,978	8,406	9,332
NEVER MARRIED	19,321	17,773	1,544	1,154	1,324	1,324	1,324	1,324	1,324	1,324	1,324
OTHER RACES	2,749	2,524	198	144	1,544	1,544	1,544	1,544	1,544	1,544	1,544
BORN IN UNITED STATES	82	28	49	34	11	11	11	11	11	8	8
BORN IN MEXICAN PARTRIDGE	29	29	0	0	1	1	1	1	1	0	0
TOTAL FOREIGN STOCK	29,816	20,735	1,923	2,160	1,283	236	936	197	958	708	708
FOREIGN BORN	5,281	4,631	600	1,193	1,202	203	171	308	50	159	156
BORN IN COUNTRY OTHER THAN UNITED STATES	19,535	18,042	1,523	1,523	1,203	803	803	803	803	803	803
UNITED KINGDOM	2,024	1,695	270	129	93	88	23	67	0	46	47
IRELAND	1,000	950	50	50	50	50	50	50	50	50	50
NORWAY	352	313	31	8	1	1	1	1	1	1	1
DENMARK	1,243	1,043	200	200	160	160	160	160	160	160	160
GERMANY	6,705	5,410	945	940	1,183	272	129	152	87	21	68
SWEDEN	1,000	950	50	50	50	50	50	50	50	50	50
CZECHOSLOVAKIA	1,553	1,140	153	280	78	87	27	52	8	18	50
AUSTRALIA	263	263	0	0	0	0	0	0	0	0	0
HUNGARY	64	40	16	8	11	11	11	8	11	11	11
U.S.S.R.	4,471	4,088	369	97	30	10	8	8	8	6	6
TURKEY	1,218	2,018	127	73	23	23	23	23	23	23	23
NETHERLANDS	1,218	1,218	0	0	0	0	0	0	0	0	0
ALL OTHER AND NOT REPORTED	4,004	3,377	262	409	96	233	65	101	76	50	142
HOUSING UNITS AND TENURE											
POPULATION IN HOUSEHOLDS	188,811	122,618	12,023	10,270	3,943	5,996	8,996	3,463	1,978	4,776	7,241
HEAD OF HOUSEHOLD	97,362	61,108	3,375	3,375	1,266	3,628	8,996	1,266	1,266	1,266	1,266
MILITARY INDIVIDUAL	8,470	8,084	218	218	209	199	199	199	199	199	199
CHILD (ONE OR MORE)	95,488	79,564	9,078	3,345	1,712	1,712	1,712	1,712	1,712	1,712	1,712
CHILD (ONE OR MORE)	99,488	99,488	0	0	0	0	0	0	0	0	0
ADULTIVE HEAD	10,400	10,400	0	0	0	0	0	0	0	0	0
ADULTIVE HEAD	3,118	2,947	198	101	39	207	69	167	33	29	120
POPULATION IN INSTITUTION	9,157	9,157	2,803	1,803	1,071	1,071	1,071	1,071	1,071	1,071	1,071
POPULATION IN INSTITUTION	9,157	9,157	2,803	1,803	1,071	1,071	1,071	1,071	1,071	1,071	1,071
POPULATION PER HOUSEHOLD	3.09	3.448	3.61	3.27	3.18	3.61	3.75	3.18	3.62	3.27	3.27
PERSONS WITH BOTH PARENTS											
PERSONS UNDER 18 YEARS OLD	50,745	41,660	9,344	3,741	1,536	8,056	1,791	1,991	570	181	1,086
PERSONS UNDER 18 YEARS OLD	48,377	37,877	9,020	3,333	1,533	8,056	1,791	1,792	452	45	809
U.S. DEPARTMENT OF COMMERCE											
Luther H. Hodges, Secretary											
BUREAU OF THE CENSUS											
Richard M. Scammon, Director											
Robert W. Burgess, Director (To)											
FIG. 37 U.S. CENSUS OF POPULATION AND HOUSING: CENSUS TRACTS											



FIG. 37 U.S. CENSUS OF POPULATION AND HOUSING: CENSUS TRACTS

Census Tracts

LABOR FORCE CHARACTERISTICS OF THE POPULATION, BY CENSUS TRACTS: 1960—Con.

[Based on 25-percent sample. Percent not shown where base is less than 200]

SUBJECT	LINCOLN—CON.													
	TRACT 0009	TRACT 0010	TRACT 0011	TRACT 0012	TRACT 0013	TRACT 0014	TRACT 0015	TRACT 0016	TRACT 0017	TRACT 0018	TRACT 0019	TRACT 0020	TRACT 0021	TRACT 0022
EMPLOYMENT STATUS: OCCUPATION & INDUSTRY														
MALE, 14 YEARS OLD AND OVER	1 470	1 425	536	971	1 263	2 049	1 762	2 637	1 484	1 139	1 577	2 191	972	2 369
PERCENT OF TOTAL	1 107	1 246	477	901	206	1 732	1 500	1 151	1 066	1 155	1 783	1 704	1 717	1 815
CIVILIAN LABOR FORCE	1 028	1 274	504	924	1 092	1 951	1 471	2 161	778	793	635	785	769	2 075
EMPLOYED	1 003	1 156	443	794	1 102	1 805	1 436	2 034	999	814	931	1 081	687	1 760
UNEMPLOYED	29	34	13	31	4	1 046	1 407	1 066	952	758	846	1 112	671	1 707
PERCENT OF CIV. LABOR FORCE	2.4	2.9	2.9	4.0	0.4	1 10	1.0	2.3	4.7	0.9	0.9	2.3	4.1	1.3
NOT IN LABOR FORCE	363	179	55	70	26	262	468	329	233	375	472	205	442	
FEMALE, 14 YEARS OLD AND OVER	1 296	1 473	387	777	815	2 335	2 088	3 038	2 029	1 378	1 265	3 295	969	3 153
LABOR FORCE	1 020	1 274	290	850	1 063	1 968	1 427	2 020	698	806	2 075	410	1 566	
PERCENT OF TOTAL	44.8	40.0	87.7	34.6	31.1	47.6	46.4	42.0	50.4	50.7	63.7	62.0	42.3	49.7
EMPLOYED	504	600	280	330	429	1 029	934	2 122	982	655	782	1 987	399	1 521
UNEMPLOYED	16	24	8	21	34	34	34	35	35	29	27	19	11	13
PERCENT OF CIV. LABOR FORCE	24.8	24.8	24.8	24.8	24.8	3.5	5.1	3.7	6.2	3.0	3.8	2.7	1.5	
NOT IN LABOR FORCE	716	895	307	639	993	1 172	1 120	1 761	1 003	680	459	1 220	559	1 587
MARRIED WOMEN IN L.F. MUSAND PRES.	382	499	210	263	326	750	579	770	469	269	142	541	261	707
WITH OWN CHILDREN UNDER 6	70	142	72	101	90	210	94	153	117	17	111			
MALE, EMPLOYED	1 003	1 156	443	798	1 101	1 646	1 407	1 666	952	758	846	1 112	671	1 707
PROFESSIONAL & TECHNICAL WORKERS	271	178	52	266	285	484	428	500	106	120	220	235	134	227
MGRS., OFFS., & PROPS. INCL. FARM	144	177	53	121	160	370	309	426	100	91	49	173	28	233
MANUFACTURERS	90	152	42	97	91	168	118	200	103	72	65	144	95	163
SALES WORKERS	91	71	53	70	151	238	184	234	93	45	20	127	56	127
CRAFTSMEN, FOREMEN, & KINDRED WORKERS	165	279	115	161	104	249	200	307	172	190	151	220	209	408
OPERATORS, MACHINISTS, & KINDRED WORKERS	85	197	113	50	120	116	116	145	142	80	189	159	333	
PRIVATE HOUSEHOLD WORKERS	4	11	4	11	8	5	5	10	8	8	8	4	4	1.5
SERVICE WORKERS	52	61	34	26	8	67	49	98	67	88	51	150	93	166
PRIVATE HOUSEHOLD WORKERS	30	93	17	61	61	55	55	65	54	48	23	73	50	94
SERVICE WORKERS EXC. PRIV. HOUSEHOLD	51	78	61	17	21	145	89	152	137	127	164	225	113	297
LABORERS, EXCEPT MINE	8	12	10	18	44	38	42	35	25	20	9	101	108	
OCCUPATION NOT REPORTED	8	4	4	4	17	21	24	46	33	20	69	81	7	48
FEMALE, EMPLOYED	564	600	280	330	429	1 029	934	2 112	982	655	782	1 987	398	1 323
PROFESSIONAL & TECHNICAL WORKERS	111	90	37	45	98	212	231	231	94	73	252	246		
CLERICAL AND KINDRED WORKERS	35	48	18	40	51	91	65	47	32	51	54	12	37	
SALES WORKERS	233	232	68	184	169	354	352	395	388	201	295	918	65	497
CRAFTSMEN, FOREMEN, & KINDRED WORKERS	65	65	23	48	97	80	150	73	31	45	17	19		
OPERATORS, MACHINISTS, & KINDRED WORKERS	4	17	4	11	5	13	12	12	8	8	20	18	19	
PRIVATE HOUSEHOLD WORKERS	52	51	34	26	8	67	49	98	67	88	51	150	93	166
SERVICE WORKERS EXC. PRIV. HOUSEHOLD	30	93	17	61	61	55	55	65	54	48	23	73	50	94
LABORERS, EXCEPT MINE	8	12	10	18	44	38	42	35	25	20	9	101	108	
OCCUPATION NOT REPORTED	8	4	4	4	17	21	24	46	33	20	69	81	7	48
TOTAL EMPLOYED	1 567	1 760	723	1 076	1 530	2 675	2 341	3 178	1 934	1 409	1 628	3 399	1 070	3 230
PRIVATE HOUSEHOLD WORKERS	100	133	58	102	1 778	1 698	2 298	1 357	1 041	1 320	2 427	924	2 427	
GOVERNMENT WORKERS	578	334	120	222	302	1 567	462	672	454	274	261	845	108	639
SELF-EMPLOYED WORKERS	124	93	43	45	200	295	195	208	119	90	35	127	31	153
UNPAID FAMILY WORKERS	35	43	8	8	16	10	8	8	4	4	4	4	7	13
TOTAL EMPLOYED	1 567	1 760	723	1 076	1 530	2 675	2 341	3 178	1 934	1 409	1 628	3 399	1 070	3 230
MINING, CONSTRUCTION, & TRADE	4	115	44	115	115	110	252	252	106	130	100	275	208	
MANUFACTURING	120	160	120	200	201	343	292	373	166	178	81	216	537	
FURNITURE & LUMBER & WOOD PRODUCTS	4	6	12	9	9	14	12	12	8	8	8	12	4	11
METAL INDUSTRIES	7	19	15	21	16	19	11	23	12	12	11	18	13	30
NONMETAL MINING	12	21	20	20	21	59	52	52	8	12	20	26	78	
TRANSPORTATION EQUIPMENT	16	65	12	16	31	146	40	20	12	12	33	30	10	50
OTHER DURABLE GOODS	8	9	11	21	22	25	17	16	16	14	14	21	8	
FOOD AND KINDRED PRODUCTS	83	135	32	51	60	80	92	99	65	55	55	100	70	220
TEXTILE AND APPAREL PRODUCTS	4	11	4	8	4	11	4	5	4	5	4	8	4	8
PRINT., PUBLISHG., & ALLIED INDUS.	70	76	20	22	33	90	53	65	76	32	32	88	44	88
OTHER NONDUR. (INCL. NOT SPEC. HFG.)	36	31	37	32	62	160	52	41	56	16	12	40	42	
RAILROAD AND RAILWAY EXPRESS SERVICE	32	80	37	31	36	167	97	79	106	50	26	82	106	149
COMMUN. UTIL., & SANITARY SERV.	35	21	18	8	21	56	52	63	32	21	27	56	45	31
WHOLESALE TRADE	47	83	37	33	54	158	112	151	151	69	52	170	43	97
EATING AND DRINKING PLACES	42	42	42	49	49	49	44	45	57	58	88	81	66	87
ACCOM., ROOMING, & BOARDING HOUSES	146	250	98	167	241	390	373	540	278	203	224	488	124	558
PRIVATE AUTOMOBILE DR. CAR POOL	1 096	1 481	613	989	1 369	2 156	1 850	2 200	1 841	1 211	1 229	1 789	766	2 235
SUBWAY OR ELEVATED	4	4	4	4	4	4	4	4	4	4	4	4	4	4
BUS OR STREETCAR	106	109	37	37	32	62	160	157	322	213	164	91	106	368
WALKED TO WORK	155	62	36	22	44	122	112	133	209	40	693	1 141	152	
DRIVE TO WORK	177	9	89	25	26	56	46	48	41	41	81	45	60	
DRIVE TO WORK, WALKED HOME	133	31	28	20	48	70	81	171	60	33	66	33	39	152
NOT REPORTED	11	16	5	5	20	40	111	62	66	41	131	172	13	100
INSIDE SMSA	1 403	1 703	696	1 084	1 480	2 419	2 199	3 027	1 913	1 397	1 480	3 269	1 046	3 154
LINCOLN CITY	1 269	1 526	630	883	2 267	2 016	1 655	1 221	1 302	2 892	904	2 799		
REMAINDER OF LANCASTER COUNTY	134	177	66	181	130	152	183	254	250	176	377	152	355	
OUTSIDE SMSA	108	31	19	68	98	78	36	32	30	43	89	22	66	
PLACE OF WORK NOT REPORTED	37	32	12	30	12	120	60	103	80	46	139	177	20	113

FIG. 38 LABOR FORCE CHARACTERISTICS

Population, by Census Tract (Table P-1). The items Head of Household, Population in Group Quotas (Other), and College enrollment are underlined in order to point up specific items used in developing the daytime population numbers. Figure 38 describes the Labor Force Characteristics of the Population by Census Tract (Table P-3). The underlined items of Married Women in Labor Force (Husband Present), Total Employed, and Worked at Home were all used in arriving at Daytime Population figures.

