This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

Designation: F1808 – 03 (Reapproved 2019)

An American National Standard

Standard Guide for Weight Control Technical Requirements for Surface Ships[1]

This standard is issued under the fixed designation F1808; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This guide provides recommended weight control technical requirements for surface ships and discusses different types of weight estimates, reports, and weight control procedures. It contains a weight classification that will assist in achieving uniformity by standardizing the weight-reporting system.

1.2 This guide is applicable to ships designed and constructed in inch-pound units of measurement and to ships designed and constructed in SI units of measurement. Whenever inch-pound units are shown or referred to in the text, or in example formats included in this guide, it is to be understood that corresponding SI units may be substituted if applicable to a ship designed and constructed in SI units, provided that whichever system is used, it is consistently used in all weight control reporting documentation for the ship.

1.3 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

F1321 Guide for Conducting a Stability Test (Lightweight Survey and Inclining Experiment) to Determine the Light Ship Displacement and Centers of Gravity of a Vessel

F1332 Practice for Use of SI (Metric) Units in Maritime Applications (Committee F25 Supplement to IEEE/ASTM SI 10) (Withdrawn 2017)[3]

3. Terminology

3.1 *Definitions:*

3.1.1 *agreed weight and center of gravity estimate, n*—an estimate of light ship weight and centers of gravity data, mutually agreed upon between the owner and the shipbuilder shortly after award of the shipbuilding contract, based on the ship design information, for example, specifications, drawings, and so forth, available at the time of award.

3.1.2 *as-built weight and center of gravity estimate, n*—a detailed final estimate of light ship weight and centers of gravity data, adjusted for inclining experiment results, reflecting the as-built ship including the net effect of contract modifications.

3.1.3 *center of gravity, n*—the point through which the resultant of all gravitational forces on a ship or a component passes. The location, a balance point, at which the entire weight of a ship may be considered to be concentrated.

3.1.4 *deadweight, n*—the total carrying capacity of a ship including weight of cargo, fuel, lubricating oil, fresh water in tanks, stores, passengers and baggage, and crew and their effects.

3.1.5 *inclining experiment, n*—a procedure performed on a completed, or almost completed, ship to establish experimentally the light ship values of the displacement and the vertical, longitudinal, and transverse positions of its center of gravity (see Guide F1321 for detailed procedures).

3.1.6 *independent weight and center of gravity estimate, n*—the estimate of light ship weight and centers of gravity performed by the shipbuilder shortly after award of the shipbuilding contract based on the ship design information available at the time of award. When compared with the owner's estimate and upon resolution of differences, an agreed upon weight and center of gravity estimate will result.

3.1.7 *light ship weight, n*—the weight of the ship with all its equipment and outfit, including permanent (fixed) solid or liquid ballast, spare parts that are carried on board, water in boilers at operating levels, machinery including Marine Sanitation Device units in working condition, lubricating oil in all machinery, but not in storage tanks, and liquids in all piping systems.

[1] This guide is under the jurisdiction of ASTM Committee F25 on Ships and Marine Technology and is the direct responsibility of Subcommittee F25.07 on General Requirements.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] The last approved version of this historical standard is referenced on www.astm.org.

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3.1.8 *longitudinal center of gravity (LCG), n*—the point through which the gravitational forces on a ship pass, measured longitudinally from amidships, measured from the forward perpendicular, or in some cases, measured from the aft perpendicular.

3.1.9 *transverse center of gravity (TCG), n*—the point through which the gravitational forces on a ship pass, measured transversely, port or starboard, from the ship's centerline.

3.1.10 *vertical center of gravity (KG or VCG), n*—the point through which the gravitational forces on a ship pass measured vertically from the keel (K) or the ship's baseline.

3.1.11 *weigh; to weigh, v*—as commonly understood in everyday usage and in the maritime industry, and as used throughout this guide, means to determine by measuring the mass of.

3.1.12 *weight, n*—as commonly understood in everyday usage and in the maritime industry, and as used throughout this guide, is synonymous with mass. In this guide, weight in inch-pound units is measured in pounds and in long tons of 2240 lbs; and in SI units (metric), weight is measured in kilograms and in metric tons of 100 kg. Refer to Practice F1332 for conversion factors to convert inch-pound quantities to SI (metric) quantities for units of weight, moment, moments to trim, and so forth.

3.1.13 *weight classification, n*—the system used in light ship weight estimating for grouping materials, equipment, or components of the ship in a structured order to facilitate comparison and to ensure completeness.

3.1.14 *weight group, n*—one of the three major elements of light ship weight as used in the weight classification, that is, hull structure, outfit, and machinery.

4. Summary of Guide

4.1 *Determination of Weight and Moment Data*—The weight and moment data for all components and material and their overall effect on the ship's weight, center of gravity, list, and trim should be determined. As ship design or ship construction drawings are prepared and as material is selected, acquired, or received, the weight and centers of gravity of all items that comprise the ship should be determined and reported in the weight estimates and reports. These data may be obtained by estimation or calculation during preliminary and contract design, by a combination of estimation or calculation of ship construction drawings, and by actual weight determination of items during detail design and construction.

4.2 *Weight Reporting and Control*—The procedures for weight reporting and control, regardless of the level of reporting, are described in Section 6 and apply for commercial ships. The method and frequency of weight reporting can vary depending on the specific ship design, as well as the technical requirements set forth in the contract. The extent and level of weight control also can vary depending on the specific ship design. Although the weight control technical requirements for commercial ships usually are less demanding than those for U.S. Navy surface ships, the need for a mechanism to control the weight of a ship still exists. Supplementary Requirement Sections S1 – S4 describe the specific weight control technical requirements for U.S. Navy surface ships.

5. Significance and Use

5.1 It is important to know the amount of weight and its location before the ship is built to be sure that when it is built it will have positive stability. Only through detailed weight estimating in the design stage and during construction can one be ensured that positive stability will be achieved and retained.

6. Procedure

6.1 A specified number of calendar days, that is, 30, 45, 60, or 90 after date of award, as specified by the owner, the shipbuilder should submit for agreement an independent weight and center of gravity estimate. This estimate should describe the weight and centers of gravity of the ship in comprehensive detail and should include summaries and work sheets showing the detailed work performed, for example, calculations and estimates based on the design information, drawings, specification, and so forth. Appendix X1 contains suggested forms for the independent estimate, and it includes a suggested weight classification system for the estimate. Terms used in the weight classification are defined in the Maritime Administration Publication, Classification of Merchant Ship Weights.[4]

6.2 A mutual agreement between the shipbuilder and the owner on the light ship weight and centers of gravity should be reached as quickly as possible after award of the shipbuilding contract. Agreement action should consist of a review of shipbuilder's independent weight and center of gravity estimates and comparison with the owner's estimate. Upon resolution of differences, an agreed upon weight and center of gravity estimate will result. Thereafter, the shipbuilder should be responsible for obtaining in the completed vessel the agreed upon weight and center of gravity characteristics adjusted for authorized departures from the contracted ship design, reflected in the agreed upon estimate.

