

Contracts and Specifications

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9.1 INTRODUCTION TO SHIPBUILDING CONTRACTS

9.1.1 Decisions Required for a Shipbuilding Contract

A contract for the construction of one or more vessels is the logical outcome of a decision by a shipowner to acquire the new ship(s) to further the objectives of the organization. Possible objectives include: a favorable return on investment; a public service (ferries, search and rescue, etc.); a captive transportation link as a component in a larger logistics system; a military or security capability; environmental monitoring and preservation; scientific research; an recreation (cruise vessels and large yachts); among other objectives of ship owning organizations.

Once the decision to acquire the new ship is made, multiple follow-on decisions are necessary. Many of those decisions are reflected in the technical specifications and plan or drawings, which define the physical ship that will satisfy the requirements of the shipowner. The development of those technical requirements in the form of Contract Specifications and Contract Plans is discussed at length in Section 9.3.

However, many non-technical decisions are needed also (see Chapters 4 and 10). Some of the non-technical decisions involve selecting a naval architectural firm to develop the technical requirements; the extent to which the design will be developed by the shipowner; the identification of qualified shipyards that will be invited to submit bids or proposals; the format of the request for proposals or invitation to bid; the flag of registry for the completed ship; and

the classification of organization that will be involved during design development and construction. In addition to those decisions, the shipowner's organization must select:

- the means of financing the construction of the ship
- the means of financing the mortgage for the complete ship,
- the basis of comparison of offers or bids from several shipbuilders,
- a shipbuilder from among the responsive bidders,
- the format of the shipbuilding contract, and
- other non-technical decisions that need to be made just to initiate the acquisition process.

There are *hazards* associated with each such non-technical decision, which hazards are in the form of risks associated with the relevant experience of the naval architect, the locale of the shipbuilder, the applicable law, financial guarantees, and the relevant experience of the shipowner's staff that is managing the ship acquisition process, among other factors. The process of developing the contract for ship construction and the letting of the contract by the shipowner is, accordingly, an orderly sequence of risk evaluation at each step along the way, followed by action that minimizes the relevant risks or considers other factors if a slightly greater risk is found acceptable.

For example, from a shipowner's perspective, retaining a naval architectural firm that has designed and similar vessels may present a lesser risk than utilizing the services of one that has only designed other forms of vessels, though the risk differential may be minimal. An adverse outcome

of such risk may be the need to negotiate a Change Order to achieve a partial rearrangement of several items to enhance operating efficiency, based on the operator's experience, which experience was not appreciated by the naval architects for whom this was their initial design of this ship type. If the shipyard is accomplishing that level of design, the shipowner may be similarly concerned about the experience of the shipyard's design staff.

The decision as to how much of the design is to be developed by the shipowner's naval architects and design engineers, and how much design development responsibility is to be assigned to the shipyard, is an important one. For certain vessel types, such as tankers and bulk carriers, shipyards may offer standard designs at attractive prices. Shipowners must recognize that such standard designs are generally optimized from the shipyard's production perspective, and may not result in the best operational, economic and maintenance considerations from the shipowner's perspective.

The considerations and process leading to those non-technical decisions are almost always unique to each ship owning organization, thus precluding the possibility of a comprehensive discussion of them. Consequently, while this chapter will occasionally refer to the outcome of most of those non-technical decisions, with one exception, they are not a point of focus within this chapter. The exception to those non-discussed, non-technical decisions is the last one mentioned, the format of the shipbuilding contract. This subject is thoroughly discussed in Section 9.2.

9.1.2 Learning from Experience

A new ship for most ship owning organizations is just one more in a series of vessels in its possession, but sometimes an acquisition of a new ship is a *first* for an organization that is just getting into ship owning. Initially, it would appear that ship-owning organizations that previously have acquired ships possess the experience to undertake the acquisition process without difficulty due to that previous experience. Conversely, it would appear that first-time ship owning organizations likely would encounter greater difficulties due to the lack of relevant experience. However, neither of those statements is necessarily true.

The only experience a ship owning organization can bring into a ship acquisition process is that of the individuals involved on behalf of that organization. If there have been a turnover of personnel since the last several acquisitions, all of the *learning* that came into the organization through those acquisitions was lost to that organization if key personnel departed. In other words, there is no *corporate memory* unless there is no turnover of key personnel or if that experience has been translated into

documentation that is used for each subsequent ship acquisition. However, such documentation is a rarity in the marine industry, with the notable exception of large government agencies having numerous documented procedures and sub-procedures. But even if acquisition guidelines and procedures are documented, they still have to be implemented by the Purchaser's staff, which implementation may result in new interpretations of the same procedural language.