In essence the principle used was to start with the nighttime population of a tract, to subtract all those clearly leaving home during the day, and to multiply the night block populations by the ratio of remaining resident tract population divided by the resident night tract population; a number that was found to vary between 0.5 and 0.7 for each tract. This gave the resident day population by block. The next step was to take the total day population of the tract (computed by the A&E during the shelter survey), and distribute the difference of the total day population and the total resident day population into the blocks found to be Industrial and Commercial areas. Land use and principal employment centers maps and air photographs were used to make the judgments necessary for this distribution. One example of computing the daytime resident population is described in Table II, wherein the calculations for tract 16 are recorded. These calculations will be used throughout this section to describe one method of computing the daytime block populations.

The daytime resident population of 4088 for tract 16 is recorded on line 11 in Table II. This 4088 figure was determined by subtracting the 3369 people on line 10, who leave tract 16 to go to work or college, from the 7475 people on line 1, who comprise the nighttime resident population. The data in line 1 were taken from the report HC(3) No. 236 while the data recorded in lines 2 through 10 are from Report PHC(1)-79.

A detailed description for computing the daytime resident population follows. Two different methods, A and B, were used in order to determine the number of people who leave a specific tract for work and

TABLE II

 DAYTIME POPULATION CALCULATIONS
 Census Tract 16
 Lincoln, Nebraska

LINE	ITEM	METHOD A	METHOD B	FINAL CALCULATIONS
1	Total Night Population			7457
2	Heads of Household		2605	
3	Working Wives		770	
4	Population in Group Quarters		31	
5	Working Population (Total Lines 2-4)	3178	3406	
6	Working at Home	- 131	<u>- 131</u>	
7	Working Away from Home	3047	3275	
8	College Enrolled	416		
9	Total Away from Home	3463	3275	
10	Total Away from Home - Average of Methods A & B			<u>-3369</u>
11	Daytime Resident Population			4088
12	Ratio of Res. Day Pop./Res. Night Pop. (Line 11/Line 1)			(0.548)
13	Given Day Population (A&E Report)			<u>5587</u>
14	Population Away from Home in the Tract (Line 13 - Line 11)			1499
15	Employed Population Located in Known Employment Centers			<u>- 125</u>
16	Retail and Commercial Population			1374

NOTE: The 1374 persons making up the Retail and Commercial Population were distributed evenly over 8 specific census blocks in Tract 16, thus resulting in 171 persons per block affected.

college as reported on line 9. When Method A resulted in a greater value than Method B the values for each method were averaged and recorded on line 10. When Method A resulted in a lower value than Method B, Method A alone was used and no average of Methods A and B was taken. Though Method A was a more simple method of calculating the number of people leaving home, this method was believed not to be sufficiently accurate in those tracts where a large number of college students were living. Inasmuch as the census data did not report the number of college students who worked, Method A might be expected to report too large a number of people leaving a tract because of "double accounting." Method B included some college students under the items of Heads of Households and Populations in Group Quarters. Method B served both as a check on Method A and as a means of permitting greater judgment in evaluating the "population away from home" figures.

Method A--Away from Home total (line 9) was determined by subtracting the Working at Home population (line 6) from the Working Population (line 5) and then adding the College Enrolled population (line 8).

Method B--Away from Home total (line 9) was then determined by subtracting the Away from Home Population (line 10) from the Total Night Population (line 1). The daytime resident population by census block was calculated by multiplying the ratio of the day to night resident population (line 12), by the respective nighttime block populations recorded in census report HC(3) No. 236. This ratio of the day to night resident population (line 12) was calculated by dividing line 11 by line 1.

As the population figures for the daytime resident population were developed, they were written into the appropriate census blocks as marked out on a large census block map prepared for Lincoln (scale 8" = 1 mile). As a second source of future reference, they were also written in the margin alongside the nighttime resident population block figures found in census report HC(3) No. 236.

D. Locating the Key Employment Centers

The key employment centers along with an estimate of the numbers of people employed were determined from an exhibit found in the Comprehensive Regional Plan for the Lincoln City-Lancaster County Metropolitan Area of Nebraska as prepared by Harland Bartholomew and Associates. The Principal Employment Centers in Lincoln with fifty or more employees, as taken from the Regional Plan, are shown in Fig. 39.

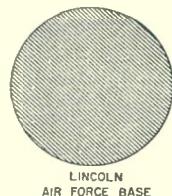
Table II shows that 125 employees were found to work in Tract 16 (line 15) as a result of information taken from Fig. 39, the Principal Employment Centers map. These 125 employees were recorded on the large census block map along with the daytime, resident population. In each tract the employees were distributed for the appropriate block or blocks, as located on the Principal Employment Centers map.

E. Developing Land Use Maps and Extrapolating Data

An important part of determining the daytime population figures is to ascertain the location and approximate numbers of people visiting the retail and commercial centers of a city. Because of the shifting, changing nature of this population, it is only possible to arrive at what appears to be a good reasonable average number of people for a given area.

Returning to our example of Tract 16 described in Table II, there were found to be approximately 1374 people (line 16) visiting the retail and commercial areas of Tract 16. This number was computed by subtracting the Employed Population (line 15) from the Population Away from Home (line 14), who are in Tract 16 during the day. The Population Away from Home was determined by subtracting the Daytime Resident Population (line 11) from the Given Day Population (line 13). The Given Day Population was taken from data generated by the A&E population survey.

By this method it was not too difficult to arrive at a figure which suggested the total number of people visiting the retail and commercial area of a tract. However, it was more difficult to determine the actual



LINCOLN
AIR FORCE BASE

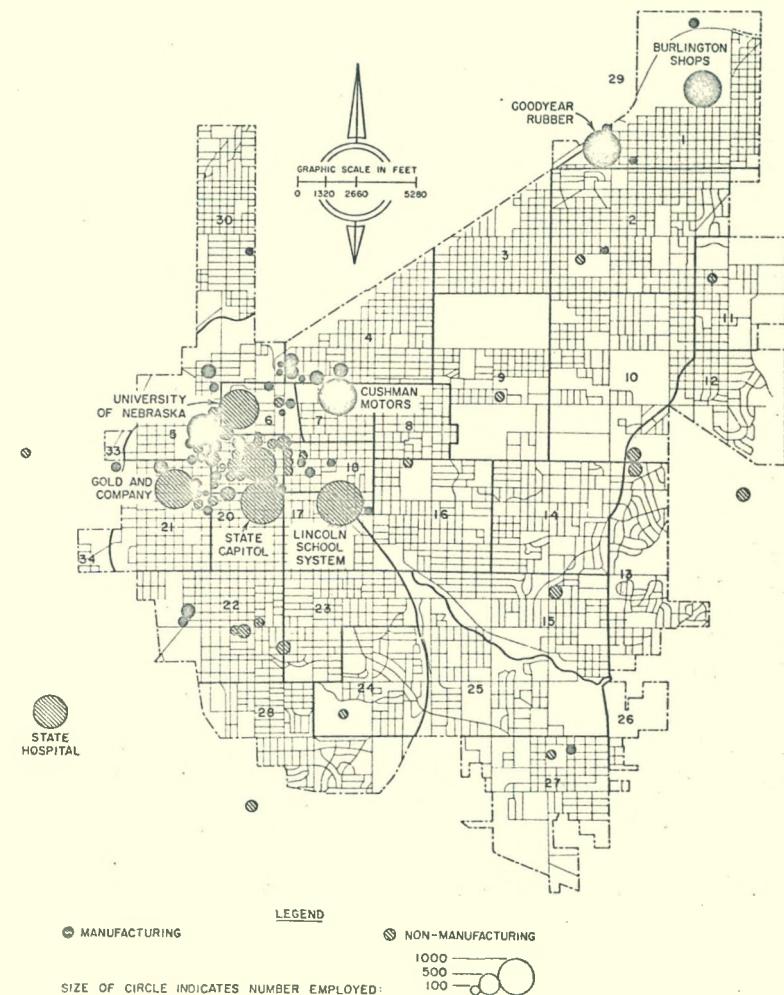


FIG. 39 PRINCIPAL EMPLOYMENT CENTERS

blocks within a tract in which these people are located, as well as their distribution.

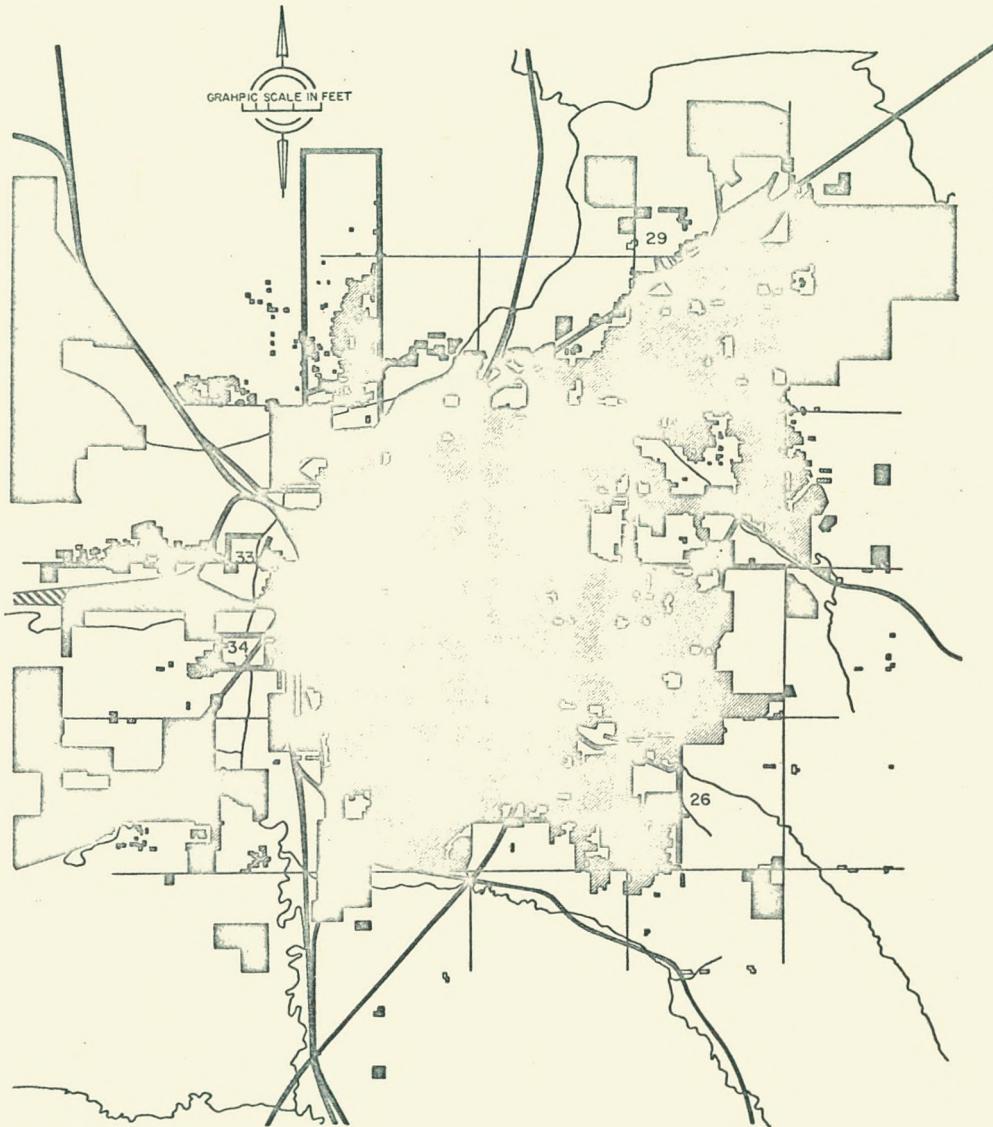
In this case, city land use maps and an air photograph, as taken from the 1961 Comprehensive Regional Plan served as the basis for estimating the locations of the retail and commercial centers. A Diagrammatic Land Use map for the city is shown in Fig. 40. The black areas, which note the commercial centers of the city were located and marked with pencil on the large census block map. The outline of these commercial areas circumscribed those census blocks located in commercial and retail areas. In Tract 16, eight (8) census blocks were found to contain retail and commercial areas, each considered to be loaded with an equal density of population. Therefore, the 1374 Retail and Commercial Population on line 16 of Table II was divided by 8, and 171 persons were added to the appropriate blocks on the large census map.