6.3 Departures from the contracted ship design, reflected in the agreed upon estimate, which affect the light ship weight and centers of gravity, should not be undertaken until the shipbuilder has submitted to the owner his estimate of the effect on weight and centers of gravity of the ship and obtained written approval to proceed with the department. Departures, which have a total impact on any weight group of less than a specified percentage, that is, 0.01, 0.02, 0.03, or 0.04 % of the light ship weight, may be considered negligible and will not require written approval with respect to weight.

6.4 The shipbuilder should submit periodically, as agreed upon, to the owner, a tabulation of approved departures and their cumulative effect on weight and centers of gravity of the agreed light ship estimate. In addition, when submitting plans that involve departures from the type of construction in the contracted ship design, reflected in the estimate, the shipbuilder

[4] U.S. Department of Transportation, Maritime Administration Classification of Merchant Ship Weights, January 1985. Available from the U.S. Maritime Administration, Office of Ship Construction, MAR-720, 400 Seventh St., SW, Washington, DC 20590.

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should itemize such departures and their effect on light ship weight and centers of gravity in his periodic reports. A final report should be submitted at the time of delivery adjusted to bring the estimated light ship weight and centers of gravity into reasonable agreement with the inclining experiment results.

7. Keywords

7.1 light ship; ship acquisition; weight control; weight estimate; weight report

SUPPLEMENTARY REQUIREMENTS

The following supplementary requirements shall apply only when specified by the purchaser in the contract or purchase order. These requirements normally are invoked for U.S. Navy Surface Ships.

S1. Special Government Requirements

S1.1 *Government Documents, Drawings, and Publications*—The following government documents, drawings, and publications form a part of this guide to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

S1.1.1 *Naval Sea Systems Command (NAVSEA) Documents:*

0900-LP-039-9020 Ship Work Breakdown Structure for Nuclear Propulsion Plant (U)[5]

S9040-AA-IDX-010/SWBS 5D, Expanded Ship Work Breakdown Structure, Vol I[6]

S9040-AA-IDX-020/SWBS 5D, Expanded Ship Work Breakdown Structure, Vol II[6]

S1.2 *Nongovernment Publications*—The following document(s) form a part of this guide to the extent specified herein. Unless otherwise specified, the issues of the documents, which are DOD adopted, are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see S4.1).

S1.2.1 *ANSI Document:*

X3.4 Code for Information Interchange[7]

NOTE S1—Nongovernment standards and other publications normally are available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.

S1.3 *Order of Precedence*—In the event of a conflict between the text of this guide and the references cited herein, the text of this guide takes precedence. Nothing in this guide, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

S2. Terminology

S2.1 *accepted ship report (ASR), n*—the ASR is the document that demonstrates the contractor's performance with regard to weight control. The ASR highlights the differences between the accepted weight estimate (AWE) or the allocated baseline weight estimate (ABWE) and the delivered ship as inclined.

S2.2 *accepted weight estimate (AWE), n*—the AWE defines the weight and centers of gravity of a ship that was awarded under a specification-type contract using the information that was available at the time of contract award. It establishes contractual values for weight and KG and is the baseline for detail design and construction.

S2.3 *acquisition margins, n*—acquisition margins are weight and KG allowances included in the weight estimate to cover the inherent limits of precision and the undefined variations of component weight and centers of gravity that take place throughout the design phases and during the construction of a ship. To provide for adequate weight control and configuration control, acquisition margins are divided into five accounts: preliminary design margin, contract design margin, detail design and building margin, contract modification margin, and government-furnished material (GFM) margin.

S2.4 *actual weight, n*—actual weight is the value obtained by a measurement of material on an accurate scale or other weighing device.

S2.5 *allocated baseline weight estimate (ABWE), n*—the ABWE is the contractor's definition of the weight and centers of gravity of a ship that was awarded under a performance-type contract at the time of hull and propulsion configuration approval. It is the baseline for detail design and construction.

S2.6 *baseline weight estimate (BWE), n*—the BWE is any designated weight estimate that is used as a starting point in a design phase for comparative analysis with subsequent weight estimates. Before contract award, the final estimate of each design phase is usually the baseline estimate for the succeeding phase. After contract award, the AWE or ABWE usually is the baseline estimate for the remainder of detail design and construction.

S2.7 *bidder's independent weight estimate (BIWE), n*—the bidder's (or offeror's) independent weight estimate is prepared by each potential contractor in response to a solicitation. It is the bidder's evaluation of the ship design based on the ship specifications, drawings, and data that comprise the contract package.

S2.8 *calculated weight, n*—calculated weight is weight computed from ship construction drawings and vendor drawings.

[5] Available from the Navy Ships Parts Control Center (SPCC), Code 709, Mechanicsburg, PA 17055.

[6] Available from Naval Sea Logistics Center, Code 623, PO Box 2060, Mechanicsburg, PA 17055-0795.

[7] Available from American National Standards Institute (ANSI), 25 W. 43rd St., 4th Floor, New York, NY 10036, http://www.ansi.org.

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S2.9 *capacity load condition (Condition E), n*—the capacity load condition is the ship complete and ready for service in every respect. It is light ship (Condition A) plus the following variable loads: maximum number of officers, crew, and passengers that can be accommodated and their effects; maximum stowage of ammunition in magazines and ready service spaces; full allowance of aircraft and vehicles (fully fueled with full allowance of repair parts and stores); maximum amount of provisions and stores that can be carried in the assigned spaces; and maximum capacity of liquids in tanks. Fuel and lube oil shall be not greater than 95 % of tank capacity, unless such tanks are compensating. Compensating tanks shall be considered filled with 95 % fuel and 5 % salt water. Maximum amounts of cargo and supplies, other than for ship's own use, shall be included to the full capacity of the assigned spaces. This load condition shall be not greater than the limiting drafts.

S2.10 *category, n*—category is a fundamental unit of machinery weight classification for nuclear-propelled ships in accordance with NAVSEA 0900-LP-039-9020.

S2.11 *category system, n*—category system is a system of machinery weight classification for nuclear-propelled ships in accordance with NAVSEA 0900-LP-039-9020.

S2.12 *contract data requirements list (CDRL) (DD Form 1423), n*—a CDRL is a contract form listing all data items selected from an authorized data list to be delivered under the contract. It includes the format, content, frequency, submittal, and distribution requirements.

S2.13 *contract design margin, n*—the contract design margin is a weight and KG allowance included in the weight estimate to account for increases associated with design development during the contract design phase. This margin is included in the feasibility and preliminary design phases. No portion of this margin is consumed before the start of contract design.

S2.14 *contract design weight estimates (CDWE), n*—the CDWE is the weight estimate of the light ship, full load, and any other specified loading condition prepared during the contract design phase.

S2.15 *contract modification margin, n*—the contract modification margin is a weight and KG allowance included in the weight estimates and reports to account for increases associated with contract modifications issued during the detail design and construction phase. This margin is included in the feasibility, preliminary, and contract design phases. For performance-type contracts, this margin is also included in detail design and building phase. No portion of this margin is consumed before award of the detail design and construction contract.

S2.16 *contract modification summary, n*—the contract modification summary is a complete listing of the weight and moment effects of approved contract changes. This information is included as an appendix to the quarterly weight reports, the accepted ship report, and the final weight report.