Similarly, it can be appreciated that a first-time ship owner can, in fact, have the benefit of prior ship acquisition experience by using, as employees or consultants, persons having directly relevant experience. It is important to stress the word *relevant*, since non-relevant experience is often the basis of false confidence or misunderstandings leading to difficulties in the ship acquisition process. Some ship owning organizations have occasionally used persons from other industries to oversee a ship acquisition process, leading to difficulties arising from the significant disparities between procedures and expectations between the different industries.

The same perspective is also valid for shipyards; the persons involved in the development and negotiation of shipbuilding contracts on behalf of the shipyard can unwittingly create situations, which are more likely to lead to contractual difficulties if the experience of past contracts is not adequately translated into the new contract development process. For example, a shipyard having considerable catamaran-building experience contracted to construct a SWATH-type vessel using estimates based on its prior twin-hull experience. However, due to width restrictions at the waterline, the SWATH construction was far more costly than comparably sized catamaran vessels.

The Chief Executive of the Royal Institution of Naval Architects in 1998-2000, Mr. Trevor Blakeley, introduced that organization's biannual courses on the management of shipbuilding contracts by stating this:

"We have all heard of disasters involving ships, ships that have run aground, broken in half in severe storms, impacted vehicular bridges in fog, or even experienced fires. But there is another form of disaster involving ships; namely, contractual disasters, situations in which the shipyard and shipowner are both terribly harmed due to mismanagement of the shipbuilding contract."

The primary basis of this chapter is past experience, not a theoretical approach to the development of contracts, agreements, specifications and plans. The avoidance of the second type of ship disasters, *contractual disasters*, is the educational intent of this chapter. Thus, in a sense, it is a form of documentation of lessons learned from prior experience in the development and management of shipbuilding contracts.

9.1.3 Perspectives, Not Standards

It is recognized that some persons reading this chapter may interpret it as establishing a *standard* for appropriate shipbuilding Agreements, Specifications Plans and contract managerial duties for ship construction. It is not intended that this chapter establish such standards. This chapter is for instructional purposes only, intended for those persons who do not yet possess experience sufficient to make the decisions that are needed in contract formation and management. The fact that in actual practice an organization may not adhere to the ideas and perspectives set forth below is not necessarily an indication of inadequate contracting and management. Rather, the ideas and perspectives presented in this chapter are intended to bring to light various possibilities and lessons learned in both contract development and contract management. The relevant experience and qualifications of each party's contract management team, coupled with the specific nature of the project and influence by market, financial regulatory and classification actors, may singularly or collectively be superior factors, relative to this chapter's recommendations, for the establishment of an appropriate contract and form of contract management.

9.1.4 Contract Development and Management

There are three aspects of shipbuilding contracts and specifications that are relevant to the context of this book and which also are central to the interests of technically-oriented persons who are likely readers of this book: 1. formation of the agreement – the keystone of the contract; 2. formation of the specifications and plans – the key technical components; and 3. management of the contract during ship construction.

Each of those three key areas is addressed as sections, below. Prior to considering them, however, some fundamental understandings of shipbuilding contracts are reviewed. It will be seen, the title of this chapter notwithstanding, that specifications are just one of several parts of a shipbuilding contract. The word "specifications" is included in the title of this chapter to emphasize that this chapter is not a discourse on contracts that is suitable for the legal profession; rather, it is specially intended for project personnel other than attorneys.

Reference 1 is a treatise on shipbuilding contracts that addresses legal issues. Per the Foreword of it, the purpose is to "*present the law relating to shipbuilding contracts in as wide a perspective as possible.*" It was initially compiled by a sub-committee of the Assembly of the Comité Maritime International, and subsequently edited into a uniform format by Malcolm A. Clarke, Ph.D., Fellow of St. John's College, Cambridge. The book addresses matters of finan-

cial security, title, risks and insurance, default and termination, among other non-technical subjects.

9.1.5 Contracts and Technical Managers

While this chapter focuses on new ship construction, nearly all the elements of it are also applicable to major ship conversion projects, and many of its elements are also pertinent to ship repair. Agreements and Specifications for both ship conversion and ship repair will need to be supplemented by other elements not described in this chapter and some of the elements described herein would have to be deleted. The reason for the inclusion of this chapter in an otherwise technical book is that the contract is the mechanism that conveys the technical, as well as non-technical, understandings, obligations, rights and responsibilities between the shipowner (or *Purchaser*) and the constructing shipyard (or *Contractor*).

The contract is the instrument that allows the intangible product of the designing naval architects and marine engineers to become a reality; without a contract, the design would never be translated into a tangible object.

Some vessels have been constructed, it may be said by others, without a contract. What is really meant, however, is that the vessel was constructed in accordance with an oral contract, not a written one. While this is altogether possible, it means that the risks associated with the vessel construction were not addressed, so both parties were taking great risks over financial and technical aspects hoping that the outcome would be satisfactory, but having no written commitment to that objective from the other party. Thus, there is always a contract, but in some rare circumstances it may have been an oral one, not a written one.

