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# NAVAL SHIPS TECHNICAL MANUAL

## CHAPTER 9000

### GENERAL



Report all inaccuracies and deficiencies noted in this manual and all other NAVSHIPS publications by a Planned Maintenance System Feedback Report (OPNAV Form 4700/7) (or a postal card addressed to NAVSHIPS or any other convenient means).

NAVAL SHIP SYSTEMS COMMAND, WASHINGTON, D. C. 20360

# NAVAL SHIPS TECHNICAL MANUAL

## CHAPTER 9000 — GENERAL

January 1968 Edition

### 9000.1 PURPOSE

1. The sole purpose of the **Naval Ships Technical Manual** is to provide the satisfactory and efficient continued performance of U.S. Naval ships. The various chapters contain detailed administrative and technical instructions amplifying U.S. Navy Regulations to assist personnel, afloat and ashore, in the satisfactory management of their ships and its machinery and equipment.

2. The Manual provides information to govern industrial activities in U.S. Naval ship and equipment repair and overhaul.

3. Wherever guidance data to aid personnel in making sound engineering judgments is included, as differentiated from mandatory requirements amplifying Navy Regulations, it is identified as such to eliminate confusion.

### 9000.2 AUTHORIZATION

This Manual is issued under the authority of Articles 0404, 0445, 0446, and 1201, U.S. Navy Regulations.

### 9000.3 INDEX

Most chapters have been renumbered recently in accordance with the Navy-Marine Corps Standard Subject Classification System. Under this system, all chapters are a part of the 9000 series which identifies Ship Design and Ship's Material subject groups. In most instances, the change required merely the addition of a "9" at the beginning and "0" at the end of the original chapter number. (Where sub-chapters were formerly listed, the new four-digit chapters will end in a final "1", "2", etc.) The "Index of Naval Ships Technical Manual Chapters," furnished as Appendix A, provides information concerning chapter numbers and chapter titles, as of this date.

### 9000.4 SCOPE

1. The **Naval Ships Technical Manual** contains instructions and guidance to personnel in the satisfactory operation, inspection, maintenance, and overall management of shipboard materials, equipments, and systems under the cognizance of the Naval Ship Systems Command. The Manual covers data applicable to a class of equipments, or common to a majority of installations (as differentiated from unique procedures and requirements applicable to specific ships, systems, or equipments, or to detailed information on electronics—which are covered by manufacturers' equipment manuals, Ship Information Books, the Electronics Installation and Maintenance Book, and other documents as appropriate).

2. The preventive maintenance information in the Manual complements the "Maintenance Requirement Cards" being supplied for programmed preventive maintenance under the 3-M system. The "Maintenance Requirement Card" is the basic job-Order requirement for each preventive maintenance task on board ship. The preventive maintenance information in the **Naval Ships Technical Manual**,

together with that in manufacturers' equipment manuals, Ship Information Books, etc., supplements each card by discussing the basis for conducting each preventive maintenance task, by providing detailed procedures for conducting corrective maintenance, and by evaluating the results of inspections and tests required to an extent not covered by the card.

3. If disagreement is found to exist between a "Maintenance Requirement Card" and a preventive maintenance procedure in this Manual (or in any other NAVSHIPS manual), the procedure in the "Maintenance Requirement Card" should be followed and the Naval Ship Systems Command should be informed of the inconsistency through submittal of a PMS Feedback Report (OPNAV 4700/7), or by means of a postal card, hand-written memo, or other readily available means.

4. This Manual is not intended to be a compendium of design and engineering information nor an all-encompassing document covering all ramifications of shipboard equipment. It is intended to provide clear and concise information which Navy personnel must have at their fingertips to obtain optimum performance from the ship throughout the ship's life and to assure that the ship will be available immediately at any time to satisfactorily carry out any assigned mission in time of war.

5. The quality and reliability of shipboard mechanical and electrical items is not constant. Although an item may have been entirely satisfactory for the purpose intended at the time of its delivery, the readiness-state is continually reduced with age and operation through normal erosion, corrosion, wear, fatigue, and other environmental forces (and possibly through up-stream failures). The failure of devices occurs because of natural laws of change, not because the finger of fate lands at random on one of a group of devices and commands "Fail!" A small defect grows cancerously until failure occurs.