S2.17 *contractor-responsible condition, n*—the contractor-responsible condition is the full-load condition without the effects of contract modifications, changes in GFM, and other allowable changes after the establishment of the AWE or ABWE. This condition is used to measure the contractor's progress in achieving his requirement to deliver the ship within contractual values (see S3.3.4.6).

S2.18 *current weight, n*—current weight consists of the most accurate data available on the date of a given weight estimate or report. The summary of current weight is frequently a combination of estimated, calculated, and actual values.

S2.19 *design and weight data sheet, n*—the design and weight data sheet is a one-page summary that includes group level weight data, hull characteristics data, displacement, and stability characteristics data, load data, and machinery data.

S2.20 *detail design and building margin, n*—detail design and building margin is a weight and KG allowance included in the weight estimates and reports to account for design changes as a result of ship construction drawing development; growth of contractor-furnished material; omissions and errors in the AWE or ABWE, as well as differing shipbuilding practices, omissions and errors in the ship construction drawings; unknown mill tolerances; outfitting details; variations between the actual ship and its curves of form; and similar differences. This margin is to compensate for all contractor-responsible differences between the AWE or ABWE and the results of the inclining experiment, as well as tolerances for experimental variation in the inclining experiment. This weight and KG allowance is budgeted and included in the feasibility, preliminary, and contract design phases, but no portion of this margin is to be consumed before award of the detail design and construction contract. Values for these margins are to be selected by the offeror and included along with rationale for their basis in BIWEs or PABWEs. The final margin allowances are then subject to negotiation between the government and the contractor that was selected for detail design and construction. The design and building weight margin shall be located at the same center of gravity as the summation of weight groups one through seven.

S2.21 *electronic media, n*—electronic media is used to transfer detailed weight and moment data that complies with the Navy standard weight estimate format and is used by NAVSEA to prepare Navy weight estimates and reports (see Annex A1).

S2.22 *estimated weight, n*—estimated weight is based on preliminary data and is subject to revision when more accurate information is available, such as when more detailed drawings are developed or when components are actually weighed.

S2.23 *expanded ship work breakdown structure (ESWBS), n*—ESWBS is a five-digit functional classification system in accordance with NAVSEA S9040-AA-IDX-010/SWBS 5D and S9040-AA-IDX-020/SWBS 5D (Vol I and II). For weight reporting purposes, only the first three digits of this system apply. The fourth and fifth single digit classification levels are used to incorporate the functions that support maintenance and repair needs.

S2.24 *feasibility study weight estimate, n*—the feasibility study weight estimate is a compilation of the ship's weight and center of gravity data that result in light ship, full load, and any other specified loading conditions. This estimate is prepared during the feasibility study design phase.

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S2.25 *final weight report (FWR), n*—a FWR is a detailed final report of weight and moment data for all required loading conditions. This report accurately reflects accumulated values for estimated, calculated, and actual weight data for the detail design, including the net effect of changes to GFM and adjudicated and unadjudicated contract modifications.

S2.26 *full load condition (Condition D), n*—the full-load condition is the ship complete and ready for service in every respect. It is light ship (Condition A), plus the following variable loads: authorized complement of officers, crew, and passengers and their effects; full allowances of ammunition in magazines and ready service spaces; full allowance of aircraft and vehicles (fully fueled with full allowance of repair parts and stores); full supply of provisions and stores for the periods specified in the design characteristics; full potable water tanks; lube oil tanks to 95 % of capacity; fuel tanks to 95 % capacity, or in the case of compensating tanks, 95 % fuel and 5 % salt water; sewage collecting, holding, and transfer tanks to 25 % capacity; anti-roll tanks to operating levels; and all other liquids in tanks to required capacity in accordance with characteristics and liquid-loading instructions. The ammunition, stores, fuel, and other liquids referred to previously are for the ship's own use. Cargo (liquid and solid) is included in the amounts normally carried or to the specified portion of the full capacity of the assigned spaces.

S2.27 *government-furnished material (GFM) margin, n*—the GFM margin is a weight and KG allowance included in the weight estimates and reports to account for increases caused by the growth in GFM during the detail design and construction phase. This margin is included in the feasibility, preliminary, and contract design phases. For performance-type contracts, this margin is also included in detail design and building phase. No portion of this margin is consumed before award of the detail design and construction contract.

S2.28 *government-furnished material summary, n*—the GFM summary is a complete listing of weight and center of gravity data for material and equipment that will be provided by the government. The baseline GFM summary, which is included as part of the AWE or ABWE, reflects the Schedule A portion of the contract at the time of contract award. The GFM summary is continuously updated as the detail design weight estimates mature and the Schedule A is modified. Also, where the contract permits, the GFM summary can include other government-responsible equipment, such as equipment designated as standard for the class, directed procurement, and so forth.

S2.29 *group, n*—group is a fundamental unit of ship classification, identified by one numeric digit or an alphabetic designator. For weight estimates and reports, a group is the first character of the three-digit system. The summation of weights and moments for all of the three-digit elements that begin with the number one is the total for Group one, and similarly for the other groups.

S2.30 *gyradius, n*—the gyradius for roll, pitch, or yaw is the square root of the quotient of the ship's weight moment of inertia about the roll, pitch, and yaw axes, respectively, divided by the ship's displacement.

S2.31 *inch-pound units, n*—inch-pound units comprise a system of units using pounds, long tons, ft, ft-lbs, and ft-tons for reporting mass properties data. These weight and moment data are carried to the nearest pound and ft-lb at all detail levels. In addition, summaries are converted and reported to the nearest one-hundredth of a long ton and to the nearest ft-ton. All levers are carried to the nearest one-hundredth of a foot.

S2.32 *KG, n*—KG is defined as the height of the ship's vertical center of gravity as measured from the bottom of the keel (includes keel thickness). When using SI units, care must be taken not to confuse the naval architectural symbol KG, in uppercase letters, with the SI symbol, kg, in lowercase letters (which represents the SI unit kilogram).

S2.33 *light ship condition (Condition A), n*—the light ship condition is the ship complete, ready for service in every respect, including permanent solid and liquid ballast, onboard repair parts, and liquids in machinery at operating levels, without any items of variable load.

S2.34 *longitudinal lever, n*—the longitudinal lever is the perpendicular distance from a transverse plane through the ship's longitudinal reference to the center of gravity of an item. The longitudinal reference is located at the forward perpendicular, unless otherwise specified by the design contract or Ship Specification Section 096.

S2.35 *mass properties data, n*—mass properties data are those physical characteristics that define the magnitude, location, and distribution of weight in the ship. They include weight, centers of gravity location, moments, and weight moments of inertia.

S2.36 *metric units, n*—metric units comprise a system of basic measures that are defined by the International System of Units based on "Le Systeme International d'Unites (SI)" of the International Bureau of Weights and Measures.

S2.37 *moment, n*—a moment is the product of a weight and its lever. For example, the longitudinal moment of an item is the product of the weight of the item multiplied by its longitudinal lever.

S2.38 *percent completion, n*—percent completion is the ratio of the current weight, less the current estimated weight, to the current weight, expressed as a percentage.