It is essential that technical project personnel have overall responsibility for the development and implementation of a shipbuilding contract, rather than business managers or lawyers, since the ultimate purpose of a shipbuilding contract is to develop and deliver a technical object, not to develop temporary business or legal relationships. Each of those, temporary business and legal relationships, are a necessity, but are not a sufficient mechanism for achieving the delivery of a new ship from Contractor to Purchaser. Further, in addition to the technical personnel and the lawyers, a wide range of professionals within both the shipowner's and the shipyard's organizations occasionally will be referring to the contract, though not managing it on a daily basis. These include persons in the areas of insurance, accounting and finance among other areas.

In the last section of this chapter, it will be shown that the on-site contract management team is responsible for management of the entire contract, including the Agreement as well as the technical requirements. Accordingly, it

is important that those technical project personnel who will constitute the contract management team be familiar, if not conversant, with the Agreement to the same extent they are with the technical documents of the contract. Further, in order to ensure that the Agreement gives those technical personnel the rights and responsibilities they need to effectively manage the contract, and assigns to the other contracting party the balance of the responsibilities necessary to achieve the final product (the ship and all its documentation), those technical personnel must participate in the development of the Agreement.

If the technical requirements and technical obligations expressed by the contract are not set forth in a comprehensive document that is entirely suitable for the objectives of the project (developing and delivering a ship), a risk is taken that financial and/or legal issues will control the project, rather than having those issues support but not control the technical project.

This chapter is not a substitute for more detailed education in the areas of contract formation and contract management. It will, however, make the reader alert to the need to look into matters surrounding contract formation and contract management, rather than merely leaving those matters to persons who do not have the same project perspectives that are appropriate to the formation and management of shipbuilding contracts.

9.1.6 Purpose of Shipbuilding Contracts

A shipyard and a shipowner enter into a contract for mutually-beneficial reasons; namely, the shipowner wishes to acquire a ship which is suitable for the shipowner's needs, and the shipyard wishes to construct, for payment, a ship within its shipbuilding capabilities in order to earn a return on its investment in shipbuilding facilities. The shipbuilding contract is the manifestation of those mutual intentions; that is, the purpose of a shipbuilding contract is to achieve the development and delivery of a ship from the shipyard to the shipowner. From the time the parties agree to that technical objective until it is achieved, the parties establish a temporary business relationship, shaped in part by legal obligations and constraints that are intended to produce a satisfactory technical outcome.

More formally, the purpose of a shipbuilding contract is to define the entirety of the temporary relationship between the Contractor and the Purchaser. Essentially, the contract in its entirety establishes the rights, responsibilities, *rules of conduct* and assignment of risks between the two parties pertaining to all foreseeable technical, cost and schedule matters, questions or disputes that may arise between the parties.

The assignment of risks does not end, however, upon contract execution; each Change Order that may be executed later as an amendment to the contract also may carry with it risks which must also be assigned. For the Contractor, usually there are the risks of cost and/or schedule overruns for fixed price contracts or fixed price Change Orders; for the Purchaser usually there are the risks of performance of the basic or altered elements of the Contract Work Scope. The assignment of those risks, however, can be different for each of the design and performance parameters and for each subsequent Change Order, as the parties may agree.

The form of a contract determines which party is accepting, to some degree or other, the risk of cost overruns. In the *fixed price* form of contract, the contractor is obliged to complete the ship and the other deliverables all for the contractually-defined fixed price, as may have been supplemented by agreed-upon changes. However, when a new ship type is being created, or when new technologies are being implemented, it may be impracticable for a shipyard to offer a competitive fixed price since there are too many unknowns. In such instances, potential contractors may not be willing to accept the risks of offering a fixed price contract within a range acceptable to the shipowner. In order to obtain the vessel, the shipowner may offer to use a *cost-plus* contract, in which the shipowner will pay all costs incurred by the shipyard, and in which the *plus* payable to the shipyard is determined according to either a formula or a fixed amount per the contract language. It is also possible for the parties to use a contract form, which leads to the sharing of cost overruns. Other variants on contract form are also possible, but infrequently used. The important point is that the form of contract determines how the parties allocate the risks of cost overruns.

9.1.7 Defining Contractual Relationships

Typically, contracts are written documents, which address all, or nearly all, of the potential elements of the contractual relationship. Sometimes, however, the shipbuilding contracts are oral to some extent, with certain elements of the contractual relationship having been established orally, while other components of the same contract may be in writing. It is not uncommon for written contracts to be incomplete; that is, some of the components of the contractual relationship remain undefined at the time the contract is initiated.

