AD-A048 211 WHEELER INDUSTRIES INC WASHINGTON D C F/G 13/10
DESIGN CRITERIA FOR MEDICAL AND DENTAL SUITES IN CRUISERS AND M--ETC(U)
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DESIGN CRITERIA FOR MEDICAL AND DENTAL SUITES

CRUISERS AND MEDIUM-SIZED AUXILIARIES

NOVEMBER 1977

Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: None

2. GOVT ACCESSION NO.

3. RECIPIENT'S CATALOG NUMBER

4. TITLE (and Subtitle): Design Criteria for Medical and Dental Suites in Cruisers and Medium-Sized Auxiliaries.

5. TYPE OF REPORT & PERIOD COVERED: Technical Report for Period August - November 1977

6. PERFORMING ORG. REPORT NUMBER: None

7. AUTHOR(s): Francis B. Merkle

8. CONTRACT OR GRANT NUMBER(s): N00014-74-C-0404 Modification P00003

9. PERFORMING ORGANIZATION NAME AND ADDRESS: Wheeler Industries, Inc. 1120 19th Street, N.W. Washington, D.C. 20036

10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: 62758N, MF 51.524.021 NR207-019/10-29-76(444)

11. CONTROLLING OFFICE NAME AND ADDRESS: Bureau of Medicine and Surgery (Code 52) Office of Naval Research (Code 444) Washington, D.C.

12. REPORT DATE: November 1977

13. NUMBER OF PAGES: 22

14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office): Same

15. SECURITY CLASS. (of this report): Unclassified

15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public use; distribution unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

Same

18. SUPPLEMENTARY NOTES

None

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Design Criteria
Medical and Dental Suites

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This document presents, The Design Criteria for Medical and Dental Suites in Cruisers and Medium-Sized Auxiliaries, November 1977, present in drawings and text, the functional design requirements of the Bureau of Medicine and Surgery for medical/dental suites in those types of ships. These suites are based upon design criteria which have been developed earlier for discrete types of dental and medical spaces, and are intended to combine appropriate numbers and types of such spaces into an optimal arrangement. → (cont over)

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Unclassified

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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This technical report takes into account the existing equipment limitations and shipboard constraints. Using the present state-of-the-art as a baseline, an outline of an R&D program will be developed. Accomplishment of this program is expected to reduce or to eliminate, in future ships, the effects of the existing equipment limitations and shipboard constraints. The R&D program will be developed as the design criteria are worked out and will be incorporated in the final report.

Additionally, these design criteria are intended to assist the Naval Sea Systems Command in designing and building shipboard medical/dental suites which will most efficiently and economically accomplish their purpose. They embody arrangements of modern types of equipment design and, at the same time, require a minimum of space. It is expected that they will provide a rational basis for the usual structural and arrangement drawings.

DESIGN CRITERIA
FOR
MEDICAL AND DENTAL SUITES IN
CRUISERS AND MEDIUM-SIZED AUXILIARIES

Sponsored by
Office of Naval Research (Code 444)
and
Bureau of Medicine and Surgery (Code 52)
under
ONR Contract No. N00014-74-C-0404, Modification P00003
Project No. 207-019/10-29-76 (444)

November 1977

TABLE OF CONTENTS

LIST OF FIGURES

PROJECT DESCRIPTION

Design criteria for four representative types of shipboard Medical and Dental Suites are being developed under Contract No. N00014-74-C 0404, Modification P00003. The work is being done in four increments, as indicated below:

1. Amphibious Assault Ships
2. Aircraft Carriers and Large Auxiliaries
3. Cruisers and Medium-sized Auxiliaries
4. Frigates and Destroyers

These design criteria are intended to provide the optimal functional configuration for each representative type of suite, giving due weight to the current equipment limitations and the existing shipboard constraints. Using these design criteria, and those developed under earlier contracts and modifications, as a baseline, an outline for a related corrective R&D program will be developed. Future accomplishment of this program will reduce or eliminate the effects of the existing shipboard constraints and equipment shortcomings detected during the development of the design criteria.

The framework for the R&D program will be developed as work progresses and will be presented as an attachment to the final report.

The design criteria for medical/dental suites being developed under the current modification will be based upon design criteria for discrete types of dental and medical spaces which were developed under earlier contracts and modifications.

DESIGN CRITERIA
FOR
MEDICAL AND DENTAL SUITES IN
CRUISERS AND MEDIUM-SIZED AUXILIARIES

November 1977

DESIGN CRITERIA FOR MEDICAL AND DENTAL SUITES IN CRUISERS AND MEDIUM-SIZED AUXILIARIES

I. GENERAL CONSIDERATIONS

These design criteria are intended by the Bureau of Medicine and Surgery to assist the Naval Sea Systems Command in designing and building medical/dental suites for future cruisers and medium-sized auxiliaries. It is expected that they will provide a rational basis for the usual structural and arrangement drawings; however, they are not intended to be working drawings. There is no intention to abridge good design and shipbuilding practice.

The objective is to provide an optimal arrangement of the types and numbers of medical and dental spaces which are required to support the assumed medical/dental missions of these types of ships. The types and numbers of spaces included are derived from a consideration of the operational capabilities necessary to support the assumed missions.

Adherence to the general arrangement shown is highly important if the objective is to be attained. It is realized that structural constraints encountered during the development of a specific design may require some deviations from general arrangement shown, but such deviations should be kept to a minimum.

The spaces and items included are confined to those that are peculiar to the medical/dental requirements. There is no attempt to include features routinely included such as access hatches, fan rooms, ventilation ducts, etc. The locations and sizes of such items are affected by several constraints, such as the designs of the decks above and below the deck on which the medical/dental suite is situated. To the maximum extent feasible such features should be arranged to avoid interference with the medical/dental functions.