S2.39 *performance-type contract, n*—a performance-type contract is the vehicle for ship acquisition resulting from a description of operational and mission requirements. Since the shipbuilder usually has substantial latitude in determining ship size and configuration, a PABWE or ABWE is used in this situation.

S2.40 *pitch moment of inertia, n*—moment of inertia about the transverse axis through the ship's center of gravity.

S2.41 *preliminary allocated baseline weight estimate (PABWE), n*—the PABWE is the potential bidder's (or offeror's) estimate of the weight and center of gravity of the ship in response to a solicitation for a performance-type contract.

S2.42 *preliminary design margin, n*—preliminary design margin is a weight and KG allowance included in the weight estimates to account for increases associated with design development during the preliminary design phase. This margin is included in the feasibility design phase. No portion of this margin is consumed before the start of preliminary design.

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S2.43 *preliminary design weight estimate, n*—preliminary design weight estimate is the weight estimate of the light ship, full load, and any other specified load condition prepared during the preliminary design phase.

S2.44 *quarterly weight report (QWR), n*—a QWR is a periodic assessment of displacement, drafts, trim, list, GM, and KG as the weight estimate matures during detail design and construction.

S2.45 *roll moment of inertia, n*—moment of inertia about the longitudinal axis through the ship's center of gravity.

S2.46 *service life allowances, n*—service life allowances are weight and KG budgets included in the design to accommodate changes as a result of both authorized (for example, ship alterations) and unplanned growth (for example, paint, personal belongings, and so forth) during the ship's operational lifetime, which tends to increase displacement and impact stability.

S2.47 *SI units (International System of Units), n*—SI units (see Practice F1332) comprise a system of units using kilograms (kg), metric tons, metres (m), kg/m, and metric ton-m for reporting mass properties data. All levers are carried to the nearest one-hundredth of a m. The weight and moment data are carried to the nearest kg and kg/m at all detail levels. In addition, summaries are converted and reported to the nearest one-hundredth of a metric ton and to the nearest metric ton-m.

S2.48 *specification-type contract, n*—a specification-type contract is the vehicle for ship acquisition resulting from a Navy controlled contract design. The products of the contract design, which usually become part of the shipbuilding contract and therefore the basis for the BIWE, include items such as: midship section drawing, lines drawing, table of offsets, general arrangement drawings, the shipbuilding specifications, and special requirements like not-to-exceed weight and KG values.

S2.49 *standard longitudinal station breakdown, n*—the standard longitudinal station breakdown is a system consisting of 22 stations designated by the letters A through X (excluding I and O). Station A is the only station forward of the forward perpendicular (FP). Station X is the only station aft of the aft perpendicular (AP). Stations B through W extend from the FP to the AP, and each comprises 1/20 of the length between perpendiculars.

S2.50 *three-digit system, n*—The three-digit system is a means of classifying mass properties data in a structured order. Every item that comprises the completed ship is included in the weight estimates and reports grouped in accordance with the three-digit system. Unless otherwise specified, the three-digit system for weight estimates and reports is the same as the first three digits of the ESWBS. An example of this numerical ordering is shown in Fig. S2.1.

UNCLASSIFIED

SHIP USS SAMPLE — WEIGHT AND MOMENT ESTIMATE — REPORT NO. 01

PREPARED BY 55W2 — INCH-POUND UNITS POUNDS, TONS, FEET — 3 JANUARY 1989

LONGITUDINAL REFERENCE IS –250.00 FROM MID PERPENDICULAR — SHEET 15

NAVY GROUP	C ITEM	S T A	DM	DESCRIPTION		UNIT WEIGHT	NO. UNITS	CURRENT WEIGHT	E C A	VERTICAL VCG	VERTICAL MOMENT	LONGITUDINAL LCG S	LONGITUDINAL MOMENT	TRANSVERSE TCG S	TRANSVERSE MOMENT	RCG EHF SGM	R P T
3				ELECTRIC PLANT													
31100	0	A		SHIPS SERVICE PWR GEN.	205186												
31100	10	N		SSTG GEN 2 ENG RM 2 #81	67750	67750.00	1	67750.C		19.01	1287928.	277.47A	18798592.	8.05S	–545388.	E3G02	
31100	20	S		SSTG GEN 3 GEN RM #82	67750	67750.00	1	67750.C		20.83	1411233.	394.05A	26696886.	4.12P	279130.	E3G02	
31100	30	G		SSTG GEN 1 AMR 1 #80	67750	67750.00	1	67750.C		10.50	711375.	149.95A	10159112.	2.30P	155825.	E3G02	
31100	40	H		SCAVENGE PUMP & AIR SEAL AMR#1		140.00	1	140.E		11.00	1540.	150.70A	21098.	2.30P	322.	M	01
31100	50	N		SCAVENGE PUMP & AIR SEAL ENG RM2		300.00	2	600.E		22.00	13200.	284.75A	170850.	12.50P	7500.	M	01
31100	60	M		SPARE BATTERIES FOR NBPS		51.00	1	51.E		34.50	1760.	259.00A	13209.	22.00P	1122.		01
31100	70	Q		ENCLOSED BATTERY RACK		100.00	1	100.E		17.25	1725.	326.00A	32600.	0.00	0.		01
31100	80	Q		BATTERIES		55.00	1	55.E		17.25	949.	326.00A	17930.	0.00	0.		01
31100	90	Q		BATTERY CHARGER		90.00	1	90.E		18.25	1643.	326.00A	29340.	0.00	0.		01
31100	100	K		MONORAIL		800.00	1	800.E		50.00	40000.	215.00A	172000.	13.00S	–10400.		01
31100	110	F		ENCLOSED BATTERY RACK		100.00	1	100.E		8.50	850.	103.00A	10300.	0.00	0.		01
				SUBTOTAL- POUNDS				205186.			3472201.		56121920.		–111889.		
				SUBTOTAL- TONS				91.60		16.92	1550.	273.52A	25054.	0.55S	–50.		
311				SHIPS SERVICE POWER GENERATION													
				GROUP TOTAL- POUNDS				205186.			3472201.		56121920.		–111889.		
				GROUP TOTAL- TONS				91.60		16.92	1550.	273.52A	25054.	0.55S	–50.		

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Note: Inch-pound units are shown in example, however SI units are applicable when specified.

FIG. S2.1 Example of a Three-Digit System Format

SAMPLE

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S2.51 *transverse lever, n*—transverse lever is the perpendicular distance from the vertical centerline plane of the ship to the center of gravity of an item.

S2.52 *vertical lever, n*—vertical lever is the perpendicular distance from a horizontal plane through the molded baseline of the ship to the center of gravity of an item.

S2.53 *weight control, n*—weight control is all of the necessary actions, such as predicting, estimating, calculating, weighing, reporting, analyzing, evaluating, and reversing adverse trends to ensure that a ship's weight and moments are consistent with its naval architectural limits for displacement, strength, stability, list, trim, and performance, such as speed, endurance, and seakeeping.

S2.54 *weight control plan, n*—a weight control plan outlines the procedures that will be followed to meet contractual weight control responsibilities (see S3.3.3.5).