If the two contracting parties have mutually decided to not reduce all of the potential components of their contractual relationship to writing, it indicates that they are each taking a risk if an un-addressed aspect of the contractual relationship becomes important at a later time. For ex-

ample, if a contract requires that the Contractor ensures that the new ship achieve a speed of, say, 28.0 knots, but in fact the vessel can achieve only 26.2 knots, the parties will have to look to the contract to understand what remedies are available to the Purchaser and what rights remain for the Contractor. The Purchaser's remedies may be financial damages or the right to reject the ship; but if the contract did not address what remedies would be available to the Purchaser, neither party can be certain of what will be the outcome of the almost-inevitable litigation. This is addressed further in Section 9.2 in the part on Liquidated Damages (Performance, Design).

As another example, suppose the Purchaser is not forthcoming with several progress payments. If the matter is sufficiently severe and creates a critical cash-flow problem to the Contractor, the Contractor may wish to take some action to minimize the consequences of the lack of contractually defined progress payments. To the extent that the contract addresses the rights of the Contractor under such circumstances, the Contractor has a clear understanding of what can be done to deal with that lack of progress payments. If, however, the contract does not address that potential aspect of the relationship, then there is no predictable outcome to the consequential dispute.

These limited examples are presented to illustrate that many potential aspects of a contract may never have to be defined but by failing to define those components of the contractual relationship in advance, the parties may have accepted risks. Thus, it can be appreciated that it is preferable to have a contract anticipate and address reasonably potential sources of dispute so that the parties have, in advance, a clear understanding of how they must act in the event a potential dispute arises, and to understand their contractually defined choices in courses of action.

9.1.8 Components of a Contract

The beginning of this chapter listed the three elements of contract support services that are considered herein: Formation of the Agreement; Formation of the Contract Specifications and Plans; and Management of the Contract During Performance. In order to put those three contract support services into context, eight major components of a contract are illustrated in Figure 9.1.

Those components, and possibly some others, as discussed below, constitute the contract. If any component of the contract refers to other standards or other regulations, then those other standards and/or regulations are also part of the contract. The fact that a requirement may be included in a contract by indirect reference does not give it any less validity than a requirement, which is directly identified

within, say, the Contract Specifications. For example, suppose a contract requires that the design of a ship achieve compliance with a particular classification organization's rules. Suppose, further, that those rules refer to the ASTM standards for ship construction, which ASTM standards include minimum dimensions of handrails for inclined ladders. The ship, then, must comply with those minimum handrail dimensions, even though none of the first-level contract documents expressly identify that particular requirement. In other words, all of the standards and regulations are equally binding upon the parties whether directly or indirectly referenced.

9.1.9 Agreement

The Agreement is often miss-labeled as the contract, but as illustrated in Figure 1, the Agreement is only one of the major components of a contract, though it is unique to each particular contract. Because the Agreement is the largely non-technical heart of the set of documents comprising the contract, its formation is addressed separately in Section 9.2. The Agreement should clearly identify each of the other major components of the contract in a non-ambiguous manner, by using author, date of publication, a revision number or other unique identifying number, if applicable.

The Agreement is also the primary document in the hi-



Figure 9.1 Major Components of a Commercial Shipbuilding Contract

erarchical list of the of components of the contract with the hierarchy being stated within the Agreement to set an order of precedence in the event of inconsistencies between the various components of the contract. An example table of contents of a commercial shipbuilding Agreement is illustrated in Table 9.I.

Several organizations have standard forms of agreements, but they may refer to them as contracts. of them is addressed separately in Section 9.3.

Those forms are the starting points of negotiations and development of the final form of the Agreement. The Association of West European Shipbuilders (AWES), the Shipowners Association of Japan (SAJ), and the Norwegian Shipowners Association (NSA) are among those organizations that have such standard form agreements. In the United States, due to significant government involvement in many shipbuilding contracts, the U.S. Maritime Administration has had standard form agreements, too. Of course, major government agencies also have their own forms for acquisition of their own ships.

9.1.10 Contract Specifications and Plans

Two other major contract components are entirely unique to each contract, the Contract Specifications and the Contract Plans, which may include schematics and diagrams. Because they are entirely unique, they are prepared in advance by one or both of the contracting parties. Often, the Contract Plans are considered to be a subpart of the Contract Specifications but that is not necessary. Further, if the parties intend that the Contract Plans be superior to the Contract Specifications in legal precedence (hierarchy) of contract components, the Contract Plans cannot be a part of the lower-level Contract Specifications. Because these components of the contract constitute its technical focus, the formation of them is critical. When a shipyard offers a standard or semi-standard design to a shipowner, these two components of the contract are usually well developed in advance by the shipyard. The shipyard may attach to the specifications *maker's list* identifying the manufacturer and model number of the equipment items that are to be installed. The shipowner may seek alterations to the shipyard-prepared documents only in selected areas, which are of particular importance to the individual shipowner, such as cargo handling or docking and mooring arrangements. The accommodations areas of otherwise standard ships may also be subject to variation due to the different nationalities of the operating crew. Further, for purposes of fleet standardization a shipowner may negotiate for particular brand names of equipment components, rather than allow the shipyard to select from among several manufacturers of that equipment.