II. SPECIFIC CRITERIA

Populations Served

Design criteria have been developed for the medical/dental complexes for large cruisers and medium-sized auxiliaries, and for the medical complex for small cruisers, which under current policy are not equipped with dental facilities. A figure of 600 total accommodations has been taken as the lower line of demarcation for the large cruisers and medium-sized auxiliaries, and an upper limit of 1,300 accommodations has been assumed for these categories. Small cruisers, by definition, are those having between 500 and 600 total accommodations. It is current policy not to provide dental facilities in ships having fewer than 600 total accommodations.

The manning levels affect the numbers of beds and berths in the wards and the sizes of the medical storerooms. The latter spaces are sized to accommodate the authorized medical allowance list material.

Operational Requirements

In the case of the large cruisers and medium-sized auxiliaries, a basic assumption has been made that the ships are to be capable of functioning in two modes, as follows:

a. In the noncombat mode, to provide the best feasible medical and dental facilities for the treatment of all embarked personnel.

b. In the combat mode, to provide the best feasible medical and dental facilities for the treatment and care of battle casualties occurring within the ship or its aircraft.

If the auxiliary is a tender, the facilities installed should provide for the personnel of ships alongside.

In the case of the small cruisers, a basic assumption has been made that the ships are to be capable of functioning in the following two modes:

a. In the noncombat mode, to provide the best feasible medical facilities for the treatment of all embarked personnel.

b. In the combat mode, to provide the best feasible medical facilities for the treatment and care of battle casualties occurring within the ship or its aircraft.

In addition, both types of ships might be called upon to provide medical assistance in the event of a major catastrophe ashore, such as an earthquake. Another possible demand might be to assist in the evacuation of refugees.

Finally, both cruisers and auxiliaries may be subject to attack by such modern weapons as heat-seeking missiles from over the horizon, and may expect heavy casualties from such attacks.

The foregoing considerations emphasize the importance of providing the best feasible medical and dental capabilities consistent with the space limitations of the ships.

Component Spaces

A first step in determining the types and numbers of space required involves a consideration of the desired medical/dental operational capabilities. This is a basic process which applies to the development of design criteria for the medical/dental suite of any type of ship. General information with respect to operational capabilities may be found in OPNAV Instruction C3501.2E. In this particular case, two lists of spaces have been developed, and are shown in Figures 1 and 2. Figure 1 lists the medical spaces, and Figure 2 concerns the dental spaces. In most cases, design criteria for the discrete types of spaces have already been developed, and are identified in the lists by the date when they were issued.

On the basis of the types and numbers of spaces which have been selected, four drawings have been developed and are shown in Figures 3, 4, 5 and 6. Figure 3, the "Medical/Dental Suite Arrangement for Large Cruisers and Medium-Sized Auxiliaries, Scheme A", shows the preferred general arrangement for those types of ships. An alternative arrangement, Scheme B, having a broader, shorter configuration, has been developed for use in designs where the fore-

DATE OF DESIGN CRITERIA	MEDICAL SPACES	NUMBER OF SPACES	
		Lge. Cruisers & Auxiliaries	Small Cruisers
9/75	Bacteriological Laboratory & Pharmacy (Combined)	1	1
10/74	Battle Dressing Station (Auxiliary)	2	2
11/76	Medical Department Office (Limited)	1	1
4/76	Medical Office and Consultation Room (Minor Operating Room)	1	1
10/74	Operating Room	1	-
9/75	Quiet Room	1	-
11/76	Quiet Room Bath	1	-
3/75	Sterilizing Room and Scrub Room	1	1
3/75	Storeroom, Medical (Main)	1	1
3/75	Storeroom, Medical (Ready Issue & Linen Issue)	1	1
11/75	Surgical Dressing Room/Main B.D.S. (Auxiliary Operating Room)	1	1
8/76	Surgical Machinery Room	1	1
9/75	Utility Room	1	1
12/74	Ward	1	1
11/76	Ward Bathroom & Physiotherapy Room	1	1
-	Washroom and Water Closet	1 or 2	1
12/74	X-Ray Darkroom	1	1
12/74	X-Ray Room	1	-

Figure 1

DATE OF DESIGN CRITERIA	DENTAL SPACES	NUMBER OF SPACES
6/74	Dental Administrative Office and Consultation Room	1
2/73	Dental Apparatus Room	1
9/71	Dental Operating Room (General)	1
9/71	Dental Operating Room (Preventive Dentistry and Oral Hygiene)	1
2/73	Dental Prosthetic Laboratory (Limited)	1
5/73	Dental Storeroom and Linen Issue Room	1
5/73	Dental X-ray Darkroom (Compact)	1
5/73	Dental X-ray Exposure Room (Compact)	1

Figure 2

and-aft dimension must be limited, but a greater athwartships dimension can be tolerated. This arrangement is shown as Figure 4. Figure 5 is the arrangement of the medical suite for small cruisers. No dental facilities are provided for this type of ship, as current policy restricts dental capabilities to ships having total accommodations of 600 or more. In Figure 6, the detached related spaces, such as the Auxiliary Battle Dressing Stations, are shown.

For convenience in use, Figures 3,4,5, and 6 are grouped together at the end of the text.

No Overflow Ward has been shown in any of the aforementioned drawings. However, it is highly desirable to locate a berthing space near the Ward, in order that some additional ward space may be readily available for use in the event that mass casualties occur.

Likewise, no Casualty Receiving Space has been included in the design. However, it is very desirable to provide a messing or lounge area near the medical complex. Such a messing space or lounge can be used for the reception of casualties when functioning in the combat mode.

Arrangement Principles

As mentioned earlier, the basic assumption has been made that the ships are to be capable of operating in two modes, namely, the noncombat, and the combat mode. The combat mode can be construed to include operations undertaken as the result of serious shipboard catastrophes or natural disasters ashore. Each mode imposes a different set of conflicting demands upon the Medical and Dental Departments, and each exercises an influence on the layout. Overall, there are constraints arising from the fact that a ship is long and relatively narrow, and the need to conserve space without jeopardizing the capability of the medical/dental complex to perform efficiently.