Other census tracts posed special problems in assessing the population. In these cases more detailed information was required. As an example, air photographs such as are shown in Figs. 41 and 42 helped to describe the characteristics of the census blocks. Figure 41 describes a typical suburb area and serves to confirm the absence of commercial or retail areas in tract 13. Figure 42 gives detail as to the size and density of buildings to be found in Tract 19 by census block in the downtown center of Lincoln.

Figure 43 is a sketch of the Existing Land Use for Tract 19 in the downtown district of Lincoln. This sketch along with the air photograph in Fig. 42 was most useful in evaluating the retail and commercial traffic for the high-density, downtown area. In those areas of the map in Fig. 43 where the "Retail Core" and "Private Office Areas" were overlapping, population densities were increased accordingly.

F. Computing a Final Daytime Population Total per Census Block

Previous paragraphs have pointed out that as the daytime population data were generated for the resident population, the employment population, and the commercial population, the respective population figures



LEGEND

RESIDENTIAL

COMMERCIAL

INDUSTRIAL & RAILROADS

PUBLIC & SEMI-PUBLIC

NOTE STREETS ARE FOR GRAPHIC REFERENCE ONLY

FIG. 40 LAND USE MAP

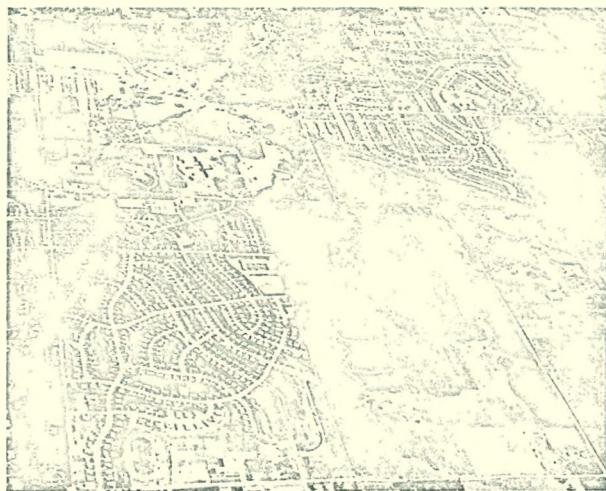


FIG. 41 TYPICAL SUBURB



FIG. 42 CENTRAL BUSINESS DISTRICT

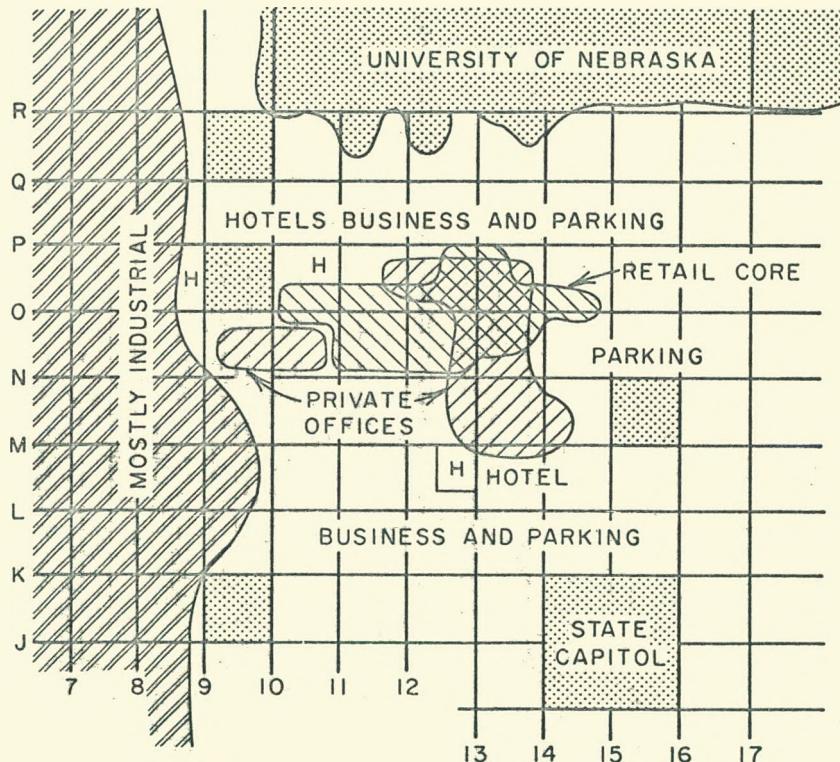


FIG. 43 BUSINESS DISTRICT LAND USE

were placed in the appropriate blocks of the large census map. These figures were then totaled in each block and the resulting sum was the block population figure used in making the daytime assignment.

In addition to recording data on the map, it is recommended that the daytime population figures by block be written opposite the appropriate blocks in the U.S. Census Report HC(3) No. 236. Data recorded in this manner is most useful as a reference and as a source of checking the accuracy of the actual assignment of people to shelters.

The final daytime population total arrived at by the technique described in Secs. V-A through V-F was 143,521. This number is somewhat greater than the A&E's estimate of 142,521. The two numbers do not agree since the A&E's population estimate by tract was not used in those cases where the method of assessing population as discussed in this section dictated otherwise.

VI PUBLIC INDOCTRINATION

The problems of informing the public of shelter assignments have been important considerations in developing the method of assignment. Observations of public reaction to the shelter program suggest that the assignment method must support the proposition that between 10 and 50 percent of the people will not know their assignment in an emergency.

A. Public Reaction

It is a regrettable fact also that many people actively resist acquiring knowledge about a shelter program, and presumably sway some less certain people. It is further predicted that, in spite of this, when faced with a sudden emergency these people will be just as anxious to find shelter as everyone else, and will, consistent with their beliefs up to that time, have made no preparations.

The assignment method has been designed to rely on the 50 percent (minimum) who do know their assignment to bring in those who do not by the follow-the-crowd principle.

B. Purpose and Method of Indoctrinating the Public

The purpose of the public indoctrination program should therefore be aimed at informing as many people as will permit, of their specific assignment, and at implanting some general rules and guidances in the minds of everyone.

It is considered that the quadrant method which gets people to stay in their own quadrant by the simple message of "don't cross 10th Street and 'O' Street wherever you are" would be effective. Also, this simple message conveyed by radio, newspapers, and television will not be forgotten.

It will be necessary to back this message up with a clear explanation of how the shelter assignment is designed; of how the population

distribution has been used to account for people moving around in their everyday lives, regardless of whether they are at home, at work, visiting their friends and relations, or just shopping downtown; that surveys have been done and assignments made that will accept people being away from home. In most cases the newspapers would demand and publish this information at the time the message was sent for publication.

C. Communicating the Specific Assignment

Having established the simple quadrant rule in the minds of the people, the next step is to try and indoctrinate people into their specific assignment.

People spend most of their time at home and at work, both locations being well known to them. In these two locations, specific assignment can be communicated. At work, the assignment should be permanently posted on notice boards and in the same locations as fire instructions.

For informing people at home, a number of alternatives are available:

- (1) Post cards sent to each home stating the assignment. This is a big task and, to be effective, needs to be repeated about once every six months to maintain the information in people's minds.
- (2) Arrange lectures to local groups such as American Legion, Red Cross, P.T.A., Women's Groups.
- (3) Have a notice published in the front of the telephone book which gives the CD Office telephone, and invites inquiries as to shelter location and assignment. This method requires the CD Office to be prepared for large numbers of phone calls whenever international crises seem to be imminent.

D. Communicating Through Maps

For a more general method of spreading the information, two maps should be produced showing the assignments. Such maps are not as complex as might be imagined. By the process of assigning blocks in groups to shelter, the bounds of areas assigned to any one shelter are often

quite large, and it becomes much easier to interpret by looking at a map, what the assignment is.

Such maps should be displayed, with explanations, in public places such as libraries, and in the waiting rooms at clinics, hospitals, and other public buildings.

E. Communicating with the Unassigned Population

There remains the problem of what to do about those that are not assigned, or assigned only at night and not by day.

A frank explanation should be made to the residents of such areas, giving:

- (1) The total population compared to available shelters.
- (2) The method of assignment, which is that those nearest to shelters are assigned first.
- (3) Recommendations for home shelter planning.
- (4) Details of future plans for building shelters or improving presently substandard facilities in those areas.
- (5) Reasons to avoid overcrowding of existing shelters. The parallel of the lifeboat which, when overloaded, sinks, drowning everyone, could be used here.

VII MAN-DAYS AND COST REQUIRED TO MAKE THE SHELTER ASSIGNMENTS

An estimate is itemized below with respect to the man-days required to produce the assignment maps, compute the assignment data, and make the actual shelter assignments. It is recommended that two planners work together in producing the shelter assignments. The estimate of man-days presumes that two planners rather than one are involved.

A. Required Man-Days

An estimate of the total man-days required for the planners to progress through the assignment process is summarized below:

Production of two suitable maps of the city of Lincoln, marking the tracts and blocks, and entering the shelters in both maps and the night population on one map	7 man-days
Computing the day population and entering it on the map	4 man-days
Assigning both day and night population, including determination of sectors or quadrants, distance measurement, and checking	20 man-days
Coloring maps day and night for easy reference	1 man-day
<hr/>	
Total assignment effort	32 man-days

B. Estimate of Cost

In order to determine the cost of making the assignments, the 16 man-days computed above would be multiplied by the appropriate man-day wage scale. This wage scale would be determined by the professional classification of the planners selected.

The cost of employing the use of data-processing equipment in order to produce the required shelter assignment reports is discussed in Appendix A. For this particular effort, about 63 machine- and man-hours were required at a total cost of approximately \$900.

APPENDIX A

DATA PROCESSING PROCEDURE

APPENDIX A

DATA PROCESSING PROCEDURE

1. Data-Processing Equipment

Reports such as are shown in Fig. A-1 were prepared by the use of electronic data processing equipment. The basic data processing equipment consisted of the following items:

- (1) Key-Punch, used to record the information found in the data sheets onto the cards.
- (2) Key Verifier, which verifies the accuracy of the key punching operation.
- (3) Interpreter, which prints onto a card the basic data to be found on the card.
- (4) Sorter, which arranges the cards in the order required.
- (5) Collator, which matches and merges the Shelter Master Cards with the Block Detail Cards.
- (6) Tabulator-Printer, which prints and lists the data from the cards onto the report paper, as is demonstrated in Fig. A-2. To use the printer a control board is wired up as shown in A-3.

The above kinds of equipment are available to all cities in the United States. Most cities of 100,000 population or greater could be expected to have data-processing equipment operating within their own boundaries or in some city not too many miles distant. Universities, industrial centers, and commercial centers are typical of the places in which a civil defense official could look to find data processing equipment. The owners of data-processing equipment frequently welcome outside contracting of such equipment so as to help fill in the idle times of the equipment.