When the ship is being designed by the shipowner, however, the shipowner's staff, or outside consultancy, develops the Contract Specifications and Contract Plans in advance. Extreme caution should be used by shipowners who allow their staffs to continue developing those Specifications and Plans after the requests for proposals have been issued to bidding shipyards, since subsequent modifications to the Specifications and/or Plans may have a significant impact on the shipyard's price and/or schedule.

TABLE 9.I Commercial Shipbuilding Agreement Typical Section Headings

Introduction
Entire Agreement
Coordination of Contract Documents
Definitions Abbreviations, Interpretation of Terms
Delivery of Vessels
Options of Additional Vessels
Project Schedule
Scope of Work and Representations
Intellectual Property Rights
Materials and Workmanship
Regulatory and Classification
Industry Standards
Contract price
Unit Price
Delivery of Vessel(s) to Purchaser
Liquidated and Actual Damages (Delivery)
Liquidated Damages (Performance, Design)
Representatives of the Parties
Examination of Plans
Inspection of Workmanship and Materials
Changes in Specifications Plans and Schedule
Adjustment of Contract Price and Schedule for Change Orders
Extension of Time
Final As-built Drawings and Calculations
Operating and Technical Manuals
Test and Trials
Warrant Deficiencies and Remedie
Progress Payments
Contract Retainage
Special Retainages

Caution should be used when Guidance Plans, or Contract Guidance Plans, are included in the contract documents, as distinct from the Contract Plans themselves. Some shipowners' naval architects add such Guidance Plans to the contract packages because it is intended that those Guidance Plans have a different contractual significance than the Contract Plans. Unless the difference in contractual significance is clearly communicated within the contract package, it is likely that the Purchaser and the Contractor will have differing interpretations as to that significance. A further discussion of this issue, along with other drawing-related issues, is presented in reference 2.

9.1.11 Non-Unique Components

Four of the components of the contract, as shown in Figure 9.1, are not unique to each contract in any regard, and thus do not require any pre-contractual preparation. They are the International Regulations, the Domestic Regulations, the Classification Requirements and the Other Referenced Standards. The exact editions, revisions or selections of those components must be unambiguously identified in the Agreement. The inclusion of non-applicable regulations or standards in the contract can be as harmful to contract fulfillment as can be the absence of otherwise necessary regulations or standards in the contract. Periodically, persons who are assembling contract packages should review the initially identified regulations and standards to ensure that they are all the latest versions and that they are applicable to the particular ship, which is being acquired at this time.

When distributing copies of the contract package to prospective bidders, it is usually not necessary to copy and distribute the non-unique components of the contract to others. However, bidding shipyards should not hesitate to ask the shipowners for copies of those components of the proposed contract documents that are not already in the possession of the ship yard; bidding a job without having reviewed all of the requirements is a recipe for unexpected costs and schedule impacts. Equally, shipowners' staffs should not list any documents within the contract package unless they have been obtained and reviewed by qualified personnel for applicability, timeliness and general meaningfulness in the contract.

9.1.12 Terms and Conditions

The Terms and Conditions of a contract, none of which are unique to a particular shipbuilding contract, are often standardized by Purchasers, especially if the Purchaser is a governmental agency or commercial entity, which frequently acquires ships. If a term or condition has to be unique to a

particular contract, it would probably be best to include it in the Agreement, not in the Terms and Conditions

However, some governmental agencies must select specific provisions from a list of potentially applicable ones. In some contracts, the Terms and Conditions are integrated into the Agreement. In any event, prior to finalizing the form of the contract in its entirety the Terms and Conditions have to be reviewed to ensure their relevance and applicability to the project. An example table of contents of a commercial shipbuilding contract's Terms and Conditions is illustrated in Table 9.II. If the Terms and Conditions are integrated into the Agreement, the consolidated table of contents of the Agreement would include all of the components of Tables 9.I and 9.II. When contract packages are being assembled, a review of recent, prior contracts may indicate that certain Terms and Conditions could be adjusted to achieve more-meaningful compliance or easier -to-understand requirements.

9.1.13 Contractor's Technical Proposal

Some shipowners seek technical proposals from bidding shipyards, which proposals show the shipowner how the bidding shipyard's offered ship will satisfy operational and/or performance requirements set forth in the shipowner's request for proposals. If such a procedure has been employed by a shipowner in the process of contract development, the successful bidder's technical proposal is usually included as a specifically identified component of the contract.

TABLE 9.II Commercial Shipbuilding Terms And Conditions

<i>Typical Section Headings</i>	
Care of Vessel(s)	(Purchaser Default)
Access to Vessel(s)	Disputes and Claims
Responsibility for Shipyard Work and Risk of Loss	Consequential Damages Assignment
Insurance requirements	Successors in Interest
Responsibilities and Indemnities	Liens Notices
Contract Security (Performance & Payment Bonds)	Title Permits, Licenses and Taxes
Termination of Work (Contractor Default)	Applicability of Law No Waiver of Legal Rights
Termination of Work	Computation of Time

tract. It is also listed in the hierarchy of contract documents, but below the other components.