In the arrangements which have been developed, priority is given to the requirements of the combat mode, which are more demanding than those of

the noncombat mode. In the former case, the facility is functioning as an emergency medical/dental facility, and time is of the essence in handling casualties, when life and limb are at stake.

In the combat mode, it is assumed that the casualties from outside the ship will generally arrive by helicopter at the Helicopter Platform. Preliminary triage would be performed there, and any required emergency treatment would be initiated, after which the casualties would be moved as quickly as possible by the best available route to the medical complex. If a messing space or lounge is available to serve as a casualty receiving space, the wounded would be brought to that area for triage and resuscitative and stabilizing measures before being routed onward to the X-ray Room, the Operating Room, or the Surgical Dressing Room, as the case might be. In the small cruisers, in which no X-ray room is provided, recourse should be had to a mobile X-ray machine, and the surgical dressing room will function as an operating room.

Mass casualties from within the ship should be brought to the medical complex by the best available routes, possibly after emergency treatment at one of the Auxiliary Battle Dressing Stations. If a lounge or messing space is available to serve as a casualty receiving area, the injured should be brought to that space for triage and onward routing.

In the case of the large cruisers and medium-sized auxiliaries, the dental facility is immediately adjacent to the medical spaces. In the combat mode this arrangement will permit maximum use to be made of the dental spaces and personnel for assistance in treating mass casualties.

Although emphasis has been placed upon the importance of the combat mode, in which mass casualties are to be handled, the requirements of the noncombat mode have not been ignored, and the arrangements developed have been compromises intended to give due weight to the needs of the noncombat mode. The medical spaces have been so arranged as to provide traffic patterns during sick call that are short and direct, e.g., the combined

bacteriological laboratory and pharmacy is adjacent to, or near, the surgical dressing room.

In the dental quarters, the general dental operating room and the dental operating room for preventive dentistry and oral hygiene are immediately adjacent, and are connected with each other. The interconnection promotes the efficient use of personnel. Both are very close to the dental administrative office and consultation room.

Ward Capacities

The numbers of Quiet Rooms and the number of beds and berths in the Wards and Quiet Rooms should be based upon the total number of accommodations in the ships. The General Specifications for Ships of the United States Navy require ward capacities of two percent of the accommodations for tenders and ships having a casualty evacuation capability, and one percent for other types. The size of the ward shown is intended to be representative but can be adjusted for the total number of accommodations in any given case.

Location in the Ship

Ideally, the Medical/Dental Suite should be so located in the ship that the Operating Room and Surgical Dressing Room are near the midships section and near the fore-and-aft center line, so as to minimize the effects of the ship's motion. It is particularly important to avoid location near the stern, in order to minimize the vibratory effects of the propellers. Another guiding principle should be the provision of good access from the helicopter platform for casualties from outside the ship and by internal routes for casualties originating within the ship. Likewise, good accessibility is necessary in order to discharge efficiently the responsibility for providing day-to-day health care.

Operating Room Complex

The Surgical Dressing Room is intended to function as an auxiliary operating room and main battle dressing station in the handling of mass casualties. As such it forms part of the operating room complex.

In the combat mode, the operating rooms will probably be the bottleneck in the flow of casualties. Accordingly, the operating room complex in the large cruisers and the medium-sized auxiliaries should afford the best feasible traffic pattern through the X-ray Room to the Operating Room (dedicated or auxiliary) to the Ward. Arrangement of the operating rooms as a pair offers space saving and permits supervision of two operating rooms by one senior surgeon, with the attendant saving in personnel.

The Operating Room, the Surgical Dressing Room, and the Ward are to have surgical suction piped in. Accordingly, it will be necessary to provide a Surgical Machinery Room, as indicated in Figure 6.

The combined Sterilizing Room and Scrub Room serves both the Surgical Dressing Room and the Operating Room and requires a minimum of space. Although a space which combines these two functions is not the ideal solution because of the possibility of cross-contamination, it is used here to save space.

In the case of the small cruisers, there is no dedicated operating room and no X-ray room. However, the Surgical Dressing Room and the Ward should have piped-in surgical suction from a detached source.

Storerooms

A dental storeroom has been included within the boundary of the Medical/Dental Suite, as it is small. However, the medical storerooms are larger, and only a Ready Issue Store room has been included within the suite itself; the Main Medical Storeroom will probably have to be located in the section of the ship devoted to storage. All storerooms must be so located that suitable temperatures can be provided, in order to preserve the shelf life of drugs and other temperature-sensitive stores. In addition, they should be readily accessible from the Medical/Dental Suites.

No space has been earmarked for the stowage of the intact Surgical Block(s), as it is assumed that provision for such supplies can be made in the general stores area of the ship, if a Surgical Block is provided.

Current policy is to require that the storerooms be sized to contain the net volume of the material in the authorized medical allowance list (AMAL), when it is boxed for shipment.

Some representative space requirements for medical allowance list material for ships in the range of 500 to 1,000 total accommodations are as follows:

Type	AMAL No.	Approx. Net Vol. (ft^3)	Approx. Net Vol. (m^3)
LPD	793	1,480	41.9
LSD	753	535	15.1
CGN9	871	933	26.4
CGN 38	870	644	18.2

The volumes of the storerooms required to receive any particular AMAL will depend upon the widths of the aisles, the assumed density of loading, and other factors.

For the purpose of these design criteria, AMAL 793 has been used as representative of large cruisers and medium-sized auxiliaries, and AMAL 870 as representative of small cruisers. In each case, a Ready Issue Storeroom and Linen Issue Storeroom has been provided in the Medical Suite, and a Main Medical Storeroom has been provided outside the Medical Suite. The Linen Issue Room has been combined with the Ready Issue Storeroom to conserve space.

A blood bank refrigerator is to be provided in one of the medical storerooms of the large cruisers and medium-sized auxiliaries.

The Main Medical Storerooms are included in Figure 6, "Detached Related Spaces", in order to show their approximate size. No particular orientation or location is implied.

In the dental facility, the dental storeroom and linen issue room have been combined in order to save space.