6. The rate of degradation and the potential for failure are directly related to the care provided in operation and maintenance. When a defect appears, the earlier the defect is noted and corrected the better. It is axiomatic that, left to themselves, things do not tend to become better—they tend to become worse. Then failure may occur just at the time when the consequences are the greatest.

7. Furthermore, the various items in the ship may perform acceptably on a long-term basis under normal operating conditions with internal surfaces corroded, eroded, and cracked, with electrical insulation hardened, and with other parts degraded similarly through prior use, as long as no mechanical shock from wartime operations, or from heavy seas, is encountered. However, the additional stress resulting from mechanical shock may cause multiple failures just at the particular time when greatest reliability is required.

8. It is the intent of this Manual to furnish information which, when used with the related equipment, system and ship manuals, and appropriate "Maintenance Requirement Cards" and Allowance Parts Lists, will mesh each shipboard item with its related test instruments, gages, controls, tools, spare parts, repair parts, equipage items, and drawings into a coherent structure depicting efficient operation, maintenance, and repair for the life of the ship.

9. Because satisfactory use of the Allowance Parts List for hull, mechanical, and electrical equipments is a major item in obtaining satisfactory performance, general APL

identification information is included below. More detailed information is included in the chapters related to Allowances and Repair Parts.

10. Each equipment APL (or CID) number is made up of 9 digits. The first two digits are intended to indicate the family of equipment involved in accordance with the following listing:

#### APL (CID) TO NOUN-NAME REFERENCE LIST

00 Ordnance  
01 Pumps  
02 Boilers  
03 Heat Exchangers  
04 Condensers  
05 Turbines  
06 Compressors/Compressor Systems  
07 Heaters  
08 Distilling Plants (also Evaporators)  
09 Battery Chargers  
10 Meters  
11 Converters  
12 Maintenance & Repair Shop Equipment  
13 Transformers  
14 Circuit Breakers  
15 Controllers  
16 Generators  
17 Motors  
18 Motor Generators  
19 Relays  
20 Rheostats  
21 Switches  
22 Switchboards  
23 Alarms & Signalling Devices--Visual  
24 Lighting Fixtures & Lamps (Elect-Nonelect)  
25 Gyro Compass Equipment  
26 Projection Equipment  
27 Interior Communication Equipment  
28 Navigation Equipment (also Timepieces)  
29 Injectors  
30 Burners  
31 Marine Hardware & Hull Items  
32 Refrigeration Equipment  
33 Air Conditioning Equipment  
34 Starters  
35 Wipers  
36 Alarms & Signalling Devices--Audible  
37 Bearings  
38 Indicators  
39 Clutches  
40 Fans  
41 Shop Equipment  
42 Regulators  
43 Galley Equipment  
44 Dehumidification Equipment  
45 Gages  
46 Testing & Measuring Equipment  
47 Chemical Warfare Equipment  
48 Filters  
49 Carburetors  
50 Panels  
51 Isolators  
52 Hydraulic Equipment  
53 Capstans

54 Printing Equipment  
55 Reels & Towing Equipment  
56 Davits  
57 Cranes  
58 Hoists & Ammunition Handling Equipment  
59 Elevators  
60 Steering Gears  
61 Controls  
Control Equipment--Constant Frequency  
Controls--Amplidyne  
Controls--Electrical  
Controls--Mechanical  
Controls--Rototrol  
Controls--Self Synchronous  
62 Winches  
63 Windlasses  
64 Fire Fighting Equipment  
65 Lubricators  
66 Engines  
67 Plumbing Equipment  
68 Magnetos  
69 Gears  
70 Governors  
71 Ignition Equipment  
72 Minor Landing Craft & Small Boats  
73 Ejectors  
74 Eductors  
75 Strainers  
76 Purifiers  
77 Traps  
78 Couplings  
79 Silencing Equipment  
80 Brakes  
81 Blowers  
82 Welding Systems  
83 Ship & Boat Propulsion Components  
84 Sick Bay Equipment  
85 Deck Machinery  
86 Photographic Equipment  
87 Underwater Log Equipment  
88 Valves  
89 Fire Fighting, Rescue, & Safety Equipment  
90 Rigging & Rigging Gear (Booms, etc.)  
91 Laundry Equipment  
92 Tanks  
93 Pipe, Tubing, Hose, Fittings (Metal & Flexible)  
94 ASW & Mine Sweeping Equipment  
95 Automotive  
96 Construction  
97 Periscopes & Masts  
98 Nuclear Equipment  
99 Miscellaneous Equipment