The purpose of including the Contractor's technical proposal as a component of the contract is to legally bind the Contractor to fulfilling its proposal but in such a manner as to ensure that the developed Specification and Plans are superior to the technical proposal in the event of an inconsistency between them.

9.1.14 Integrated Contract Package

Project management team members should review all the components of a proposed contract package prior to execution of the contract to ensure that they are applicable to the project, that they are consistent with the project, and that all the components are fully integrated with one another.

Often, organizations have allowed the Agreement to be developed by their legal staffs, and have had the Contract Specifications and Plans developed by their technical staffs. This is not an unreasonable utilization of special skills if it applied only to the Terms and Conditions of the contract.

However, it creates certain risks for both Purchasers and Contractors if that philosophy is applied to formation of the Agreement. It is not unusual to find after contract execution, that there are inconsistencies between the Agreement, on one hand, and the General Section, or other sections, of the Contract Specifications on the other.

The hierarchy clause in the Agreement typically will dictate that the Agreement is superior to the Specification in the event of such an inconsistency, so there is no contractual ambiguity. Thus, in the presence of an inconsistency, the full intent of the Specifications may not have to be fulfilled by the Contractor, thereby leaving Purchaser with a less than complete set of contract deliverables.

In addition to possibly missing out on otherwise anticipated contract deliverables, there is a more significant reason to have the Agreement drafted or controlled by project technical personnel and later reviewed by the legal staff. Namely, such personnel understand what can go wrong or be overlooked during ship construction, and can thus build into the contract several mechanisms to significantly reduce the likelihood of such occurrences. This is discussed in greater detail in Section 9.2 on Formation of the Agreement.

9.1.15 Decision-Making Authority

The contract documents, especially the Contract Specifications and Contract Plans, used in conjunction with the other components of the contract, define certain technical aspects of the ship that will be developed and delivered to

the Purchaser by the Contractor. Numerous details, which are not initially defined in the Contract Specifications and Contract Plans, may have to be developed after the contract is executed. The contractual identification of applicable regulations, classification rules and standards will largely shape many of the developmental *micro-design* decisions that need to be made to achieve the completed ship. However, there will also be numerous developmental *micro-design* decisions that are not controlled by the contractually identified regulations, classification rules and standards.

When the parties executed the shipbuilding contract, the authority to make those decisions was passed from the Purchaser to the Contractor, unless the contract gives the Purchaser some residual decision-making authority. This is unlikely, however; most contracts give that authority exclusively to the Contractor, modified only by the necessity of allowing the Purchaser to review detailed plans before actual ship construction (2). This matter can become a source of disputes; it is discussed in greater detail in the Section 9.3 on Formation of Contract Specifications and Plans.

9.1.16 Government Contracts

The form of contracts issued by government agencies is often different from commercial contracts, but the general nature of the components of them is the same as the commercial contracts discussed herein. There are more forms of government contracts than there are government agencies; many agencies utilize multiple forms of contracts for various reasons.

The form and content of contracts from government agencies must comply with the procurement regulations applicable to each particular government agency. Thus, it is expectable to see differences between federal contracts, on one hand, and state or provincial contracts on the other. Some quasi-governmental agencies are also shipowners, such as port and canal authorities; and they may have forms of contracts that are different again.

Even within a federal or national government, different agencies have different procurement regulations applicable to them, and have evolved their own particular forms of contracts to suit those regulations. Within the U.S., for example, contracts for the Army's supply/logistic support ships are different from the contracts issued by the Army's Corps of Engineers, who maintain dredged waterways. The Navy's contracts for combat ships are a different form than those used for auxiliary ships. The National Oceanographic and Atmospheric Administration's contracts for its ships are different from other federal agencies. Coast Guard contracts for its front line cutters are different than for its support ships, such as small search-and-rescue craft.

Non-maritime regulations may affect the forms of contracts from government agencies, such as requirements for minority-owned or women-owned contractors, contracts set aside for small businesses, the need to comply with equal employment opportunity laws, or contracts set aside for economically-depressed areas, among other possible constraints.

Most government contracts are awarded based on either lowest bid or best value bid that fully conforms to the requirements of the contract. The criteria to establish best value vary among the agencies. In contrast, a commercial developed has the flexibility to award the contract on any basis it wishes, not necessarily lowest bid or best value.

The administration of government contracts is usually bifurcated; one part of the government agency has technical oversight and responsibility, and another part of the same agency has fiscal oversight and responsibility. This bifurcated contract management means that a contractor has to interact with the government agency, as its customer, in a manner which is different than the way that same contractor would interact with a commercial customer.