Dispersion of Spaces

The Main Medical Storeroom and the Ready Issue Storeroom should be well separated from each other, in order to prevent the loss of both storerooms from the same major fire or weapon impact. The same considerations apply to the Auxiliary Battle Dressing Stations, which must be well separated from each other and from the Main Battle Dressing Station (Surgical Dressing Room.) Normally, one Auxiliary Battle Dressing Station should be forward, and one aft. They should be so located as to be readily accessible to large concentrations of personnel.

Personnel Considerations

Full exploitation of the medical and dental capabilities of the facilities envisioned by these design criteria requires a substantial medical and dental staff for routine operations.

As mentioned earlier, operation in the combat mode imposes a heavier medical and dental personnel requirement than does the noncombat mode. Because the ships are combatants, they may have to function in the combat mode. In the absence of a Surgical Team the ship's personnel will have to provide the medical and dental support required to handle casualties inflicted by enemy action or major shipboard catastrophes. Under such circumstances the Battle Dressing Stations assume a major importance and impose a personnel requirement not mentioned heretofore. The design criteria for the latter type of space provide a facility that is intended to be capable of resuscitation, stabilization, treatment, and minor surgery, and in an emergency, of major surgery.

The foregoing considerations indicate three major requirements:

a. The availability of adequate numbers of personnel in the ship's Medical and Dental Departments.

b. The availability of required skills in these personnel.

c. A plan for cross-utilization of personnel of the ship's Medical and Dental Departments.

Adherence to these principles will be necessary if the full capabilities of the facilities are to be realized. In the absence of such conditions, there will be pressure to "make do" by such expedients as using other categories of personnel, e.g., yeomen or storekeepers, to augment the medical and dental personnel. Such expedients have been tried in the past and have generally not been successful, usually as the result of lack of training, dedication, or availability of the substitute personnel.

While these types of ships may not normally be considered to have casualty receiving responsibilities, it is conceivable that, in some circumstances, a Surgical Team might be embarked in the large cruisers or medium-sized auxiliaries. In that event, it will be necessary to provide accommodations for such personnel, who may be a substantial increase over the personnel normally assigned. The personnel can be flown aboard, but the accommodations cannot be.

Multifunctional Spaces

In the interest of saving space, a number of rooms have been assigned two functions. Such combined spaces include the following:

1. Ward Bath and Physiotherapy Room (includes Sitz bath and arm and leg whirlpools)
2. Quiet Room (serves as an Isolation Ward)
3. Bacteriological Laboratory and Pharmacy (Combined)
4. Sterilizing Room and Scrub Room
5. Ready Issue Storeroom and Linen Issue Room
6. Dental Storeroom and Linen Issue Room
7. Dental Administration Office and Consultation Room

In general a combined space does not afford the ideal arrangement, but is used because of space limitations.

Modifications of Design Criteria

The application to specific types of ships of the generalized design criteria for discrete spaces which were developed earlier has required some modifications to the design criteria for certain spaces. In addition to the

combining process mentioned earlier, a number of spaces, such as the X-ray Room, have been reduced in size. The Surgical Dressing Room has been rearranged to mate with the Sterilizing Room and Scrub Room. Several spaces have different configurations in Scheme A and Scheme B, in order to conform to differences in the overall arrangement. In the Dental Operating Room (Preventive Dentistry and Oral Hygiene) only three cubicles are provided in the instruction area, instead of six. However, the generalized design criteria should be considered as guides for the functions and types of equipment required.

III. DRAWING NOTES

The arrangement sketches are assemblies of various discrete types of spaces for which design criteria have already been developed. Although the original size and arrangement of each space was intended to be generally usable, there were a few cases in which modifications were required to adapt the spaces to a particular layout. Typical cases are mentioned earlier under "Modifications of Design Criteria."

It is infeasible in generalized layouts, such as these, to include such features as access hatches, ventilation ducts, fan rooms, etc., because they are so greatly influenced by the arrangements of the decks above and below. Accordingly, no attempt has been made to include them, but it is realized that their inclusion will necessarily influence the working plans. The same is true for such features as structural bulkheads. For these reasons, no attempt has been made to fair the fore-and-aft boundaries of the arrangement sketches, which present a stepped appearance.

Dimensions have not been indicated on the sketches, in order to avoid clutter. In general, the dimensions of the various spaces can be derived from the separate design criteria for the spaces.