11. The next three digits are intended to indicate the manufacturer for this item (except for valves and miscellaneous equipment). For example, "01603" might apply to Worthington pumps. (The same manufacturer's number does not carry over from one equipment family to another. For example, Worthington compressors might be "06005" or "06190.") The remaining four digits are assigned in numerical order. Each distinct sub-assembly of an assembly has its own APL number. For example, a turbo-generator

would have one number for the turbine, another number for the reduction gear (if included), and another number for the generator.

12. Federal Stock Numbers, as listed on the APL and assigned to each item to be stocked, have a numbering system differing from that for APLs. The first two digits in each FSN identify the family (or group) of items involved.

The following is a list of representative groups:

- 19—Ships, Small Craft, Pontoons, and Floating Docks.
- 20—Ship and Marine Equipment.
- 28—Engines, Turbines, and Components.
- 29—Engine Accessories.
- 31—Bearings.
- 39—Materials Handling Equipment.
- 40—Rope, Cable, Chain and Fittings.
- 43—Pumps and Compressors.
- 45—Plumbing, Heating, and Sanitation Equipment.
- 47—Pipe, Tubing, Hose, and Fittings.
- 48—Valves.
- 53—Hardware and Abrasives.
- 59—Electrical and Electronic Equipment Components.
- 61—Electric Wire and Power and Distribution Equipment.
- 80—Brushes, Paints, Sealers, and Adhesives.
- 95—Metal Bars, Sheets, and Shapes.

The aforementioned two digits and the next two digits indicate the Federal Supply Class. For example, 4820 covers non-powered valves and 5310 covers nuts and washers. The last seven digits indicate the Federal Item Identification Number (FIIN), which provides a unique number for each unique item expected to be stocked. In contrast to APL numbers, the Federal Stock Number stays the same for interchangeable items which are not identical.

13. The NAVSHIPS numbers now being assigned to each chapter of this Manual were developed as follows:

- a. The first four digits of the 11-digit number, "0901, are unique to the Naval Ships Technical Manual.
- b. The next three digits indicate the chapter and sub-chapter number.

- c. The following three digits always are "000". The last digit indicates the Distribution Control Statement Number as required by a recent DOD regulation.

14. There are three Distribution Control Statement numbers which apply to chapters of this Manual.

- a. Chapters having NAVSHIPS numbers ending in "0001" bear Statement No. 1 of the DOD regulation: "Distribution of this document is unlimited."

- b. Chapters having NAVSHIPS/FSN numbers ending in "0002" bear Statement No. 2 or No. 4 of the DOD regulation, as follows:

Statement 2—"This document is subject to special export controls and each transmittal to foreign governments or foreign nationals may be made only with prior approval of the Naval Ship Systems Command."

Statement 4—"Each transmittal of this document outside the agencies of the Department of Defense must have prior approval of the Naval Ship Systems Command."

- c. Chapters having NAVSHIPS numbers ending in "0003" bear Statement No. 4 of the DOD regulation. These chapters incorporate information which is more sensitive in nature than chapters ending in "0002." Greater distribution control is provided.

15. Some chapters of this Manual are issued in two editions—one edition ending in "0003" and the other ending in "0002" in compliance with varying requirements for supplying information to other than Department of Defense activities. Naval activities will be furnished the "0003" version normally and need not reference the "0002" edition. The DOD regulation provides for use of two additional statements, but these are not now used for any chapter of this Manual.

16. All holders of chapters of this Manual should handle each document within the limitations of the controls established by the Distribution Control Statement indicated on the specific document. All chapters marked with Statement No. 3 are also marked "FOR OFFICIAL USE ONLY" to further control distribution.