S2.55 *weight distribution, n*—a weight distribution is a weight summary by the standard longitudinal station breakdown and is used to develop shear forces and bending moments.

S2.56 *weight moment of inertia, n*—weight moment of inertia about any reference axis through the ship's center of gravity is the summation of the moment of inertia of each item about its own axis (parallel to the reference inertia axis), plus the products obtained by multiplying the weight of each item by the square of its distance from the reference inertia axis (see S3.3.2.3).

S2.57 *weight reporting, n*—weight reporting is the preparation and submission of the most accurate and current weight and moment data available at designated intervals throughout the design and construction phases.

S2.58 *yaw moment of inertia, n*—moment of inertia about the vertical axis through the ship's center of gravity.

S3. Procedures

S3.1 *General Report Requirements*—The contract will invoke this guide and specify technical data to be prepared, including modifications and exceptions. The CDRL will specify requirements for deliverables, such as data to be submitted, frequency of submission, number of copies, and recipients. The general requirements for the weight estimates and reports listed in this standard are specified in S3.1.1 through S3.2. The interface of weight estimates and reports is depicted in Fig. S3.1.

S3.1.1 *Loading Conditions*—Weight estimates and reports shall contain loading conditions for light ship, full load, and contractor responsibility, unless otherwise specified by the contract. The light ship condition includes a summary of

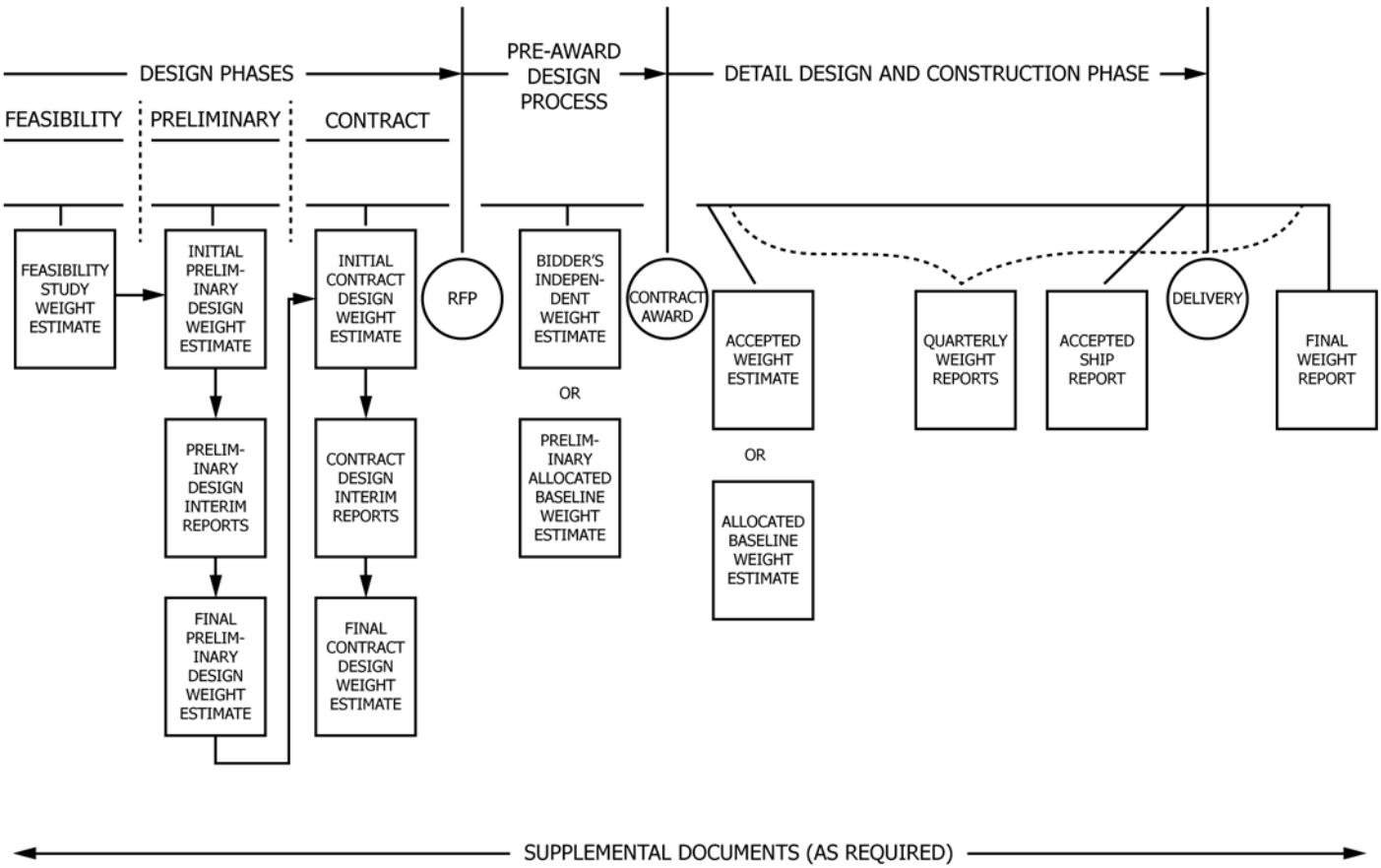

FIG. S3.1 Interface of Weight Reporting During Design and Construction

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one-digit groups and the remaining acquisition margin. These values are combined to result in the light ship weight, centers of gravity, and associated moments. The light ship condition in the FWR shall be adjusted to correlate with inclining experiment data. Building margin is used to account for irreconcilable differences between the FWR and the inclining experiment. Building margin is the only acquisition margin account that is permitted in the FWR. Other margin accounts, such as detail design margin, will either be fully depleted or if remainders exist they should be deleted from the FWR. The full-load condition is computed by adding specified items of variable load to the light ship condition and reflects the actual ship that is planned for delivery. The contractor-responsible condition is the full-load condition without the effect of contract modifications, both adjudicated and unadjudicated; the net weight change and associated moment changes from baseline values of current GFM items that were included in the original Schedule A or were subsequently added to Schedule A through a change in acquisition responsibility; and other allowable changes beyond the control of the contractor (see S3.3.4.6). This condition is used to assess contractual performance. In addition to the total weight, centers of gravity, and associated moments, each loading condition also shall display KG, metacentric height (uncorrected and corrected for the free surface effect of liquids in tanks), list, trim, and drafts above the bottom of the keel at the perpendiculars and midship. Figs. S3.2-S3.4 provide examples of typical loading conditions.

S3.1.2 *Margins*—Acquisition margins shall be included in the estimates and reports. Throughout the design cycle, the appropriate margin account shall be adjusted concurrently to compensate for departures from the original estimates. This computation permits the maintenance of a constant design baseline until the budgeted margin account is exceeded. Weight margins shall be located at the same centers of gravity as the ESWBS current one-digit totals. Fig. S3.5 provides a typical example.

S3.1.3 *Reasons for Changes*—Weight estimates and reports shall include an addendum that explains each cause of significant change in weight or moment within every three-digit element. Unless otherwise specified, a significant change is a 1 % or greater difference from an element's previous estimate. A brief narrative of the ship's condition relative to its naval architectural or contractual limits shall be included in this section. If any of these limits is in jeopardy, recommendations for reversing the adverse trend are also required.