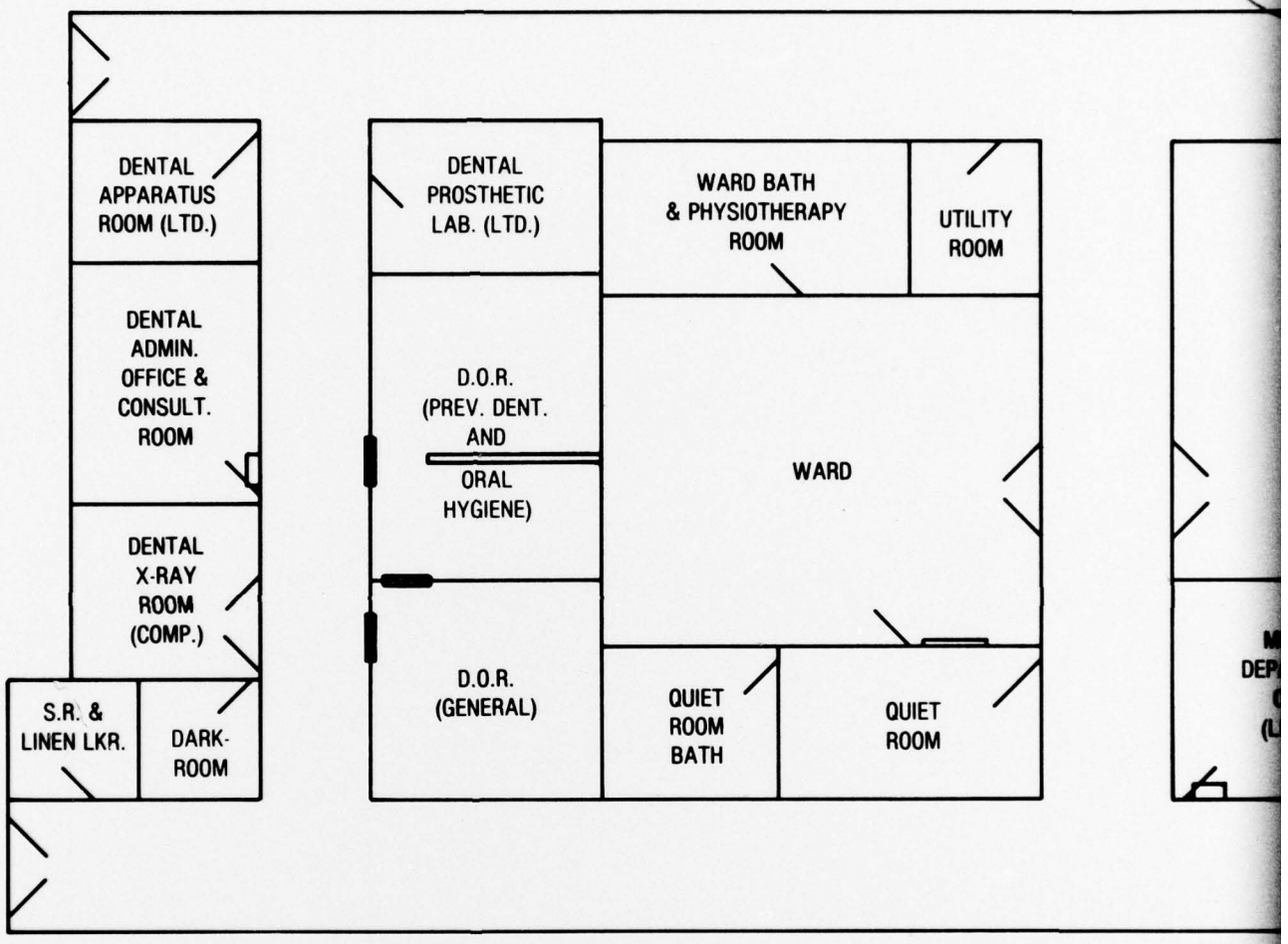
Conversion of dimensions between the U.S. Customary Units and the International System of Units (SI), commonly called the Metric System, may be made by reference to the following table.

INCH-MILLIMETER EQUIVALENTS

in.	0	1	2	3	4	5	6	7	8	9
					mm					
0		25.4	50.8	76.2	101.6	127.0	152.4	177.8	203.2	228.6
10	254.0	279.4	304.8	330.2	355.6	381.0	406.4	431.8	457.2	482.6
20	508.0	533.4	558.8	584.2	609.6	635.0	660.4	685.8	711.2	736.6
30	762.0	787.4	812.8	838.2	863.6	889.0	914.4	939.8	965.2	990.6
40	1016.0	1041.4	1066.8	1092.2	1117.6	1143.0	1168.4	1193.8	1219.2	1244.6
50	1270.0	1295.4	1320.8	1346.2	1371.6	1397.0	1422.4	1447.8	1473.2	1498.6
60	1524.0	1549.4	1574.8	1600.2	1625.6	1651.0	1676.4	1701.8	1727.2	1752.6
70	1778.0	1803.4	1828.8	1854.2	1879.6	1905.0	1930.4	1955.8	1981.2	2006.6
80	2032.0	2057.4	2082.8	2108.2	2133.6	2159.0	2184.4	2209.8	2235.2	2260.6
90	2286.0	2311.4	2336.8	2362.2	2387.6	2413.0	2438.4	2463.8	2489.2	2514.6
100	2540.0	...	...	...	...	...	...	...	...	...

Note: All values in this table are exact, based on the relationship that 1 in = 25.4mm. By manipulation of the decimal point, any decimal value or multiple of an inch may be converted to its exact equivalent in millimeters, centimeters, or meters.

This table is taken from the American Society for Testing and Materials Standard for Metric Practice, E380-76.