17. Chapters which have not yet been rewritten, and reissued as separate paper-bound booklets for general fleet use (See para. 9000.6) are included in 3 separate loose-leaf volumes (NAVSHIPS 0901-000-0010, 0901-000-0020, and 0901-000-0030 respectively). These chapters, including changes through 15 August 1967 should be used until superseded. Appendix A identifies Chapters, which have now been rewritten, renumbered, and reissued, by NAVSHIPS No. and date. Pending rewriting, and where the replenishment stock of a loose-leaf chapter was low, replenishment of stock has been made by printing the same text in paper-bound booklet format. These reprinted chapters were assigned NAVSHIPS numbers as set forth in para. 13 above. The paper-bound replenishment chapters and the looseleaf chapters with the earlier NAVSHIPS numbering system are interchangeable in these cases. Chapters presently in this category are not identified by NAVSHIPS No. and date in the listing in Appendix A.

18. In providing guidelines to promote the satisfactory and efficient continued performance of U.S. Naval ships and their materials and equipments, this Manual (and other manuals) provides for the periodic accomplishment of various items of work. However, too much emphasis cannot be placed on the need for watch-by-watch attention to each item, and a continuous awareness of any change in GAGE READING, TEMPERATURES, APPEARANCE, NOISE, VIBRATION, LEAKAGE, or ODOR. Particular items of continued attention should include:

- a. **Cleanliness.** Foreign material breeds casualties—whether the item is a boiler tube, a lube-oil system, an electric motor, or practically anything else on board ship.

- b. Assurance that all bolts, nuts, and locking devices are secure and are accounted for. Many major casualties have resulted because a threaded fastener was not applied properly at time of a previous reassembly or because it worked loose while in service. (General information relating to threaded fasteners is included in Chapter 9090.)

- c. Operate within established limits. Do not overstress.

- d. Replace parts only when necessary. All new parts should be compared with the old parts before installation to determine equivalence. Then, assure that extreme care is used to provide correct reassembly.

## 9000.5 FEEDBACK

As stated in article 9000.1, the sole purpose of this Manual is to promote the satisfactory and efficient perform-

ance of U.S. Naval ships. If any part of this Manual does not serve that purpose to the extent required for your needs, as a specific U.S. Naval user of the Manual, it can be expected that future users will be similarly stymied if the deficiency is not eliminated. Article 9000.4 requests that the Naval Ship Systems Command be informed if any inconsistency between any portion of the Manual and any "Maintenance Requirement Card" in the 3-M system is noted. Similarly, do not hesitate to call the attention of the Naval Ship Systems Command to any apparent error, omission, or possible beneficial change (no matter how small, large, or apparently unorthodox) at any time. The comment may be forwarded by a PMS Feedback Report (OPNAV 4700/7), a postal card, a long-hand memo, or any other means which is convenient.

#### 9000.6 CHANGES TO THE MANUAL

Official changes to the Naval Ships Technical Manual have been issued, in recent years, in looseleaf form to allow ready insertion by the receiving activities in consolidated bound volumes of the Manual. The procedure is now being changed. In order to allow the ship to distribute copies to the working spaces where the information is required, chapters (and sub-chapters where appropriate) will now be issued as separate paper-bound volumes. Each ship should order sufficient copies of each chapter to allow use by all personnel needing the specific information involved. Normally, up-dated chapters will be issued yearly, or less frequently for those chapters where yearly revision is not necessary. Where intra-year changes are required to be issued, either an intra-year edition of the chapter will be issued, or a NAVSHIPS Notice will be distributed as a temporary supplement for use pending issue of the revised edition.

The front cover of each paper-bound chapter will be marked with the month and the year of the last change. Chapters as revised, and in the quantity required to provide the information where needed, as previously established, will be issued by automatic distribution list to U.S. Navy activities continually interested in a particular subject.

Each Naval activity should keep Navy Publications and Forms Center, 5801 Tabor Ave., Philadelphia, Pa., 19120 advised of any increase or decrease in the quantities required for each chapter.

#### 9000.7 DISTRIBUTION

1. Copies of chapters required by DOD activities shall be requisitioned on a one-time basis directly from the Naval Publications and Forms Center (NPFC), 5801 Tabor Avenue, Philadelphia, Pa. 19120, in accordance with NAVSANDA/

NAVSUP 2002 using DD Form 1348.

Quantities of 10 or less of any chapter may be obtained without justification. If a quantity in excess of 10 is required, the request should be forwarded to NPFC, Code 1013 with an accompanying note justifying the need for the quantity requested. Requests from other activities should be forwarded to the "Controlling DOD Office" established by the Distribution Statement on the document, indicating the basis for the request.