S3.1.4 *Table of Contents*—The estimates and reports shall contain a table of contents.

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SHIP USS SAMPLE — WEIGHT AND MOMENT ESTIMATE — REPORT NO. 01

PREPARED BY 55W2 — INCH-POUND UNITS POUNDS, TONS, FEET — 3 JANUARY 1989

LONGITUDINAL REFERENCE IS -250.00 FROM MID PERPENDICULAR — SHEET 2M

NAVY GROUP	DESCRIPTION		PERCENT COMPLETE EST.	CALC.	ACTUAL	CURRENT WEIGHT	VERTICAL VCG	MOMENT	LONGITUDINAL LCG S	MOMENT	TRANSVERSE TCG S	MOMENT
	SUMMARY LIGHTSHIP CONDITION WITH MARGINS											
	GROUPS 1 - 7		100	0	0	6608.29	26.68	176303.	229.34A	1515522.	0.02S	−111.
M	MARGINS	WEIGHT	100	0	0	264.33	26.68	7052.	229.34A	60621.	0.02S	−4.
		VCG					1.07	7334.				
	GROUPS 1 - 7 WITH MARGINS					6872.62	27.75	190689.	229.34A	1576143.	0.02S	−116.
L	LOADS		100	0	0	0.00	0.00	0.	0.00	0.	0.00	0.
	LIGHT SHIP CONDITION		100	0	0	6872.62	27.75	190689.	229.34A	1576143.	0.02S	−116.

NOTE: ALL OF THE FOLLOWING QUANTITIES (EXCEPT AS NOTED) ARE REFERENCED FROM 250.00 FEET FWD OF THE MID PERPENDICULAR, THE CENTER LINE, AND THE BASE LINE.

1. LENGTH BETWEEN PERPENDICULARS	500.00	FEET
2. BOTTOM OF KEEL BELOW BASE LINE	0.06	FEET
3. C.G. ABOVE BOTTOM OF KEEL . .	27.81	FEET
4. C.G. ABOVE BASE LINE . . .	27.75	FEET
5. DRAFT AT L.C.F. FOR ABOVE DISP.	17.98	FEET
6. TONS PER INCH IMMERSION . .	48.55	TONS/INCH
7. TRANSVERSE METACENTER (KEEL) .	28.80	FEET
8. GM, WITHOUT FREE SURFACE CORR.	0.99	FEET
9. FREE SURFACE CORRECTION .	0.00	FEET
10. GM, WITH FREE SURFACE CORR. .	0.99	FEET
11. MOMENT TO ALTER HEEL ONE DEGREE	119.20	FOOT-TONS
12. LIST	0.97	DEGREES STBD
13. MOMENT TO ALTER TRIM ONE INCH	1283.88	FOOT-TONS
14. L.C.B. ON EVEN KEEL AT ABV DRAFT	246.93	FEET AFT
15. LONGITUDINAL CENTER OF GRAVITY	229.34	FEET AFT
16. TRIMMING LEVER	17.59	FEET FWD
17. TRIM	7.85	FEET BY HEAD
18. L.C.F.	270.77	FEET AFT
19. DIFF IN DRAFT, L.C.F. TO MIDSHIP	0.33	FEET INCREASE
20. DRAFTS:		
FORWARD PERPENDICULAR . .	22.24	FEET
MEAN	18.31	FEET
AFT PERPENDICULAR . . .	14.39	FEET
21. DESIGNED DRAG	0.00	FEET

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Note: Inch-pound units are shown in example, however SI units are applicable when specified.

EXAMPLE

FIG. S3.2 Example of Light Ship Condition Format

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SHIP USS SAMPLE — WEIGHT AND MOMENT ESTIMATE — REPORT NO. 01

PREPARED BY 55W2 — INCH-POUND UNITS POUNDS, TONS, FEET — 3 JANUARY 1989

LONGITUDINAL REFERENCE IS -250.00 FROM MID PERPENDICULAR — SHEET 1M

NAVY GROUP	DESCRIPTION		PERCENT COMPLETE EST.	CALC.	ACTUAL	CURRENT WEIGHT	VERTICAL VCG	VERTICAL MOMENT	LONGITUDINAL LCG S	LONGITUDINAL MOMENT	TRANSVERSE TCG S	TRANSVERSE MOMENT
	SUMMARY FULL LOAD CONDITION WITH MARGINS											
	GROUPS 1 - 7		100	0	0	6608.29	26.68	176303.	229.34A	1515522.	0.02S	–111.
M	MARGINS	WEIGHT	100	0	0	264.33	26.68	7052.	229.34A	60621.	0.02S	–4.
		VCG					1.07	7334.				
	GROUPS 1 -7 WITH MARGINS					6872.62	27.75	190689.	229.34A	1576143.	0.02S	–116.
F	LOADS, FULL		100	0	0	1674.07	11.33	18973.	258.54A	432809.	0.16P	264.
	FULL LOAD CONDITION WITH MARGINS		100	0	0	8546.69	24.53	209662.	235.06A	2008952.	0.02P	148.

NOTE: ALL OF THE FOLLOWING QUANTITIES (EXCEPT AS NOTED) ARE REFERENCED FROM 250.00 FEET FWD OF THE MID PERPENDICULAR, THE CENTER LINE, AND THE BASE LINE.

1.	LENGTH BETWEEN PERPENDICULARS	500.00	FEET
2.	BOTTOM OF KEEL BELOW BASE LINE	0.06	FEET
3.	C.G. ABOVE BOTTOM OF KEEL . .	24.59	FEET
4.	C.G. ABOVE BASE LINE . . .	24.53	FEET
5.	DRAFT AT L.C.F. FOR ABOVE DISP.	20.75	FEET
6.	TONS PER INCH IMMERSION . .	51.68	TONS/INCH
7.	TRANSVERSE METACENTER (KEEL) .	29.00	FEET
8.	GM, WITHOUT FREE SURFACE CORR.	4.41	FEET
9.	FREE SURFACE CORRECTION .	0.16	FEET
10.	GM, WITH FREE SURFACE CORR. .	4.25	FEET
11.	MOMENT TO ALTER HEEL ONE DEGREE	633.76	FOOT-TONS
12.	LIST	0.23	DEGREES PORT
13.	MOMENT TO ALTER TRIM ONE INCH	1453.19	FOOT-TONS
14.	L.C.B. ON EVEN KEEL AT ABV DRAFT	251.96	FEET AFT
15.	LONGITUDINAL CENTER OF GRAVITY	235.06	FEET AFT
16.	TRIMMING LEVER	16.90	FEET FWD
17.	TRIM	8.28	FEET BY HEAD
18.	L.C.F.	273.31	FEET AFT
19.	DIFF IN DRAFT, L.C.F. TO MIDSHIP	0.39	FEET INCREASE
20.	DRAFTS:		
	FORWARD PERPENDICULAR . .	25.28	FEET
	MEAN	21.14	FEET
	AFT PERPENDICULAR . . .	17.00	FEET
21.	DESIGNED DRAG	0.00	FEET

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Note: Inch-pound units are shown in example, however SI units are applicable when specified.