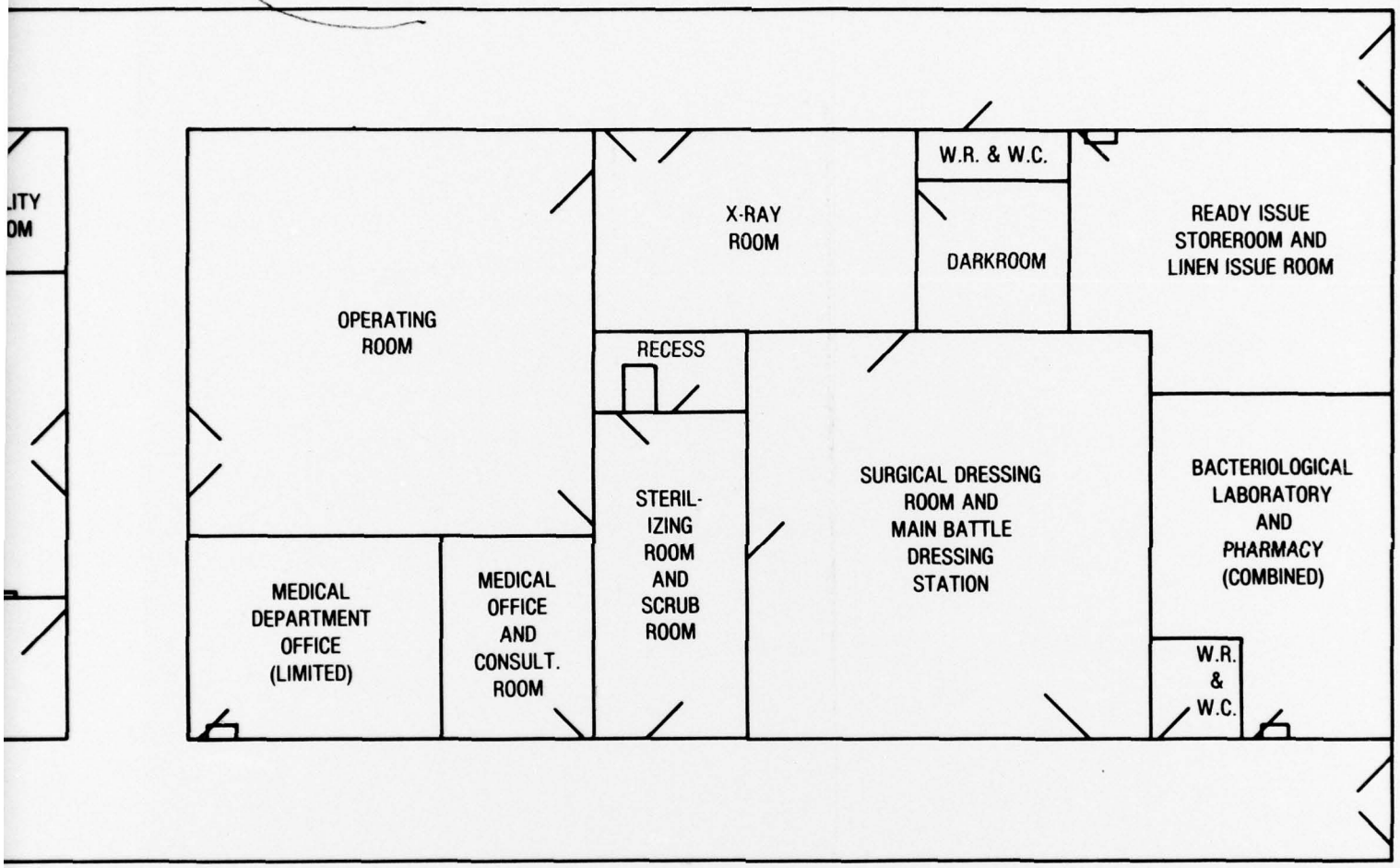
MEDICAL/DENTAL SUI
SCHEM

METERS

0 5 10

SCALE: 1/0.96 cm = 1 m

FC



CAL/DENTAL SUITE ARRANGEMENT
SCHEME A

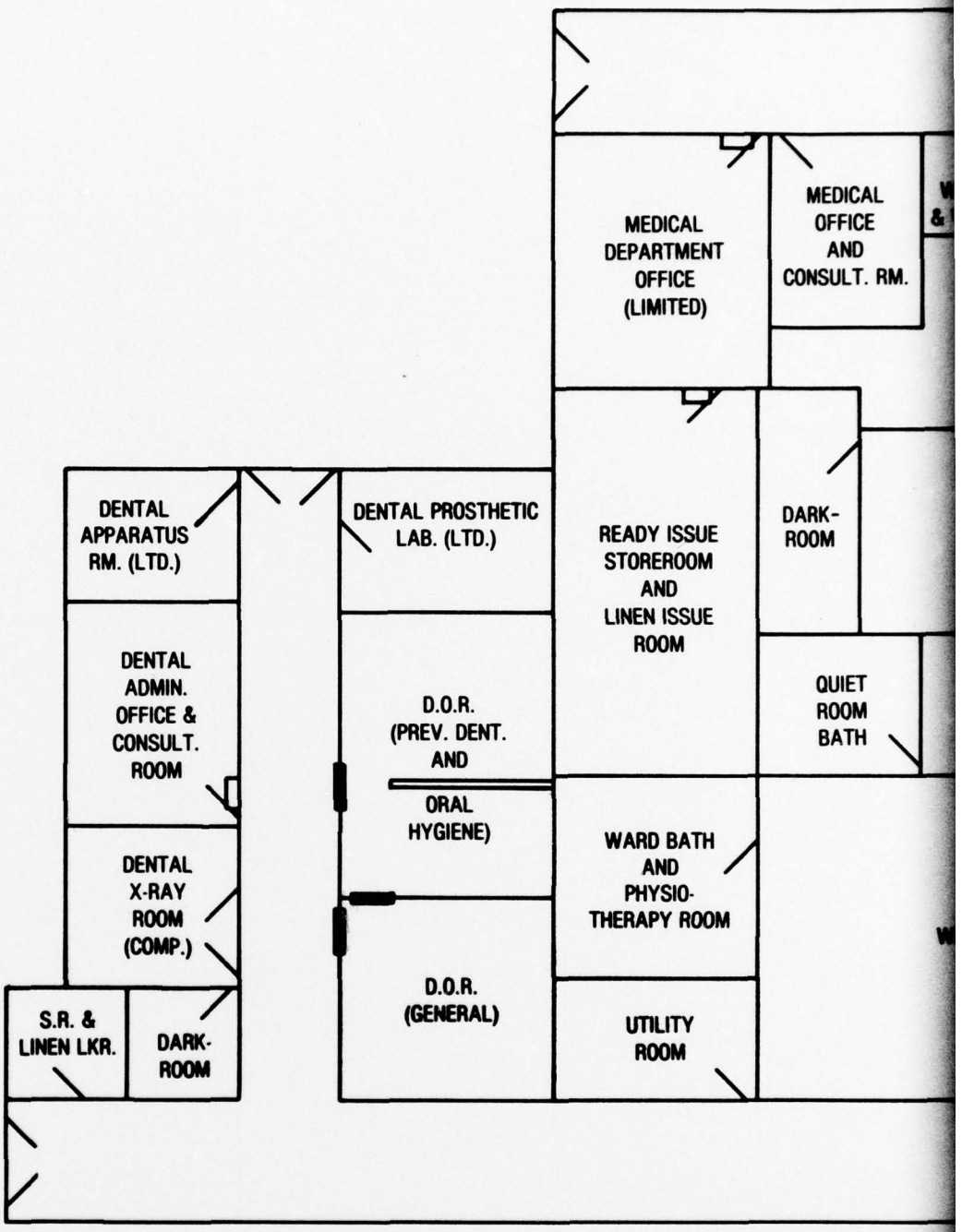
FEET

0 4 8 12 16 20 24 28 32 36 40

SCALE: 1/8" = 1'-0"