2. The NAVSHIPS Number/Federal Stock Number for each consolidated volume of the previous 3-volume set has been cancelled. Bound volumes and loose-leaf binders will no longer be supplied. In this connection, holders of the Manual should note that the present total number of pages in each of the three volumes is excessive for ready handling and quick reference and tends to overload each binder. Where an activity will continue to require a complete set of consolidated chapters for general reference, it is considered advisable that the activity should divide the chapters into at least five volumes. To provide for the instances when a DOD activity requires a complete set of chapters, NAVSHIPS 0901-000-000 has been assigned to the consolidated set in order to simplify requisitioning. The set of chapters so supplied will include the "0003" version of a chapter where both "0003" and "0002" versions are available (see 9000.4 para. 15) and may include both old loose-leaf chapters (with changes) and bound booklet Format until all old chapters are superseded.

3. This edition of this chapter, and future paper-bound chapters, will be punched with three holes to simplify inclusion in a 3-hole binder (when a receiving activity desires to consolidate chapters).

4. The change from the previous 18-hole arrangement is being made because of the general availability of 3-hole binders and the greater ruggedness of the paper binding with only three holes. If an activity desires to retain paper-bound chapters with 18-hole binders, local punching will be required.

5. Some revisions to chapters, and complete chapters to the Manual, recently issued (and gummed labels distributed to holders of the Manual for affixing to the inside and outside of the front and back covers of each of the previous three volumes) state:

"This document is subject to special export controls and each transmittal to foreign governments and foreign nationals may be made only with prior approval of the Office of Chief of Naval Operations (CNO/ONI)."

In keeping with article 9000.4.14, it is requested that all labels, revisions, and chapters so marked which will continue in use be modified to replace "Office of Chief of Naval Operations (CNO/ONI)" by "Naval Ship Systems Command."

## STATUS OF NAVAL SHIPS TECHNICAL MANUAL CHAPTERS

[Note: at all times, NAVSUP Publication 2002 (Navy Stock List of Publications and Forms, Cognizance Symbol I) lists the latest revision of each chapter. Paper-bound chapters which have been distributed to the Fleet up to the present time and supersede the loose-leaf 3-volume Format are identified by NAVSHIPS Number and Date of Issue. For all others, the prior loose-leaf Format (or bound booklet dated Sept. 1967 and containing the same text) is appropriate. (See 9000.4 para. 17). Where a NAVSHIPS No. ending in "0003" is listed, an edition ending in "0002" may also be available. However, these editions are not listed since the "0003" edition should be used for the maintenance and repair of U.S. Naval ships.]

Chapter No.	Title	NAVSHIPS No.	Date of Issue
9000	General	0901-000-0002	October 1969
9001	Publications and Drawings		
9002	Administration of Funds		
9003	Allowances, Surveys, and Requests for Material		
9004	Inspections, Records, Reports, and Tests		
9006	Submarines		
9007	Service Craft	0901-030-0003	September 1967
9030	Readiness and Care of Vessels In Inactive Status		
9070	Docking Instructions and Routine Work in Drydock		
9080	Trials		
9090	Locking Procedures and Torque Wrenches for Threaded Fasteners	0901-090-0001	September 1967
9110	Hull Structures		
9120	Hull Fittings		
9140	Deck Coverings		
9150	Gasoline (Aviation and Automotive) and JP-Fuel Systems		
9160	Access Closures		
9170	Cranes and Booms	0901-150-0003	September 1967
9180	Rigging		
9190 <sup>1</sup>	Preservation of Ships in Service		
9200	Winches and Capstans		
9210	Hydraulic Equipment		
9220	Steering Systems		
9230	Industrial Gases; Generating, Handling and Storage		
9240 <sup>2</sup>	Ship Control Equipment		
9250	Towing Gear		
9260	Moorings and Appliances		
9270	Wire Rope		
9280	Fiber Rope: Natural and Synthetic		
9290	Weights, Stability, and Integrity (Seaworthiness)		
9300	Stowage of Safe, Semisafe, and Dangerous Materials		
9310	Repair Parts		
9331	Life Preservers, Use and Periodic Testing of	0901-331-0001	February 1969
9332	Sanitation; Living, Berthing, Medical and Dental Equipment		
9340	Commissary Equipment	0901-332-0002	September 1967
9350	Laundry		
9380	Ventilating, Heating, Air Conditioning and Other Environmental Control Systems	0901-412-0002	July 1969
9390	Thermal Insulation		
9400	Tables of Technical Data		
9411	Propulsion Turbines (Steam)		
9412	Diesel Engines (Propulsion and General Purpose)		
9413	Electric Propulsion Installations		
9416 <sup>3</sup>	Gas Turbines		
9420	Reduction Gears		
9430	Shafting, Bearings, and Seals		
9440	Propellers		
9450	Lubricating Oils, Greases, and Hydraulic Fluids and Lubrication Systems	0901-416-0003	September 1967