EXAMPLE

FIG. S3.3 Example of Full-Load Condition Format

S3.1.5 *Special Coding*—An explanatory note and remarks section shall be included to define special coding symbols, such as material codes, GFM indicators, and reasons for change indicators.

S3.1.6 *Lever Symbol*—Vertical levers shall be indicated by a "–" for below the baseline and a "+" or a blank for above the baseline. Longitudinal levers shall be indicated by an "F" or a "–" for forward of the reference plane and an "A," a "+," or a blank for aft of the reference plane. Transverse levers shall be indicated by a "P," a "+," or a blank for port and an "S" or a "–" for starboard.

S3.1.7 *Reporting System Units*—Estimates, reports, and other specified mass properties documentation and data shall be reported in either inch-pound or metric units as specified in the contract.

S3.1.8 *Paper*—Estimates and reports shall be machine written on 8½- by 11-in. paper, and protected by hard covers, but not permanently bound. The original or reproducible copy shall be suitable for microfilming.

S3.1.9 *Supporting Documents*—Background information, studies, directives, correspondence, and all detail calculations pertaining to weight and moment data, including density factors, shall be made available to the Navy upon request.

S3.2 *Classified Reports*—Weight reports containing classified data shall be marked in accordance with the security requirements contained in the contract. Whenever possible, classified or proprietary material shall be downgraded by deleting classified or proprietary portions that do not impair the usefulness of the document.

S3.3 *Detailed Requirements:*

S3.3.1 *Predetail Design Phase*—Estimates, reports, and supplemental documents for these design phases shall be prepared in accordance with S3.3.1.1 through S3.3.2.10, as applicable, unless otherwise specified.

S3.3.1.1 *Weight Estimates and Reports*—Weight estimates and reports prepared during these phases consist of baseline weight estimates, interim reports, and final design weight estimates. These estimates and reports contain detailed information appropriate to the design phase, loading conditions for light ship and full load, and are summarized in tabular form as follows:

(1) Three-digit system number and title.
(2) Current weight.
(3) Current vertical lever.
(4) Current vertical moment.
(5) Current longitudinal lever.
(6) Current longitudinal moment.
(7) Current transverse lever.
(8) Current transverse moment.

The mass properties data included in these estimates and reports are based on the engineering products available before the date of the document.

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Full document details: ASTM F1808-03(2019)

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SHIP USS SAMPLE — WEIGHT AND MOMENT ESTIMATE — REPORT NO. 01

PREPARED BY 55W2 — INCH-POUND UNITS POUNDS, TONS, FEET — 3 JANUARY 1989

LONGITUDINAL REFERENCE IS –250.00 FROM MID PERPENDICULAR — SHEET 1M

NAVY GROUP	DESCRIPTION	PERCENT COMPLETE EST.	CALC.	ACTUAL	CURRENT WEIGHT	VERTICAL VCG	MOMENT	LONGITUDINAL LCG S	MOMENT	TRANSVERSE TCG S	MOMENT
	SUMMARY										
	CONTRACTOR RESPONSIBLE CONDITION										
	FULL LOAD	100	0	0	8546.69	24.53	209662.	235.06A	2008952.	0.02P	148.
	EFFECT OF CON NODS	100	0	0	–15.00	30.13	–452.	265.98A	–3990.	2.37S	36.
	EFFECT OF GFM WEIGHT CHANGES	100	0	0	–6.25	23.04	–144.	135.36A	–846.	0.80P	–5.
	EFFECT OF CLASS-STANDARD EQPT	100	0	0	–20.00	18.28	–366.	295.74A	–5915.	0.18P	–4.
	CONTRACTOR RESPONSIBLE CONDITION	100	0	0	8503.79	24.53	208623.	234.93A	1997772.	0.02P	176.

NOTE: ALL OF THE FOLLOWING QUANTITIES (EXCEPT AS NOTED) ARE REFERENCED FROM 250.00 FEET FWD OF THE MID PERPENDICULAR, THE CENTER LINE, AND THE BASE LINE.

1. LENGTH BETWEEN PERPENDICULARS 500.00 FEET
2. BOTTOM OF KEEL BELOW BASE LINE 0.06 FEET
3. C.G. ABOVE BOTTOM OF KEEL . . . 24.59 FEET
4. C.G. ABOVE BASE LINE . . . . . 24.53 FEET
5. DRAFT AT L.C.F. FOR ABOVE DISP . . 20.69 FEET
6. TONS PER INCH IMMERSION . . . . 51.62 TONS/INCH
7. TRANSVERSE METACENTER (KEEL) . 29.00 FEET
8. GM, WITHOUT FREE SURFACE CORR . 4.41 FEET
9. FREE SURFACE CORRECTION . 0.16 FEET
10. GM, WITH FREE SURFACE CORR. . 4.25 FEET
11. MOMENT TO ALTER HEEL ONE DEGREE 630.34 FOOT-TONS
12. LIST . . . . . 0.28 DEGREES PORT
13. MOMENT TO ALTER TRIM ONE INCH 1450.17 FOOT-TONS
14. L.C.B. ON EVEN KEEL AT ABV DRAFT 251.85 FEET AFT
15. LONGITUDINAL CENTER OF GRAVITY 234.93 FEET AFT
16. TRIMMING LEVER . . . . . 16.92 FEET FWD
17. TRIM . . . . . 8.27 FEET BY HEAD
18. L.C.F . . . . . 273.30 FEET AFT
19. DIFF IN DRAFT, L.C.F. TO MIDSHIP 0.39 FEET INCREASE
20. DRAFTS:
    FORWARD PERPENDICULAR . . 25.22 FEET
    MEAN . . . . . 21.08 FEET
    AFT PERPENDICULAR . . . . . 16.95 FEET
21. DESIGNED DRAG . . . . . 0.00 FEET

Note: Inch-pound units are shown in example, however SI units are applicable when specified.

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EXAMPLE

FIG. S3.4 Example of Contractor-Responsible Condition Format

S3.3.1.2 *Baseline Weight Estimates*—The initial estimate for a given design phase is designated the baseline weight estimate. The baseline weight estimate consists of the light ship, full load, and any other specified loading condition. The estimate shall be titled Baseline Preliminary or Baseline Contract Design Weight Estimate. The requirements for the estimate are as specified in S3.3.1.1.

S3.3.1.3 *Interim Reports*—Weight estimates produced at specified intervals during a given design phase are designated interim weight reports. The interim report summarizes the current weight and moment status of the design and highlights any changes that occurred during the reporting period. The report shall contain the light ship, full load, and any other specified loading condition. It also shall reflect the appropriate title, such as Preliminary Design Interim Report No. 2. Fig. S3.6 and Fig. S3.7 provide typical examples. In addition to the requirements specified in S3.3.1.1, the report shall contain the following:

(1) Previous design phase group level summary.

(2) Previous report group level summary.

(3) Current group level estimate, and when required, the element level estimate and longitudinal weight distribution data.