There is great flexibility as to the actual locality in which the key punching and processing of the "punched cards" is done. After the basic shelter assignment data is generated and recorded for a city, the

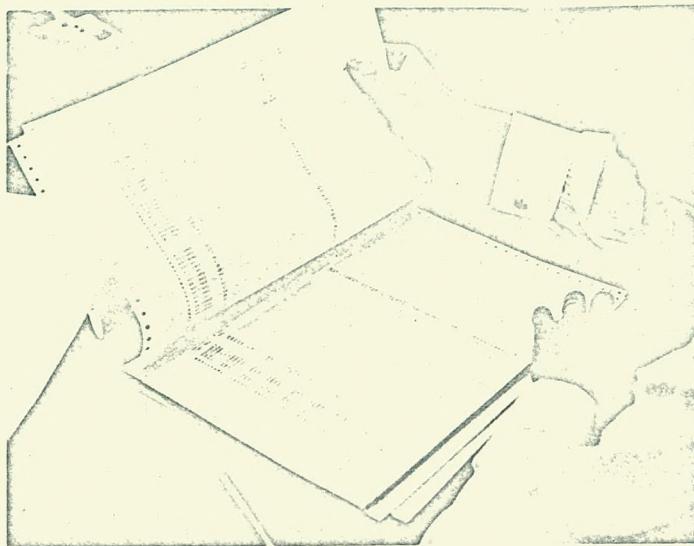


FIG. A-1 TYPICAL REPORT



FIG. A-2 TABULATOR-PRINTER IN OPERATION

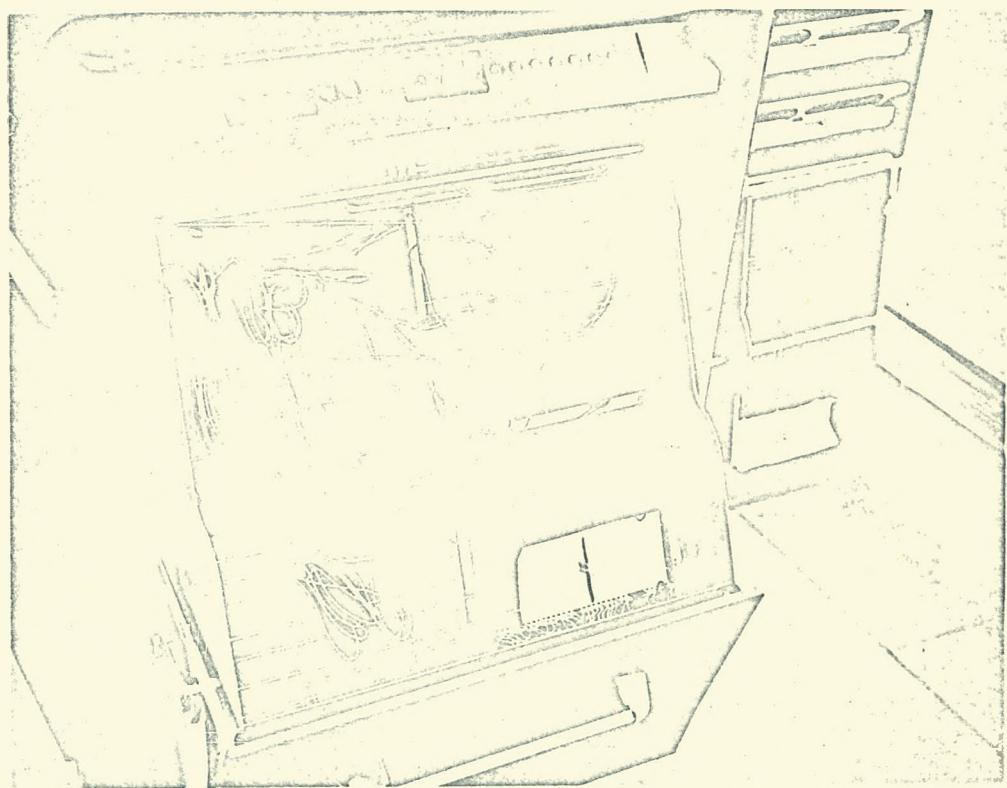


FIG. A-3 PRINTER CONTROL BOARD

cards may be key-punched and processed at a central data-processing office, serving either a city, a state, a region, or the nation as a whole. The punched cards for this research report were key-punched and processed by a commercial data-processing firm that serves many clients in the San Francisco Bay area.

It is believed that the time analyses reported under Sec. 6 of this Appendix and the cost analyses recorded under Sec. 7 would be representative of the time and cost required to produce a similar set of reports in most sections of the U.S. for a city typical of Lincoln, using local data-processing equipment. However, it is to be expected that items of cost and/or the form of the reports might vary, depending upon the manufacturer and the type of equipment.

A discussion follows which describes the data-processing procedure followed in producing the reports for Lincoln, Nebraska.

2. Punching and Verification Instructions

Punching and verification instructions are necessary before the "Card Forms" can be designed and the cards punched. Figures A-4 through A-7 record the key punching instructions prepared in order that the following cards could be designed and punched:

- (1) The Shelter Master Cards with name and address
- (2) The Shelter Card Master
- (3) The Block Detail Cards for day and night assignments
- (4) The Unassigned Block Cards.

These instruction sheets describe the fields, or numbered columns, to be used up by specific cards in order to report out the shelter assignment data. A total of 80 columns were available in each of the punch cards used in this report.

3. Multiple Card Layout

The data recorded in the Punching and Verifying Instruction sheets were used to prepare the Multiple Card Form shown in Fig. A-8. This multiple card form was the basis for designing six (6) different decks

PUNCHING AND VERIFICATION INSTRUCTIONS

CUSTOMER Civil Defense

REPORT TITLE **Shelter Master Cards (Name and Address)** **Estimate No.** _____

REPORT No. _____ Job No. _____

Approx. No. of Cards 200 Operation Code _____

Operation Code

Machine Code 026

Machine Code 026

DISPOSITION OF CARDS:

Next Sheet No. _____ Date Prepared 3-21-63

Date Prepared 3-21-63

**FIG. A-4 PUNCHING AND VERIFICATION INSTRUCTIONS
SHELTER MASTER CARD (Name and Address)**

PUNCHING AND VERIFICATION INSTRUCTIONS

CUSTOMER Civil Defense

REPORT TITLE **Shelter Card Master** **Estimate No.**

REPORT No. _____ Job No. _____

Approx. No. of Cards 200 Operation Code _____

Operation Code _____

Machine Code 026

DISPOSITION OF CARDS:

Next Sheet No. _____ Date Prepared 3-21-63

Date Prepared 3-21-63

FIG. A-5 PUNCHING AND VERIFICATION INSTRUCTIONS
SHELTER MASTER CARDS

PUNCHING AND VERIFICATION INSTRUCTIONS

CUSTOMER Civil Defense

REPORT TITLE Block Detail Days and Nights Estimate No.

REPORT No. _____ Job No. _____

Approx. No. of Cards 2000 Operation Code 026

Operation Code 026

Machine Code

DISPOSITION OF CARDS:

Next Sheet No. _____ Date Prepared 3-21-63

Date Prepared 3-21-63

**FIG. A-6 PUNCHING AND VERIFICATION INSTRUCTIONS
BLOCK DETAIL DAYS AND NIGHTS**

PUNCHING AND VERIFICATION INSTRUCTIONS

CUSTOMER Civil Defense

REPORT TITLE Unassigned Blocks **Estimate No.**

REPORT No. 600 Job No. _____

Approx. No. of Cards _____ Operation Code _____

Machine Code 026

DISPOSITION OF CARDS:

Next Sheet No. _____ Date Prepared 3-21-63

Date Prepared 3-21-63

FIG. A-7 PUNCHING AND VERIFICATION INSTRUCTIONS UNASSIGNED BLOCKS

CLIENT ANY CITY

DATE 3-16-63

JOB DESCRIPTION

FIG. A-8 MULTIPLE CARD FORM SHOWING CARD LAYOUTS

of punched cards. These six (6) decks are numbered 1 through 6 on the Multiple Card Form and are respectively labeled as follows:

- (1) Shelter Master
- (2) Block Detail for Nighttime Assignments
- (3) Block Detail for Daytime Assignments
- (4) Shelter Masters with name and address
- (5) Block Detail for the Unassigned Nighttime Blocks
- (6) Block Detail for the Unassigned Daytime Blocks.

As many columns as possible in all cards were designed with common fields of information, as the Multiple Card Form indicates. These card decks were designed in this manner so as to: (1) assure the appropriate matching and merging of cards, (2) facilitate the job of key-punching and handling the cards, and (3) reduce the data processing costs.

As will be noted in the Multiple Card Form, Columns 1 through 13 possessed fields that were common to all cards. These spaces were filled by codes describing the day and night assignments, the Standard Location number, the Census Tract Number, and the Census Block Number. Column 14 was skipped in all cards, with the exception of in the Assigned Block Detail Cards wherein a resident population code number was introduced. In Cards 1 through 4, the shelter and block cards, Columns 15 through 19 were reserved for a Shelter Number, and Columns 20 and 21 contained a Protection Factor code. In Card 1, the Shelter Master, Columns 22 through 35 were divided into Shelter Capacity, Date Licensed, and Date Stocked. In Cards 1, 2, and 3, the Shelter Master and Block Detail cards, Columns 43 through 46 were reserved for the Data Surveyed. Columns 76 and 77 were marked with a segment code in all Cards, with the exception of the Shelter Master Address Card, card number 4. All Block Detail Cards devoted Columns 36 through 40 to either nighttime or daytime population data. The distance code in Columns 41 and 42 was common to both the nighttime and daytime block cards, card numbers 1 and 2. In the Shelter Master (Address Card), card number 4, columns 22 through 80 were reserved for the name and address of the specific shelter. In the

Shelter Master, card number 1, Columns 78 and 79 were used to record the Partial Block Code. All other columns in the cards were unassigned.

4. Flow Charts of Procedures

Before the cards were key punched, Flow Charts were developed which described the operations and procedures to be performed in order that various shelter assignment reports could be generated. Figures A-9 through A-16 describe eight Flow Charts that report on the Procedures to be used in producing the following reports:

- (1) Shelter Name and Address List
- (2) Listing of all Assigned and Unassigned Blocks
- (3) Shelter Assignments with Ample Warning Time
- (4) Shelter Assignments with One Hour Warning
- (5) Shelter Assignments with Thirty Minute Warning
- (6) Unassigned Blocks with Ample Warning Time
- (7) Unassigned Blocks with One Hour Warning Time
- (8) Unassigned Blocks with Thirty Minutes Warning.

These Flow Charts (or Procedure Diagrams) serve to report the sequence in which the cards are to be punched, verified, sorted, collated, and listed.

5. Specifications for Wiring the Control Panels

The most complicated and expensive task performed in utilizing the data-processing equipment for a shelter assignment was found in the wiring of two printer control panels. A printer control panel with wiring is shown in Fig. A-3 of the main text.

Figure A-17 shows the Planning Chart used in wiring the printer panel for the Shelter Name and Address Listing, Report Number 1 and Procedure Number 1. The Control Panel Diagram is shown in Fig. A-18. The Planning Chart used in wiring the printer panel for Reports 2 through 8 (and Procedures 2 through 8) is depicted in Fig. A-19.

The instructions for wiring the collator panel required in Procedure Number 3 (or Report Number 3) are summarized under Fig. A-20.