FORWARD

Figure 3



MEDICAL/DENTAL SUITE AR
SCHEME B

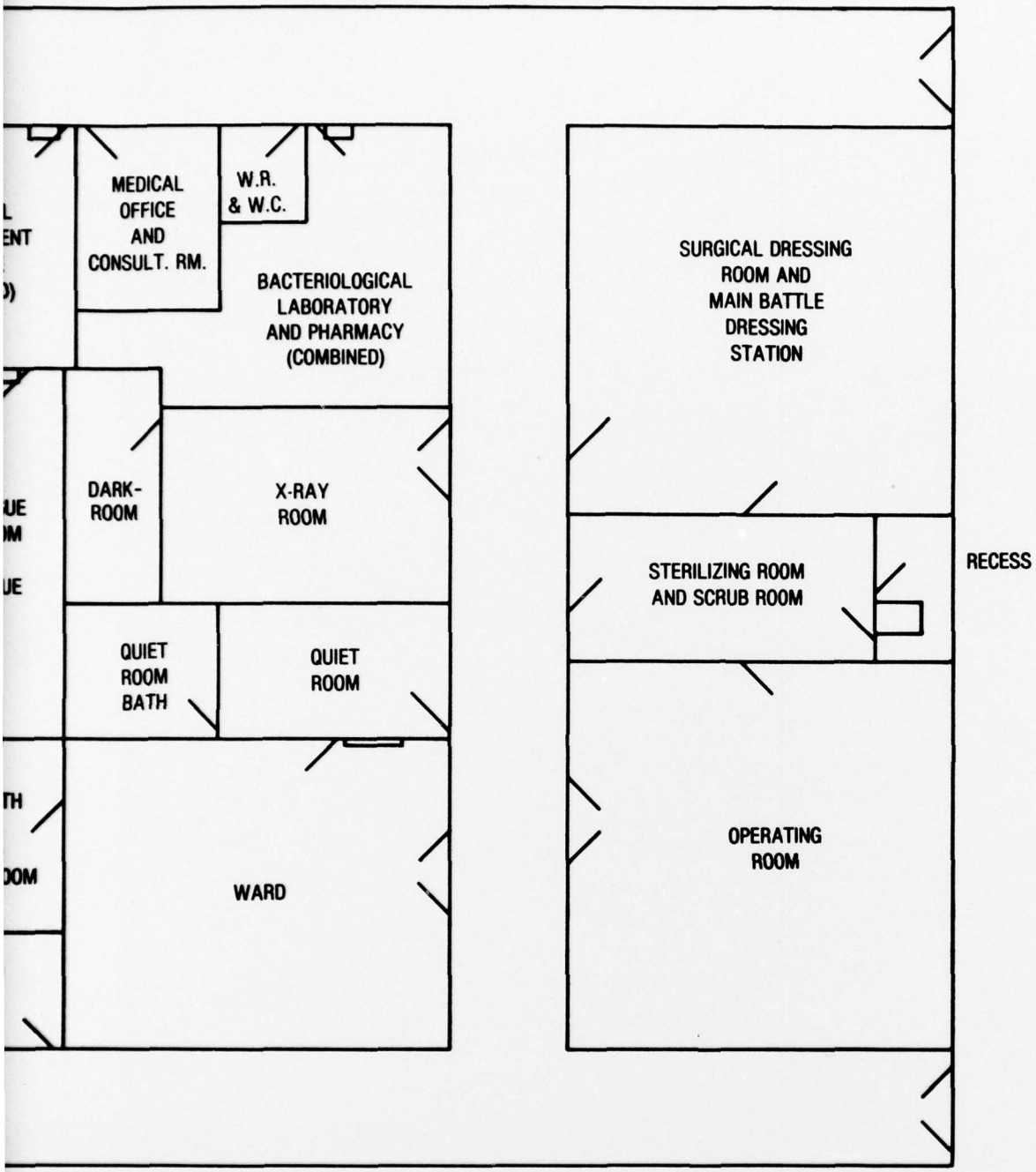
METERS

0 5 10

SCALE: 1/0.96 cm = 1 m

FORWARD

AND MEDIUM-SIZED AUXILIARIES



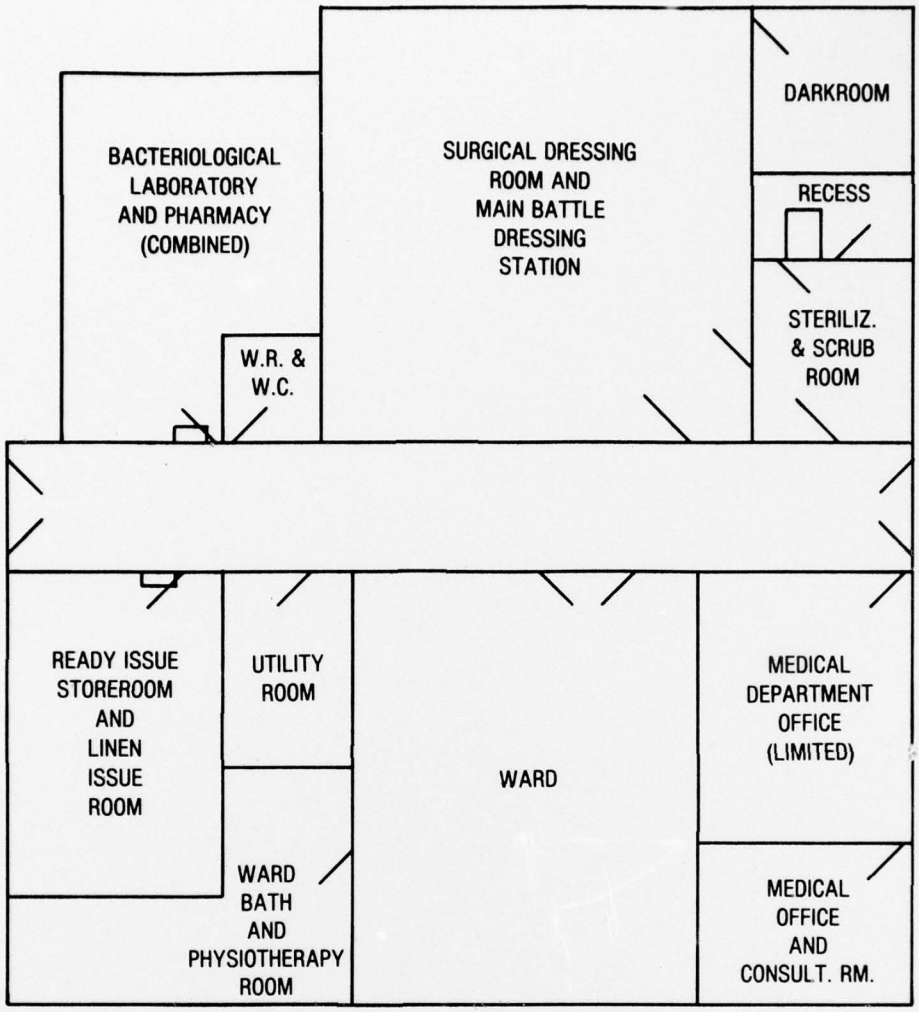
ENTAL SUITE ARRANGEMENT
SCHEME B

FEET
0 4 8 12 16 20 24 28
SCALE: 1/8" = 1'-0"

FORWARD

Figure 4

SMALL CRUISERS



MEDICAL SUITE ARRANGEMENT

METERS

0 2 4 6

SCALE: 1/0.96 cm = 1 m

FEET

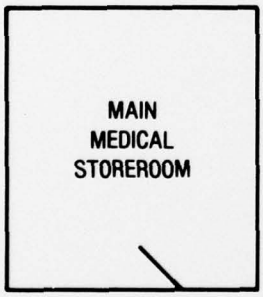
0 4 8 12 16 20 24

SCALE: 1/8" = 1'-0"

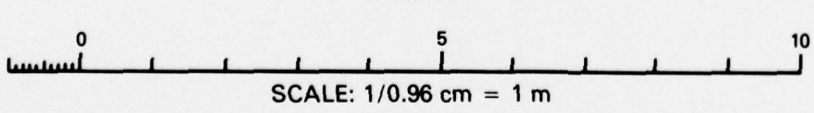
FORWARD