(4) Net change, by group and total, between (*1*) and (*3*).

(5) Net change, by group and total, between (*1*) and (*3*).

(6) The current status of margins, loads, full-load displacement, KG, list, and trim. The changes corresponding to the total net change calculated for (*4*) and (*5*) shall be shown for margins, loads, and full-load displacement.

(7) A brief narrative providing rationale for any significant changes since the previous report and classified by the groups in which the changes occurred.

S3.3.1.4 *Final Design Weight Estimate*—The final estimate produced during a design phase is designated as the final design weight estimate. This estimate will reflect the final weight and moment data for light ship, full load, and any other specified loading condition. The estimate shall be titled Final Preliminary or Final Contract Design Weight Estimate. The requirements for the estimate are specified in S3.3.1.1 and S3.3.1.3.

S3.3.2 *Supplemental Documents*—The supplemental documents specified in S3.3.2.1 through S3.3.2.10 shall provide additional information and background data required during the preliminary/contract design phases.

S3.3.2.1 *Weight and Moment Trade-Off Studies*—These studies consist of determining the mass properties impact of various configuration change proposals and engineering alternatives that are being considered for inclusion in the design. The studies are delivered on an "as requested" basis and contain detailed mass properties calculations that include the

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SHIP USS SAMPLE — WEIGHT AND MOMENT ESTIMATE — REPORT NO. 01

3 JANUARY 1989

PREPARED BY 55W2 — INCH-POUND UNITS POUNDS, TONS, FEET

LONGITUDINAL REFERENCE IS –250.00 FROM MID PERPENDICULAR — SHEET 26

NAVY GROUP	C ITEM	S T A	DM	DESCRIPTION	UNIT WEIGHT	NO. UNITS	CURRENT WEIGHT	E C A	VERTICAL VCG	VERTICAL MOMENT	LONGITUDINAL LCG S	LONGITUDINAL MOMENT	TRANSVERSE TCG S	TRANSVERSE MOMENT	RCG R EHF P SGM T
M				DESIGN AND BUILDING MARG											
M1200	0	*		DESIGN AND BUILDING MARGIN											
M1200	10	0		WEIGHT MARGIN	4.00		592102.		26.68	15796738.	229.34A	135790800.	–0.02S	–9976.	
M1200	20	0		VCG MARGIN	0.00	4.0	0.		0.00	16428606.	0.00	0.	0.00	0.	
				SUBTOTAL-POUNDS			592102.			32225344.		135790800.		–9976.	
				SUBTOTAL-TONS			264.33		54.43	14386.	229.34A	60621.	0.02S	–4.	
M12				DESIGN AND BUILDING MARGIN											
				GROUP TOTAL-POUNDS			592102.			32225344.		135790800.		–9976.	
				GROUP TOTAL-TONS			264.33		54.43	14386.	229.34A	60621.	0.02S	–4.	

Note: Inch-pound units are shown in example, however SI units are applicable when specified.

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EXAMPLE

FIG. S3.5 Example of Margins Format

impact of the study on ship displacement, KG, list, and trim. There is no fixed format for the completed study, but the ESWBS classification system shall be used to structure and summarize the data.

S3.3.2.2 *Weight Distribution Report*—A longitudinal weight distribution shall be provided in a tabulated format in accordance with the standard longitudinal station breakdown. Weight and longitudinal center of gravity shall be determined for each ship station for both light ship and full-load condition. The resultant total weight and longitudinal center of gravity for the weight distribution report for each condition shall equal the values reflected in the weight estimate or report for the same condition in that reporting period.

S3.3.2.3 *Weight Moment of Inertia*—When specifically required by the contract, weight moment of inertia data shall be included for the full-load condition. Current weights, centers of gravity, and engineering information describing the shape and orientation of each data element shall be used to develop weight moment of inertia data. The minimum data required are as follows:

(1) Ship-oriented roll, pitch, and yaw weight moments of inertia about each individual data element's centroidal axes.

(2) Ship-oriented roll, pitch, and yaw weight moments of inertia about the ship's centroid in the full-load condition.

S3.3.2.4 *Ship Specification Sections*—Ship specification sections shall define the requirements of the weight control program and the range of acceptable trim and list limit values that are to be invoked upon the shipbuilder. Deviations from this standard, such as special loading conditions, reporting units, or margins, shall be defined clearly. The format for the specification sections will be provided by NAVSEA.

S3.3.2.5 *Circular of Requirements Sections*—These sections shall provide the weight control requirements when a performance-type contract is used. The content of these sections shall be similar to S3.3.2.4, with the addition of service-life allowance quantities.

S3.3.2.6 *Contract Data Requirements List (CDRL)*—A CDRL will be developed that itemizes the data deliverables that shall be required by the ship acquisition contract. The portion of the CDRL that contains weight estimates, reports, and supplemental documents shall be generated during the contract design phase (see S4.2).

S3.3.2.7 *Solicitation Input*—A request for proposals or similar document shall be prepared that describes the ship design to potential shipbuilders and defines the format for submitting a bid or making an offer. The following portions of the solicitation package that pertain to weight control shall be generated during contract design:

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USS SAMPLE WEIGHT AND C.G. DESIGN MARGIN STATUS
PRELIMINARY/CONTRACT DESIGN - INTERIM REPORT

A. WEIGHT:

	Item	Contract Design Baseline 10/7/88	Last Report 12/2/88	Current Report	Change From BL	Change From Last Report
1.	GROUPS 1–7	6084.9	6123.1	6148.4	(+) 63.5	(+) 25.3
2.	a. P.D. Margin	0.0	0.0	0.0	0.0	0.0
	b. C.D. Margin	76.9	46.4	**35.6**	(–) 41.3	(–) 10.8
3.	D & B Margins	392.1	392.1	392.1	0.0	0.0
4.	Loads	1874.4	1870.9	1839.2	(–) 35.2	(–) 31.7
5.	Projected Delivery	8428.3	8432.5	**8415.3**	(–) 13.0	(–) 17.2

6. Limits:

Speed	9400
Strength	**9370**
Subdivision	9426
"V" Lines	9500

SERVICE LIFE DISPLACEMENT ALLOWANCE:

7.	Required	**841**
8.	Available at Projected Delivery	**955**

B. CENTER OF GRAVITY - CURRENT STATUS:

			KG	List	Trim
1.	GROUPS 1-7	26.26	26.24	2.95° (P)	0.33' (A)
2.	a. P.D. Margin	0.00	**0.00**		
	b. C.D. Margin	0.28	**0.30**		
3.	D & B Margins	1.00	1.00		
4.	Projected Delivery (Light Ship)		27.54		
5.	Projected Delivery (Full Load)		**23.96**	0.37° (P)	0.77' (A)

LIMITS:	ALLOWABLE KG	LIST	TRIM
	25.32	**0.50° P/S**	**1.5' (A)/0.5'(F)**

SERVICE LIFE KG ALLOWANCE:

6.	Required	**1.00**
7.	Available at Projected Delivery	**1.36**

Note: Inch-pound units are shown in example, however SI units are applicable when specified.

EXAMPLE

FIG. S3.6 Example of Interim Report Format (page 1)

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