NAME & ADDRESS LISTING

PROCEDURE NO. 1

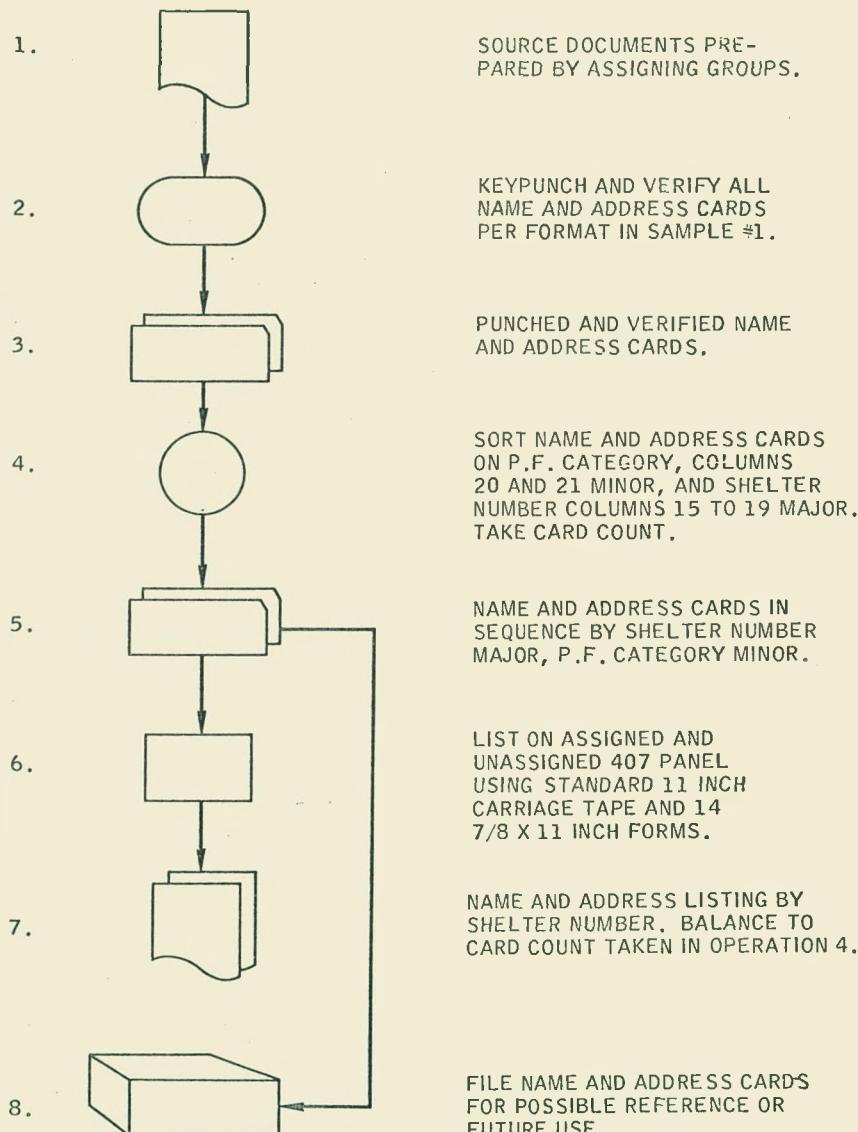


FIG. A-9 NAME AND ADDRESS LISTING - PROCEDURE NO. 1

ASSIGNED & UNASSIGNED BLOCKS

PROCEDURE NO. 2

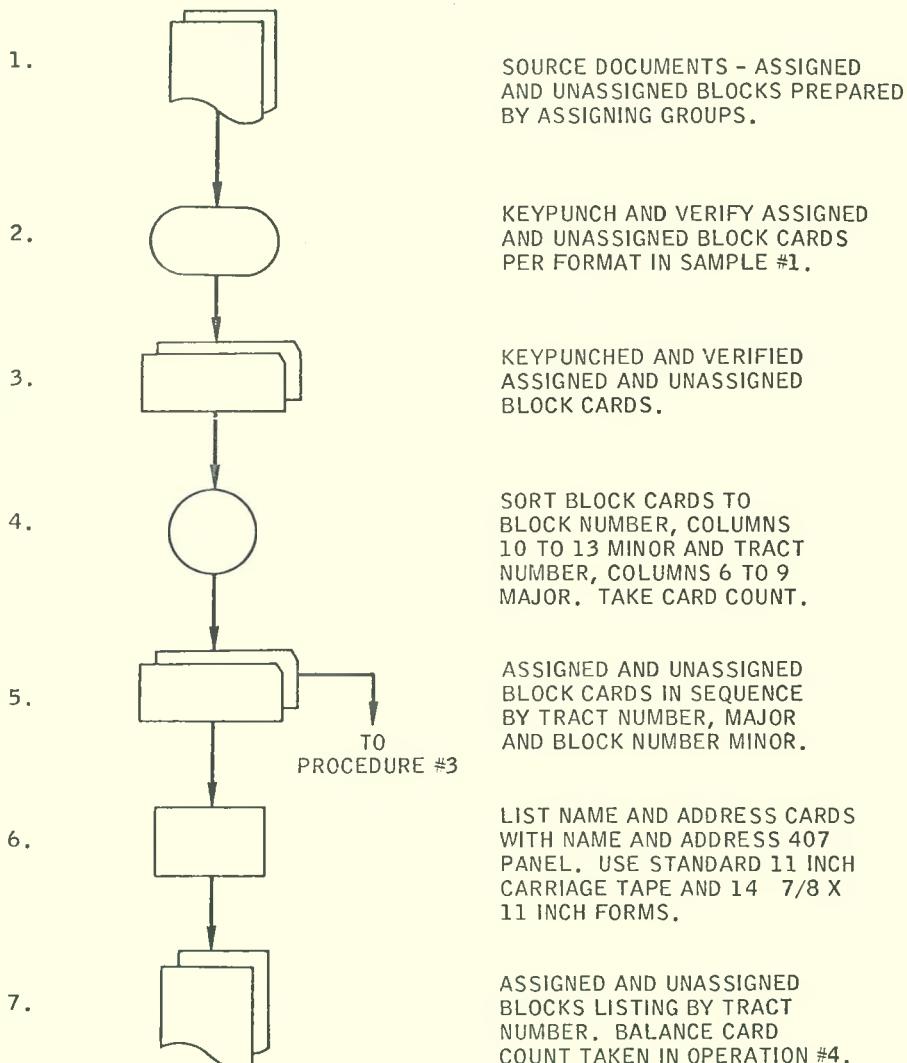


FIG. A-10 ASSIGNED AND UNASSIGNED BLOCKS - PROCEDURE NO. 2

SHELTER ASSIGNMENTS (AMPLE WARNING TIME)

PROCEDURE NO. 3

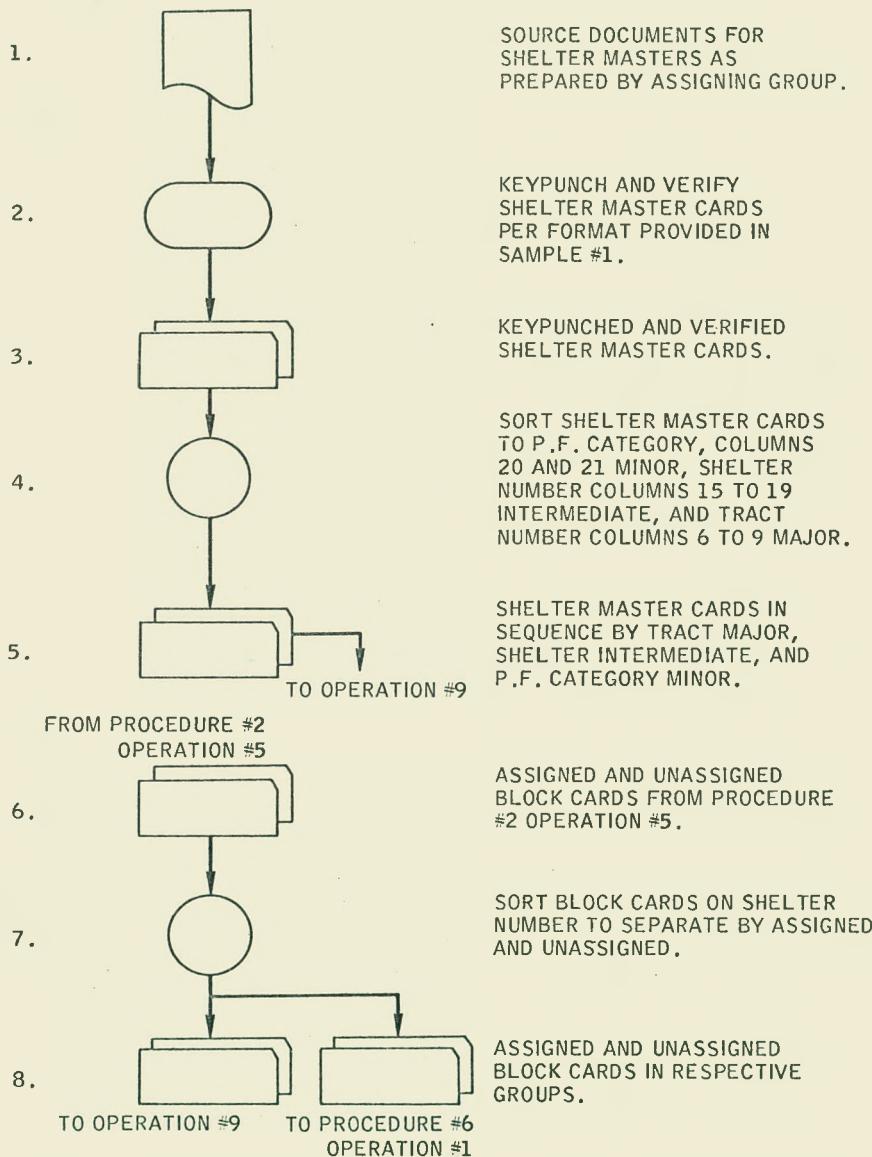


FIG. A-11 SHELTER ASSIGNMENTS (ample warning time) – PROCEDURE NO. 3

SHELTER ASSIGNMENTS (AMPLE WARNING TIME)

PROCEDURE NO. 3 (CONTINUED)

FROM OPERATION #8 FROM OPERATION #5

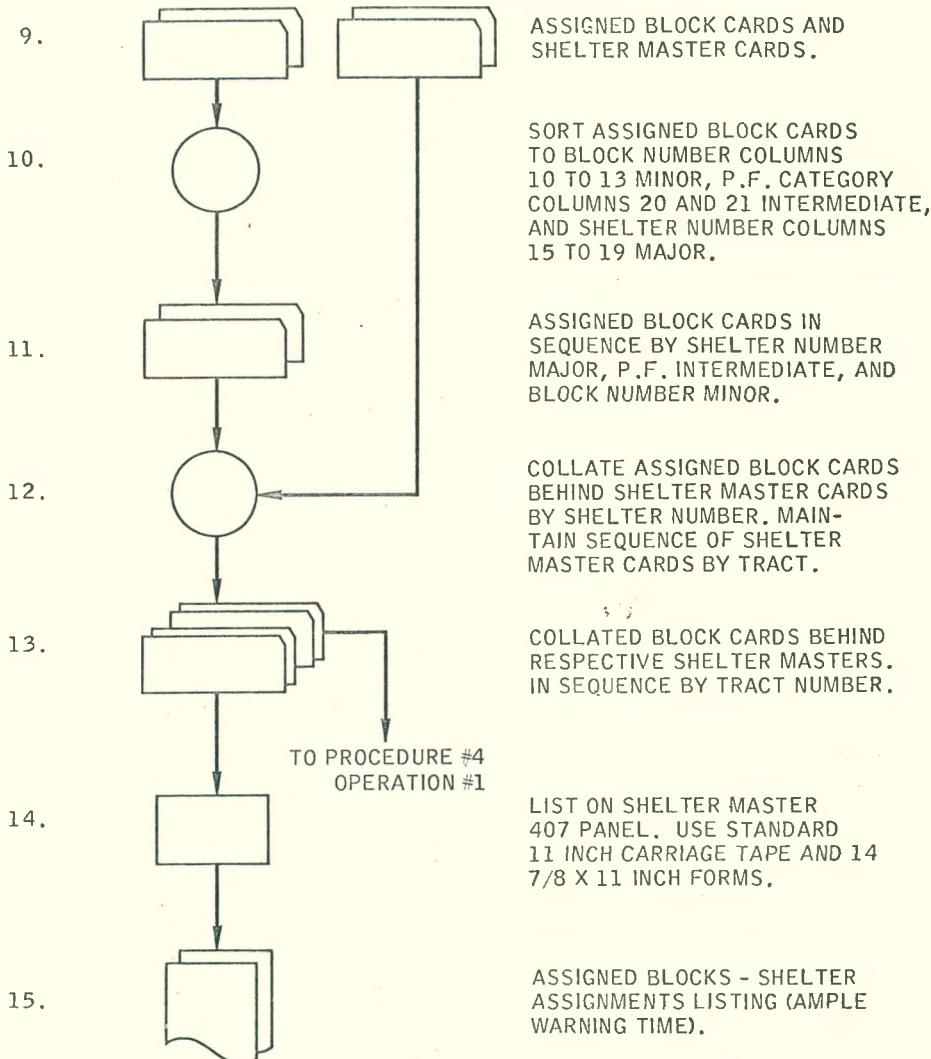


FIG. A-11 continued

SHELTER ASSIGNMENTS (ONE-HOUR WARNING)