AUXILIARY BATTLE DRESSING STATIONS A
FORWARD AND ONE AFT. NO PARTICULAR

SMALL CRUISERS

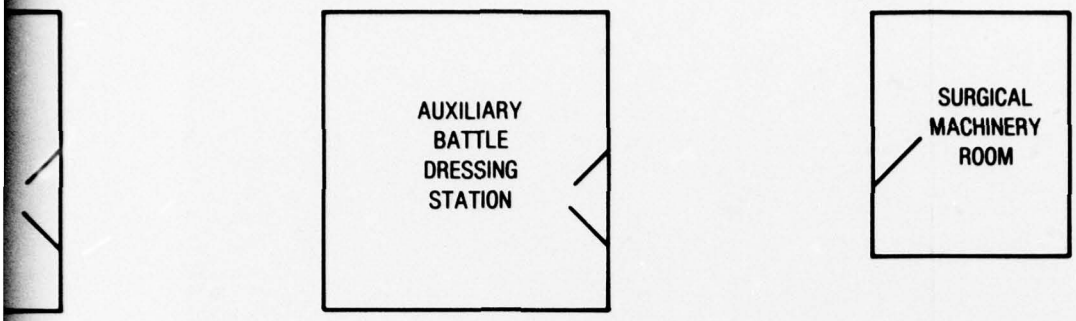


AUXILIARY BATTLE DRESSING STATIONS A
FORWARD AND ONE AFT. NO PARTICULAR



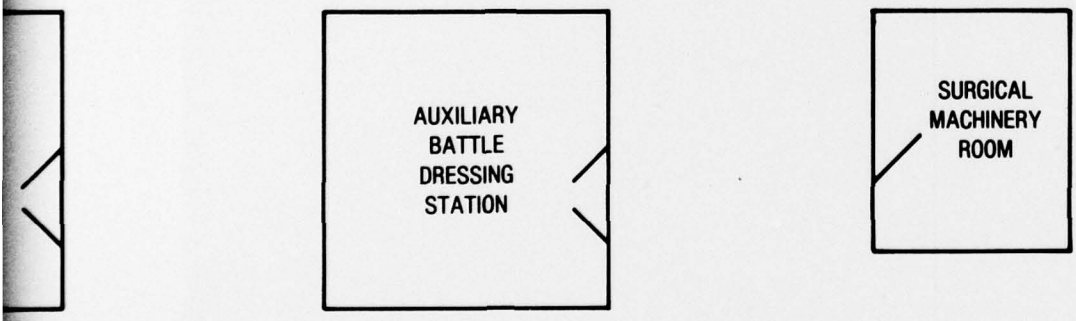
DETACHED RELATED S

UISERS AND MEDIUM-SIZED AUXILIARIES

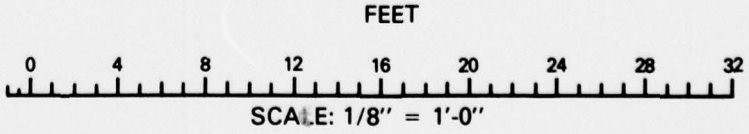


DRESSING STATIONS ARE TO BE LOCATED ONE
E AFT. NO PARIICULAR ORIENTATION IS IMPLIED.

SMALL CRUISERS



E DRESSING STATIONS ARE TO BE LOCATED ONE
NE AFT. NO PARTICULAR ORIENTATION IS IMPLIED.



DETACHED RELATED SPACES

Figure 6