# APPENDIX A (Cont'd)

## STATUS OF NAVAL SHIPS TECHNICAL MANUAL CHAPTERS

Chapter No.	Title	NAVSHIPS No.	Date of Issue
9460 <sup>4</sup>	Condensers and Air Ejectors	0901-460-0003	September 1967
9470	Pumps	0901-470-0002	Pending
9480	Piping Systems	0901-480-0002	Pending
9490	Compressed Air Plants	0901-490-0003	September 1967
9500	Auxiliary Steam Turbines		
9510	Boilers	0901-510-0002	Pending
9530	Blowers		
9540 <sup>3</sup>	Gas Turbines		
9550	Fuel Oil Stowage and Equipment	0901-550-0003	September 1967
9560	Boilerwater/Feedwater. Test and Treatment	0901-560-0002	February 1969
9562	Feedwater System and Apparatus	0901-562-0002	January 1969
9570	Clutches and Couplings		
9580	Distilling Plants		
9590	Refrigeration Systems		
9600	Electric Plant — General	0901-600-0002	Pending
9610	Electric Power Generators and Conversion Equipment		
9621	Electric Power Distribution System	0901-621-0002	September 1967
9622	Storage Batteries (Portable) and Dry Batteries	0901-622-0002	September 1968
9623	Submarine Storage Batteries	0901-623-0002	March 1969
9630	Electric Motors and Controllers		
9640	Lighting	0901-640-0002	March 1969
9650	Interior Communications Installations		
9660	Searchlights		
9670	Electronics		
9690	Electrical Measuring and Test Instruments	0901-690-0002	September 1968
9700	Flags and Bunting		
9710	Fire Control Installation		
9720 <sup>5</sup>	Turrets and Gun Mounts (or 9720 and 9740)		
9770	Shipboard BW/CW Defense and Countermeasures	0901-770-0002	September 1968
9780	Ammunition Handling and Stowage	0901-780-0003	September 1967
9813 <sup>6</sup>	Mine Protection: Degaussing and Mine Sweeping	0901-813-0002	September 1968
9820	Boats and Lifesaving Craft	0901-820-0002	September 1968
9830	Elevators		
9850	Motion Picture Equipment		
9870	Mechanical Measuring Instruments		
9880-I	Damage Control: Stability and Buoyancy	0901-881-0002	Pending
9880-II	Damage Control: Practical Damage Control	0901-882-0002	Pending
9880-III	Engineering Casualty Control	0901-883-0002	May 1969
9900	Radiological Recovery of Ships After Nuclear Weapons Explosions		
9910	Workshop Equipment on Ships		
9920 <sup>7</sup>	Welding and Allied Processes	0901-920-0003	September 1967
9922	Non dest. Test of Metals—Qual. of Nav. Pers.	0901-922-0002	March 1969
9930	Firefighting — Ships	0901-930-0003	September 1967
9940	Salvage		
9950	Gaskets and Packing		

<sup>1</sup>Chapter 9190 includes "Painting," "Cathodic Protection," and Reconditioning of submerged mechanical equipment.

<sup>2</sup>Chapter 9240 includes "Navigational Equipment" and "Periscopes." (Periscopes are to be transferred to Chapter 9006.)

<sup>3</sup>Chapter 9416 supersedes Chapter 9540.

<sup>4</sup>Chapter 9460 includes "Heat Exchangers."

<sup>5</sup>In the paper-bound edition prepared for replenishment stock, Chapter 9720 includes material previously in Chapter 9740.

<sup>6</sup>Chapter 9813 includes material previously in Chapter 9811.

<sup>7</sup>Chapter 9920 includes "Entry Into Closed or Poorly Ventilated Spaces."