PROCEDURE NO. 4

FROM PROCEDURE #3
OPERATION #13

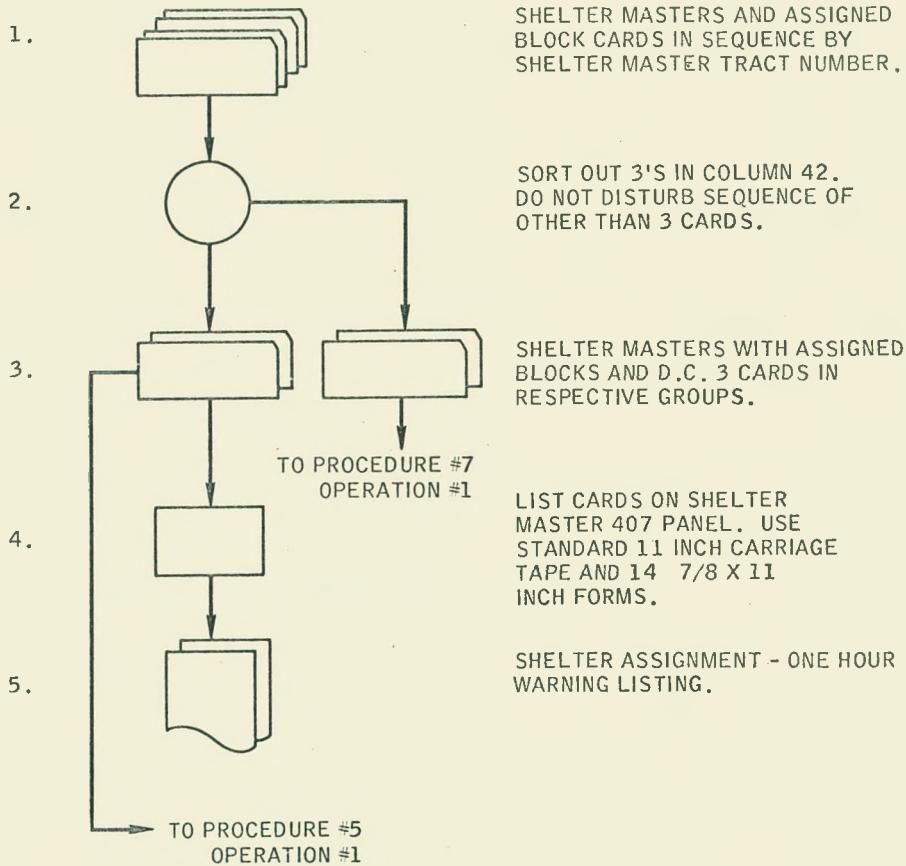


FIG. A-12 SHELTER ASSIGNMENTS (one hour warning) - PROCEDURE NO. 4

SHELTER ASSIGNMENTS (30 MINUTE WARNING)

PROCEDURE NO. 5

FROM PROCEDURE #4
OPERATION #3

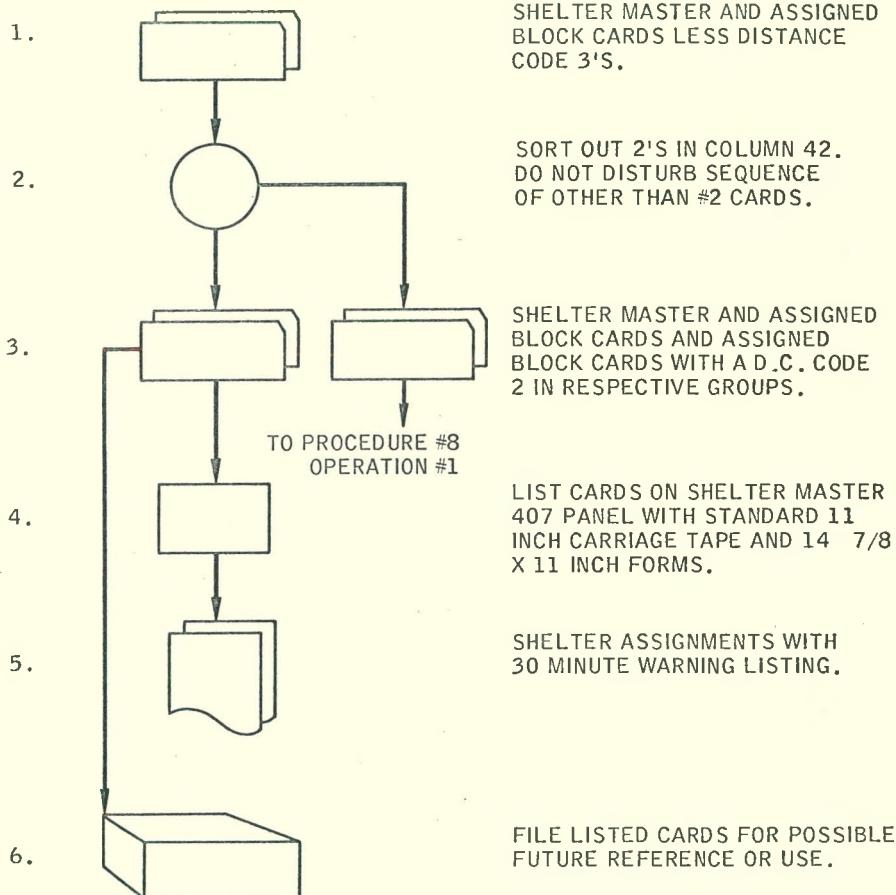


FIG. A-13 SHELTER ASSIGNMENTS (30 minute warning) - PROCEDURE NO. 5

UNASSIGNED BLOCKS (AMPLE WARNING TIME)

PROCEDURE NO. 6

FROM PROCEDURE #3
OPERATION #8

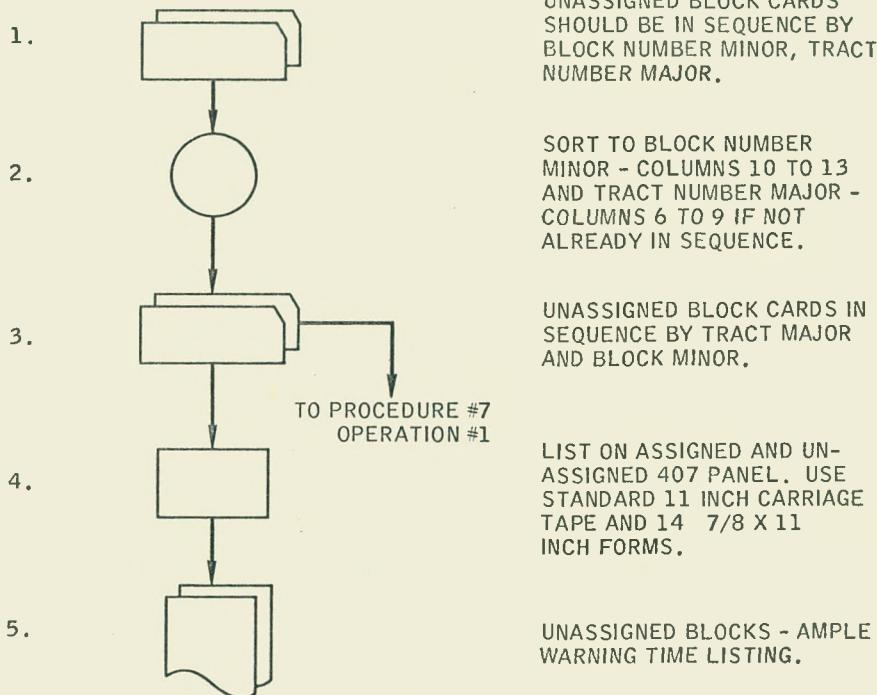


FIG. A-14 UNASSIGNED BLOCKS (ample warning time) - PROCEDURE NO. 6

UNASSIGNED BLOCKS (ONE-HOUR WARNING)

PROCEDURE NO. 7

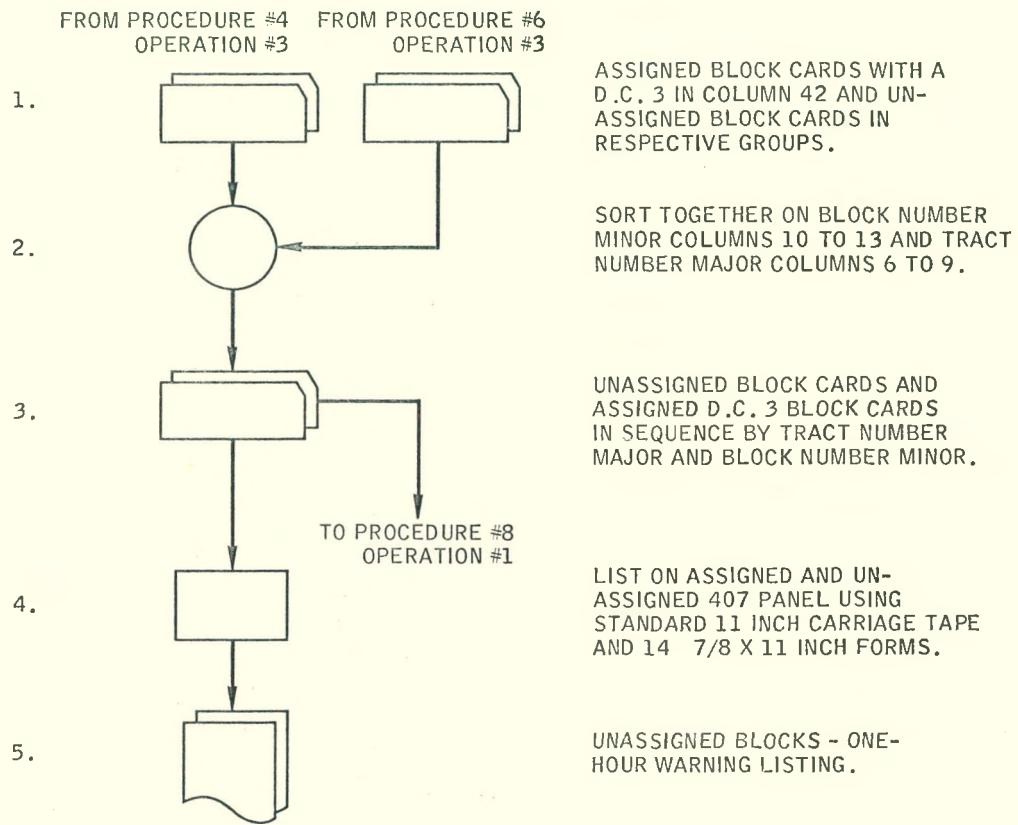


FIG. A-15 UNASSIGNED BLOCKS (one hour warning) – PROCEDURE NO. 7

UNASSIGNED BLOCKS (30 MINUTES WARNING)