When government agencies send out requests for proposals, invitations to bid, or similarly named bid packages, the packages usually include the Agreement and the Terms and Conditions under which the contract will be awarded. The opportunities to negotiate the clauses of the Agreement or the sections of the Terms and Conditions are more limited than for proposed commercial contracts. Pre-bid questions posed to the government agency may result in a re-examination of parts of the proposed Agreement or Terms and Conditions, but usually the agency will not consider altering those components of the proposed contract due to procurement regulations imposed on the agency.

The administration of a government contract by a commercial shipyard is inevitably more complex, and thus more costly, than administration of a commercial contract. There are multiple reasons for this phenomenon, but experienced shipyards take those extra costs into account when preparing their bids for government contracts.

Despite all those differences between commercial contracts and government contracts, the fundamentals are the same. Whether given different titles or other nomenclature, the components of a government contract are the same as illustrated in Figure 9.1. The purpose of a shipbuilding contract involving a government agency remains the same as described above for commercial contracts: defining the technical aspects of the products to be delivered and establishing the rights, responsibilities, "rules of conduct" and assignment of risks between the two parties pertaining to all foreseeable technical, cost and schedule matters, questions or disputes that may arise between the parties, all for the intended delivery of a ship and the associated documentation.

9.1.17 Government Role in Commercial Contracts

There are several reasons why there may be direct or indirect participation by a government agency in a contract involving a commercial developed and a commercial shipyard. One possibility is that the vessel is being constructed for long-term charter to a government agency, so the agency may have technical representatives in the ship yard or examining shipyard drawings in parallel with the commercial Purchaser's representatives. In that situation, while there may be no direct contractual relationship between the government agency and the shipyard, but because it is hard to ignore an *elephant* in your back yard, the management and administration of the contract will be affected.

A more common possibility is that a government agency is providing some form of financial support in order to encourage the domestic shipbuilding industry. That financial support may be in the form of a mortgage guarantee, perhaps predicated on the ship's construction meeting certain criteria.

Another form of governmental financial support may be a direct shipbuilding subsidy, where the agency pays for a certain percentage of each progress payment again perhaps predicated on the ship's construction meeting certain criteria. A third form of government financial support may be an indirect subsidy, in which the government agency has a relationship with the shipyard in order to help offset some of the shipyard's costs. These last two forms of financial support (subsidies) are, of course, hotly debated within both domestic and international political arenas.

Nevertheless, it should be appreciated that any form of governmental financial assistance direct or indirect, or other government role in a commercial contract may affect some of the clauses of the Agreement and some of the Terms and Conditions of the contract, and may impact the administration and management of the contract as well. Shipyards must be willing to accept those additional burdens, however, if they wish to be eligible to secure the shipbuilding contract.

9.1.18 Charterer's Role in Contracts

In the previous section, the possibility that a government agency may be the vessel's charterer was included as a potential form of government involvement in a commercial shipbuilding contract. Similarly, a commercial vessel charterer may be involved in a shipbuilding contract in which the Purchaser is a separate corporation.

When a charterer, either commercial or governmental, is present at the ship yard, or otherwise looking over the shoulders of the Purchaser's representatives, while the ship is being constructed, certain risks may arise. While the Pur-

chaser has willingly entered into back-to-back contracts, the Contractor's performance under the shipbuilding contract may affect the viability of the charter contract. For example, if a charter requires the new ship to be available for first cargo no later than a certain date, a delay by the shipbuilder may result in cancellation of the charter. This situation has occurred several times, leaving the Contractor and Purchaser to figure out what becomes of the ship if that situation was not already addressed by the contract.

Another possibility is that the Charterer will seek changes in particular items of equipment or in stateroom arrangements to suit the experience or nationality of the crew. Other changes may be needed to suit the specific ports and docking facilities that will be used.

These situations, and others that may arise due to the involvement of the vessel's charterer during ship construction, usually result in change orders, with the Purchaser being caught in between the needs of both the charterer and the Contractor. In many of those instances, it may be best to have those changes made after ship delivery from the Contractor by a separate, topside contractor instead of a full-service shipyard. A riding crew can accomplish some of the changes so that the vessel is not delayed in its initial positioning voyage. Other forms of solutions to the problems that arise due to the charterer's involvement should also be explored for minimum impact on cost and schedule.

9.2. FORMATION OF THE SHIPBUILDING AGREEMENT

9.2.1 Introduction

Major components of a shipbuilding contract have been illustrated in Figure 1 and discussed above in Section 9.1. It was pointed out that there might be additional components of a contract, such as the Contractor's technical proposal. In this subchapter, the elements of the Agreement as listed in Table 9.I are discussed, including their purpose and, if appropriate, special considerations that should be given to them during formation of the Agreement.