PROCEDURE NO. 8

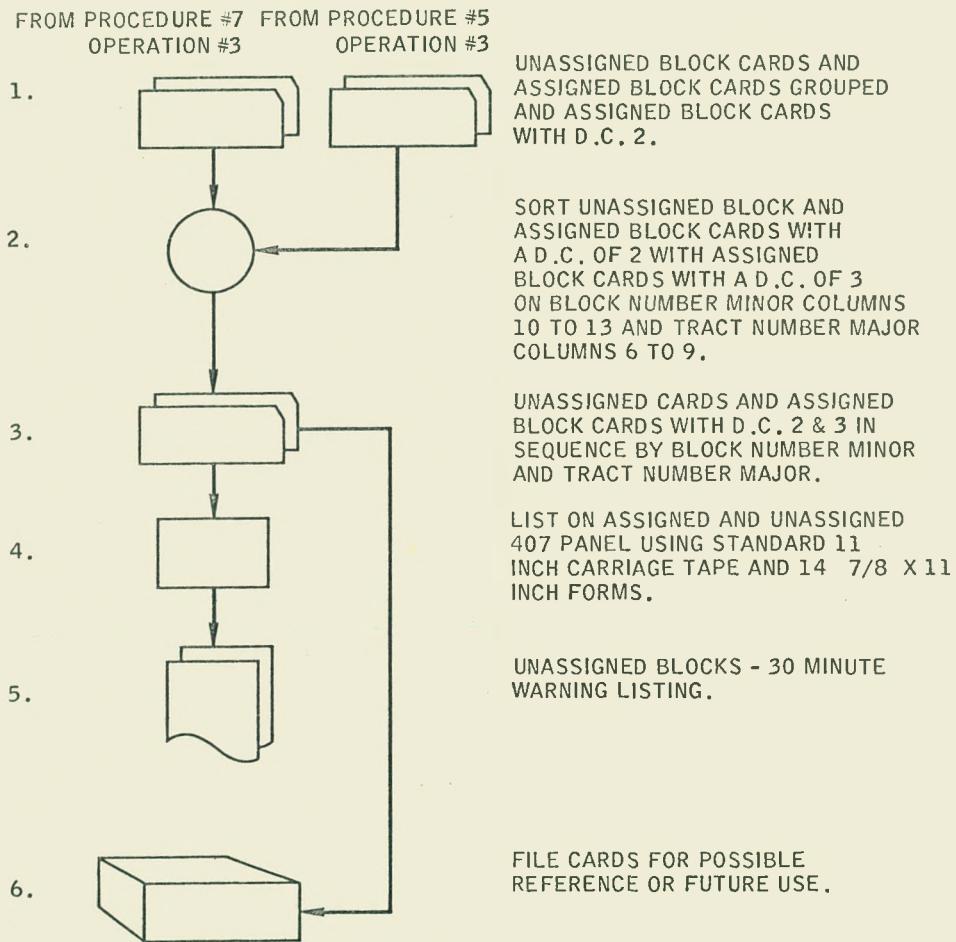


FIG. A-16 UNASSIGNED BLOCKS (30 minute warning) – PROCEDURE NO. 8

2. Ass

4. She

6. Una

8. Un

PLANNING CHART

REPORT

CONTROL PANEL SWITCHES				SPACE		CONTROL		TAPE CHANNELS (TAPE CUT ON LINE 132)						
LIST	OFF <input type="checkbox"/>	SP SW <input type="checkbox"/>	ON <input type="checkbox"/>	1 X	2	HEAD		NO	USE	LINES	NO	USE		
RO	ON <input type="checkbox"/>	SYMBOL <input type="checkbox"/>	R <input checked="" type="checkbox"/>	EX	X (1 card)	SKIP								
LCT	ON <input checked="" type="checkbox"/>	LC SK <input type="checkbox"/>	ON <input type="checkbox"/>	SUP		TR R								
SPL PRG	ON <input type="checkbox"/>	CAR <input type="checkbox"/>	ON <input type="checkbox"/>	SEL		TR PR	X							
		SP-C <input type="checkbox"/>	ON <input type="checkbox"/>	LINES	6 X 8	SP PU								
(Standard 11 inch carriage tape)														
REPORT HEADINGS				LOC. CODE	TRACT NO.	BLOCK NO.	P	SHELTER NUMBER	PF	SHELTER CAPACITY	DATE LICENSED	DATE STOCKED		
CARD COLUMNS				1 2-5	6-9	10-13	14	15-19	20-21	22-27	28-31	32-35		
EMITTED CHARACTERS				***										
PRINT ENTRY	TRANSFER	4-7 8-12 15-19 22 25-31 34-35 38-45 48-55								58-64				
	NORMAL	1/3 4-7 8-11 15-18 22 25-29 34-35 41 45-47												
	COUNTER-CONTROLLED									38-40 42-44				
ZERO PRINT CONTROL				1-11 16-22 25-29 34-35 38-47										
PRINT CONTROL				Transfer print on steps 2 and 3 of Overflow Program.								Wire all	Wire all	
PROGRAM CONTROL				min. (unassigned lists)				int. (assigned lists)		Start Overflow Program on x-80 header card		Start Ov from 12		
COUNTERS	1 MINOR	GROUP									6A			
		CONTROL									+ on a "1" in col. 1			
	2 INTER.	GROUP									6C			
		CONTROL									+ transfer from 6A			
	3 MAJOR	GROUP												
		CONTROL												
	4 FINAL	GROUP									6E			
		CONTROL									+ transfer from 6C			
	5	GROUP												
		CONTROL												
STORAGE	UNIT		A, B & C											
	CONTROL	IN	X in column 80 (11 punch) from first reading station, (header card)											
		OUT	During Overflow Program step 3 and step 2.											
SUMMARY PUNCH CARD COLUMNS														
SELECTORS	NO.	PU	NO.	PU	NO.	PU	NO.	PU	NO.	PU	NO.	PU		
	T	T	T	T	T	T	T	T	T	T				
	N	N	N	N	N	N	N	N	N	N				
	C	C	C	C	C	C	C	C	C	C				
MISCELLANEOUS Punch heading information in header card.														
CARDS USED Shelter Master Cards, Assigned Blocks, and Unassigned Blocks														

FIG. A-19 TABULATOR-PRINTER PL

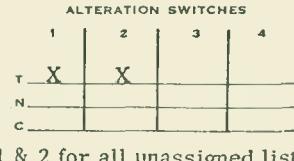
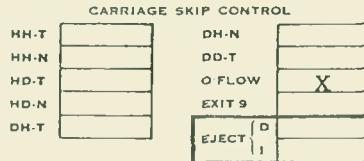


REPORT

2. Assigned and Unassigned Blocks 3. Shelter Assignments (Ample Warning Time)
 4. Shelter Assignments (One Hour Warning) 5. Shelter Assignments (30 Minute Warning)
 6. Unassigned Blocks (Ample Warning Time) 7. Unassigned Blocks (One Hour Warning)
 8. Unassigned Blocks (30 Minute Warning)

CHANNELS (TAPE CUT ON LINE 132)

LINES	NO	USE	LINES
carriage tape)			



(1 & 2 for all unassigned lists)

DATE LICENSED	DATE STOCKED	BLOCK POPULATION	DC	DATE SURVEY
28-31	32-35	36-40	41-42	43-46
	,	***	,	***
48-55	58-64	67-76	79-80	83-88
		71 75-77	79-80	84-87 88-90 97 101-105
		66-70 72-74	78-79 81-83 85-87	92-96 98-100
		67-74	79-87	93-100
				108-111
				109-111

Wire all report headings to Transfer Print Entry. Card columns - emitted info to Normal Print.
 Wire all counter exits to Counter-Controlled Print Entry.

Program	Start Overflow Program from 12 punch in carriage tape	Overflow Program (Overassigned Totals)	(Underassigned Totals)	(Block Count)
	8A	6B (debits)	6B (credits)	4A
	+ on an "N" in column 1	+ on an "N" in column 1 - on an "I" in column 1	+ on an "N" in column 1 - on an "I" in column 1	+ 1 on an "N" in column 1.
	8C	6F	6D	4B
	+ transfer from 8A	+ transfer from 6B	- transfer from 6B	+ transfer from 4A

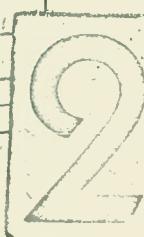
	8E	8B	8D	4C
	+ transfer from 8C	+ transfer from 6F	- transfer from 6D	+ transfer from 4B

STORAGE UNITS ASSIGNED TO 409 PUNCH

ard)

409 PUNCHED CARD COLUMNS

PU	NO.	PU	NO.	PU	NO.	PU	NO.	PU
T	T	T	T	T	T	T	T	T
N	N	N	N	N	N	N	N	N
C	C	C	C	C	C	C	C	C



ACCOUNTING MACHINES, CONTROL PANEL DIAGRAM

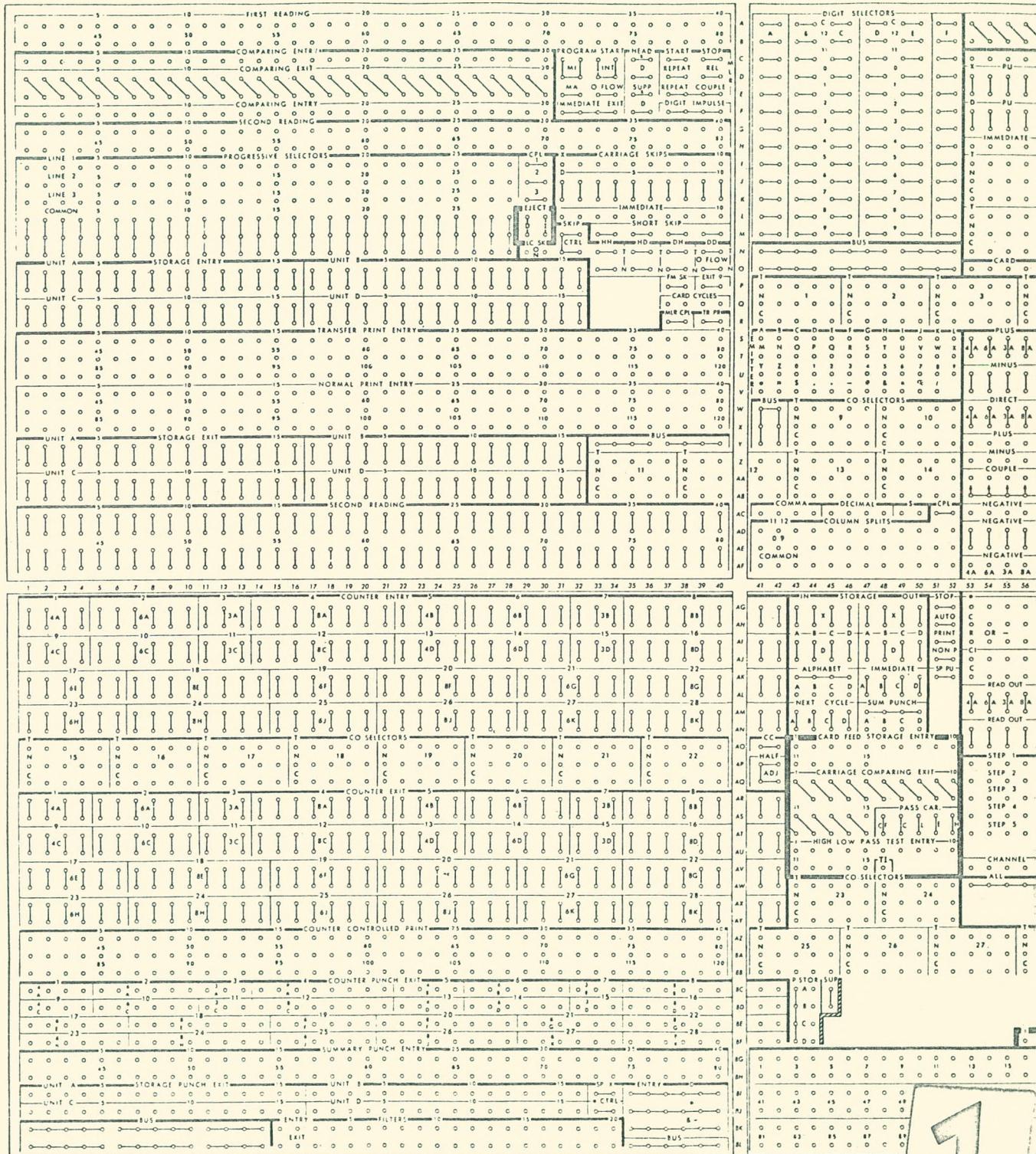
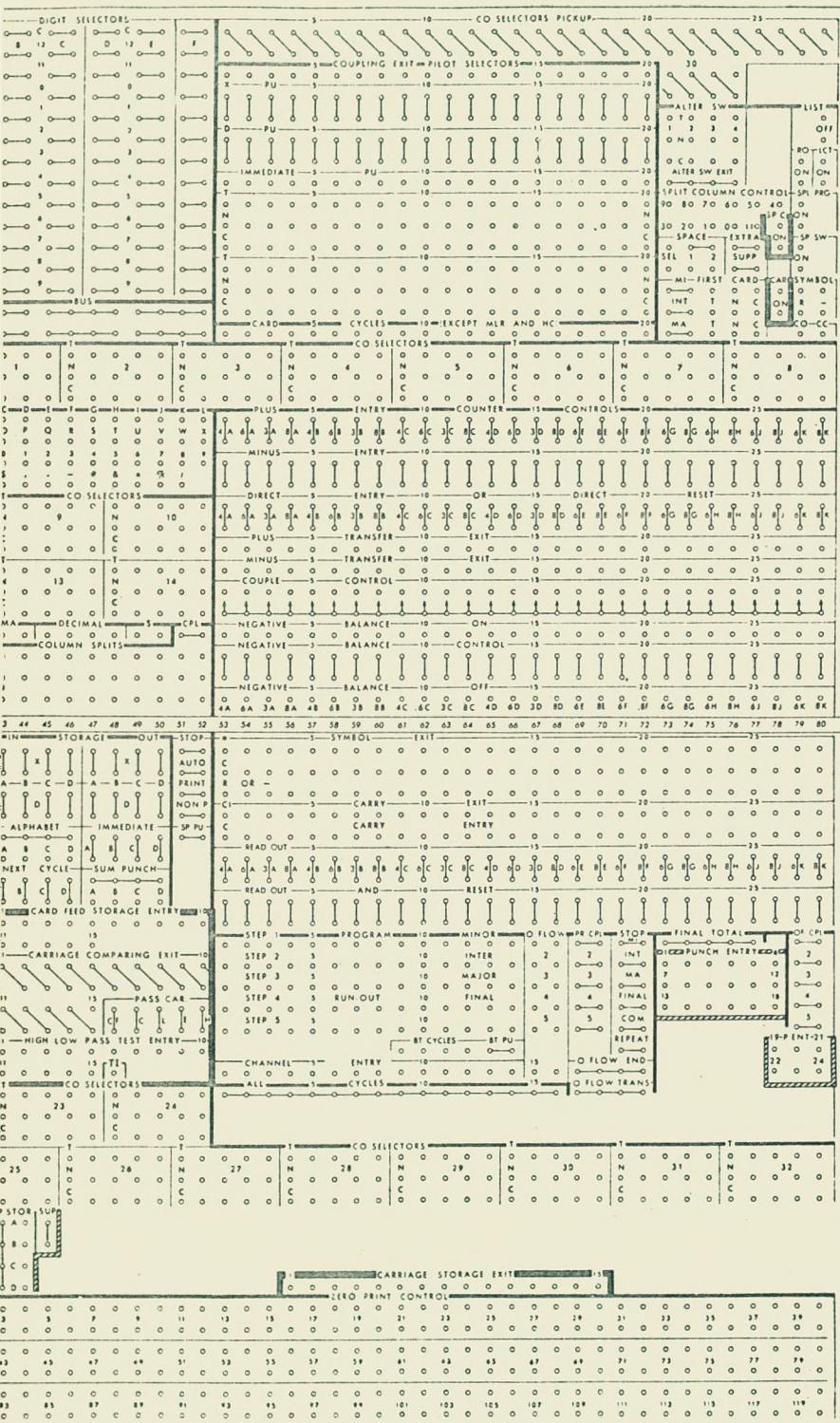


FIG. A-18 BASIC

S. CONTROL PANEL DIAGRAM

FIXED CARRIAGE CONTROL PANEL



2

REPORT

DIAGRAM NO

DATE _____

PLANNING CHART

REPORT

Repor

CONTROL PANEL				SPACE	CONTROL	TAPE CHANNELS (TAPE CUT ON LINE 132)					
SWITCHES				1	HEAD	NO	USE	LINES	NO	USE	
LIST	OFF <input type="checkbox"/>	SP SW	ON <input type="checkbox"/>	2	SKIP						
RO	ON <input type="checkbox"/>	SYMBOL	R <input type="checkbox"/>	EX	MLR						
LCT	ON <input checked="" type="checkbox"/>	LC SK	ON <input type="checkbox"/>	SUP	TR PR						
SPL PRG	ON <input type="checkbox"/>	CAR	ON <input type="checkbox"/>	SEL	SP PU						
		SP-C	ON <input type="checkbox"/>	LINES	6 X 8						

(use standard 11 inch carriage tape)

REPORT HEADINGS		LOC. CODE	TRACT NO.	BLOCK NO.	P	SHELTER	PF	R	NAME AND ADDRESS OF SHEL			
		1	2-5	6-9	10-13	14	15-19	20-21	22	23-80		
EMITTED CHARACTERS												
PRINT ENTRY	TRANSFER	4-7	8-12	16-20	25	29-35	39-40	44	48-74			
	NORMAL	1	4-7	8-11	16-19	25	30-34	39-40	44	48-105		
	COUNTER-CONTROLLED											
ZERO PRINT CONTROL		1-11	16-25			30-44			48-105			
PRINT CONTROL		Transfer Print on steps 2 and 3 during Overflow Program.										
PROGRAM CONTROL		Start an Overflow Program with an X-80 header card and on a 12 in tape/										
COUNTERS	1	MINOR	GROUP									
			CONTROL									
	2	INTER.	GROUP									
			CONTROL									
	3	MAJOR	GROUP									
			CONTROL									
4	FINAL	GROUP										
		CONTROL										
5		GROUP										
		CONTROL										
STORAGE	UNIT		A, B & C									
	CONTROL	IN	X in column 80 (11 punch) from first reading station.									
		OUT	on step 2 and step 3 of Overflow Program.									
SUMMARY PUNCH CARD COLUMNS												
SELECTORS	NO.	PU	NO.	PU	NO.	PU	NO.	PU	NO.	PU	NO.	PU
	T	T	T	T	T	T	T	T	T	T		
	N	N	N	N	N	N	N	N	N	N		
	C	C	C	C	C	C	C	C	C	C		
MISCELLANEOUS Punch heading information in header card.												
CARDS USED Name and Address Master Cards Only.												

FIG. A-17 TABULATOR-PRINTER

1

Report No. 1 - Name And Address Listing

APPEAL CUT ON LINE 132

NO	USE	LINES

CARRIAGE
HH-T
HH-N
HD-T
HD-N
DH-T

E SKIP CONTROL
DH-N
DD-T
O-FLOW
EXIT 9
EJECT D
I

TOGGLE SWITCHES	ON
ERTED	<input type="checkbox"/>
AL TOTAL	<input checked="" type="checkbox"/>
M STOP	<input checked="" type="checkbox"/>
ET CHECK	<input checked="" type="checkbox"/>

PRESS OF SHELTER

108-111
108-111

ape/ (Shelter Count)

4A

+ 1 on a "2" in column 1.

STORAGE UNITS ASSIGNED TO 409 PUNCH

409 PUNCHED CARD COLUMNS

NO.	PU								
T	T	T		T		T		T	
N	N	N		N		N		N	
C	C	C		C		C		C	

INSTRUCTIONS FOR WIRING COLLATOR PANEL
REQUIRED IN PROCEDURE NO. 3
(077 - 085 - 087 - 089 Type)

1. Shelter Master cards should be in sequence by Tract No. - Major
Shelter No. - Minor
2. Assigned Block cards should be in sequence by Shelter No. - Major
PF Code - Intermediate
Block No. - Minor
3. Wire panel as follows:
All basic setup switches wired on.
Secondary Read columns 15-19 to Secondary Selector Entries 1-5.
Primary Read columns 15-19 to Primary Selector Entries 1-5.
Primary Sequence Read columns 15-19 to Primary Sequence Entries 1-5.
Wire Primary Selector Entries 1-5 to Primary Sequence Selector Entries 1-5.
Wire Low Primary Sequence to Error Stop.
Wire Low Secondary to Pocket 3 Select.
Wire Low Primary to Pocket 1 Select.
4. Place Shelter Masters - one tract at a time - in the Primary Feed.
5. Place all Assigned Block cards in the Secondary Feed.
6. After each run is complete place the cards in Pocket 2 - keeping them in sequence - in a tray ready to be listed.
7. The cards in Pocket 3 will then go back in the Secondary Feed to be matched against the next group of Shelter Masters, ie Tract No. 0002.
8. There should be no cards in Pocket 2. (if so that means there is a Shelter Master with no Block cards assigned to that shelter)
9. Repeat this operation until last group of Shelter Masters is matched out with remaining Assigned Block cards. (listing can now be run)

FIG. A-20 INSTRUCTIONS FOR WIRING COLLATOR PANEL – PROCEDURE NO. 3

6. Time Analyses by Operation

A total of approximately 63 man-hours were required to process the cards and operate the data processing equipment in order to produce the Shelter Name and Address Listing report plus the seven reports describing the nighttime assignment. These eight reports (or procedures) along with the times required are itemized in Fig. A-21. The hours recorded included some experimental work necessary in order to work out the "bugs" that was not repeated in the daytime assignment reports. For example, the 40 hours recorded under Procedure 2 for key punching and verifying the 2700 nighttime block detail cards were reduced to 27 hours for key punching and verifying the same number of daytime block detail cards. Procedures 3 through 8 required about the same number of hours for both the nighttime and daytime assignments.

7. Cost Analyses

Approximately \$900 was required per order to contract the data-processing portion of producing fourteen reports pertaining to shelter assignment in Lincoln, Nebraska (see Fig. A-22). The \$900 cost was broken down as follows:

- (1) \$450 for providing eight (8) nighttime reports including the Shelter Name and Address list.
- (2) \$329 for completing seven (7) daytime reports.
- (3) \$122 for wiring the Printer Control Panels.

As shown in Figure A-22, a considerable reduction in cost occurred for producing the daytime reports 2 and 3 as compared to the nighttime reports 2 and 3. It is noted that the combined costs of producing these reports was \$275 for the nighttime as compared to \$194 for the daytime. As mentioned in Sec. 6 above, these reductions were realized in the daytime reports as a result of procedure refinements discovered in producing the nighttime reports.

The data-processing costs itemized in Fig. A-22 are characteristic of those costs that could be expected in key punching and processing Shelter Assignment cards for a city of about 129,000 resident population,

similar to Lincoln, Nebraska. Lincoln contains about 2700 Census Blocks and 180 shelters (pf Category of 2 or greater) located in 147 separate buildings.

In all, a total of about 5800 cards were key punched and processed.

Stanford Research Institute - Civil Defense

TIME ANALYSIS BY OPERATION

1.	Procedure No. 1 - <u>Name and Address Listing</u>	
A.	Keypunch and Verify: Approximately 200 Shelter Name and Address Cards	5.0 Hours
B.	Sorting	.3 Hours
C.	Listing *Set-Up .1 Running <u>.3</u>	<u>.4 Hours</u> 5.7 Hours
2.	Procedure No. 2 - <u>Assigned and Unassigned Blocks</u>	
A.	Keypunch and Verify: Approximately 2000 Assigned Cards 700 Unassigned	40.0 Hours
B.	Sorting	.8 Hours
C.	Listing *Set-Up .1 Running <u>1.0</u>	<u>1.1 Hours</u> 41.9 Hours
3.	Procedure No. 3 - <u>Shelter Assignments</u> (Ample Warning Time)	
A.	Keypunch and Verify Shelter Masters: Approximately 200 cards	5.0 Hours
B.	Sorting Collating Listing *Set-Up .1 Running <u>1.0</u>	1.5 Hours 2.5 Hours <u>1.1 Hours</u> 10.1 Hours

*Using Wired Control Panel

FIG. A-21 TIME ANALYSIS BY OPERATION

4.	Procedure No. 4 - <u>Shelter Assignment</u> (One hour Warning)	
A.	Sorting	.3 Hours
B.	Listing	
	*Set-Up .1	
	Running .8	.9 Hours
		1.2 Hours
5.	Procedure No. 5 - <u>Shelter Assignment</u> (30 Minute Warning)	
A.	Sorting	.2 Hours
B.	Listing	
	*Set-Up .1	
	Running .8	.9 Hours
		1.1 Hours
6.	Procedure No. 6 - <u>Unassigned Blocks</u> (Ample Warning Time)	
A.	Sorting	.5 Hours
B.	Listing	
	*Set-Up .1	
	Running .4	.5 Hours
		1.0 Hours
7.	Procedure No. 7 - <u>Unassigned Blocks</u> (One Hour Warning)	
A.	Sorting	.5 Hours
B.	Listing	
	*Set-Up .1	
	Running .5	.6 Hours
		1.1 Hours
8.	Procedure No. 8 - <u>Unassigned Blocks</u> (30 Minute Warning)	
A.	Sorting	.5 Hours
B.	Listing	
	*Set-Up .1	
	Running .5	.6 Hours
		1.1 Hours

Allow approximately five hours handling time (clerical).

*Using Wired Control Panel

FIG. A-21 continued

DATA PROCESSING COSTS
SHELTER ASSIGNMENT REPORTS
LINCOLN, NEBRASKA

COST ANALYSIS

	<u>Night Assignment</u>	<u>Day Assignment</u>
A. Report 1 Name and Address Listing	\$ 40.00	\$ _____
B. Report 2 Assigned and Unassigned Blocks	200.00	139.00
C. Report 3 Shelter Assignments (Ample Warning)	75.00	55.00
D. Report 4 Shelter Assignments (One Hour Warning)	25.00	25.00
E. Report 5 Shelter Assignments (30 Minute Warning)	22.00	22.00
F. Report 6 Unassigned Blocks (Ample Warning)	20.00	20.00
G. Report 7 Unassigned Blocks (One Hour Warning)	20.00	20.00
H. Report 8 Unassigned Blocks (30 Minute Warning)	<u>22.00</u> <u>\$424.00</u>	<u>22.00</u> <u>\$303.00</u>
Supplies: Cards & Paper	<u>26.00</u>	<u>26.00</u>
Night	\$450.00	\$329.00
Day	329.00	
Wiring two panel boards	<u>122.00</u> <u>\$901.00</u>	

FIG. A-22 COST ANALYSIS

UNCLASSIFIED

UNCLASSIFIED

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RESEARCH
INSTITUTE

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