The order or sequence of the components of the Agreement are not important, as long as they tie into each other, do not create variances with one another, and are supported by the other components of the contract without inconsistencies or ambiguities. This presentation assumes that the Terms and Conditions as listed in Table 9.II, mostly legal issues, are a separate component of the contract, although they need not be. Some drafters of contracts, especially commercial shipbuilding contracts, include the terms and conditions in the Agreement.

9.2.2 Contract Deliverables and Communications

During formation of the Agreement and other components of the contract, a fundamental principle of contract management should be borne in mind:

"Contract management should commence the moment a contract is contemplated, not after it is signed." (3)

The significance of that principle during Agreement formation is that it reminds the parties that any contract rights, obligations, communications or inspections, among other considerations, that either party may wish to be able to exercise during contract performance, have to be built into the contract documents from the outset. After the contract is signed, it is too late to ask the other party to give you contract rights that are not already spelled-out in the Agreement or other components of the contract.

Every contract has a set of contract deliverables, in addition to the ship itself. Some of these deliverables may include drawings, correspondence, comments, inspection reports, calculations, test results, and similar documentation. Other deliverables may be spare parts, manuals, or other hardware-related items, in addition to training of vessel operating personnel on the use of ship-specific equipment. It is essential that the parties anticipate what the entire set of contract deliverables is to be prior to contract execution. The creation of each contract deliverable has a cost associated with it; and it is impractical, if not unreasonable, to expect one of the parties to agree to produce a deliverable that was not already included in the contract's work scope. Thus, every form of contract communication and deliverable that will be developed under each party's contract management staff has to be identified in advance of contract execution.

9.2.3 Introduction of Agreement

This component of the Agreement first identifies the parties: their corporate names, the legal form of the organization (corporation, partnership, privately-held, non-profit state or federal agency, etc.), the jurisdiction of their existence, for example, *incorporated in the State of _____*, and the nature of their business as it pertains to this particular contract.

This section of the Agreement goes on to describe the nature of the project which is guided and controlled by this Agreement (new ship construction, ship conversion, etc.), and then describes the general role of each party. The principle location of the work is also included, but this does not necessarily bind the Contractor to performing all work at that location.

The role of the Purchaser is, of course, primarily financial, in addition to having certain rights of inspection, drawing review, etc., which rights are spelled out in other parts of the contract documents. The Contractor, of course, will

be described as capable of constructing, testing and delivering the vessel. One element of this description, which is often left out, but which is essential, is that the shipyard is obligated to complete the design of the vessel from the status of the design as represented by the other contract documents. Ordinarily, a shipyard will understand that it must produce the detail plans and working drawings, which are necessary to achieve construction of the ship. But often some design development efforts are needed between the Contract Plans and Contract Specifications on one hand, and the detail plans and working drawings, on the other. This part of the Agreement should mention that the Contractor has responsibility to complete the design, as necessary, thus implying that its engineering and drafting responsibility is not limited only to producing detail plans and working drawings, but begins where the Contract Specifications and Contract Plans leave off.

9.2.4 Entire Agreement

This section of the Agreement reminds the parties that only this Agreement and the other documents to which it refers constitute the binding contract; and that any pre-contract agreements or understandings, whether written or oral, have no standing with regard to this contract. However, it is not quite that simple and straightforward.

First, underlying all contract law are legal requirements that the parties cooperate with each other, and that the parties always take actions to mitigate damages in the face of untoward events, regardless of which party will incur those damages. These underlying legal requirements, among others in different jurisdictions, are binding, though unstated in any commercial contract.

Second, it has to be appreciated that pre-contractual agreements or understandings may, in fact, serve to interpret, but not add to, the current contract, as long as those other agreements and understandings are not in conflict with the current contract. Pre-bid correspondence between bidders and the Purchaser, as well as pre-bid meetings, may form the basis for development of a common interpretation of an otherwise-ambiguous specification requirement. If the contract documents contain an ambiguity that is not resolvable by reference to a component of the contract listed in the hierarchy clause, it may already have been resolved in advance of contract execution, in the form of an *interpretation* or an expression of the *intent of the parties*.

As an example, suppose the contract documents state that the final hull color shall be selected by the shipowner's representative; but during contract negotiations, the parties have already agreed that the shipyard can paint it blue because the shipyard has excess blue paint and is offering a

lower price if the blue paint can be used instead of some other, as yet unidentified color. If the parties agreed in writing, in advance of contract execution, that the negotiated price would be reduced in exchange for acceptance of blue paint, then that pre-contract understanding constitutes a binding interpretation of the contract language because the contract language does not preclude the color selection being accomplished prior to contract execution. Both parties are benefiting from that pre-contract agreement and it is not inconsistent with the contract, but rather serves to interpret the otherwise-ambiguous contract language.

Clearly, however, if any pre-contract agreement or understanding, whether written or oral, is in distinct contrast to a contractual requirement, that pre-contract agreement or understanding is of no consequence and has no value in contract interpretation.

9.2.5 Coordination of Contract Documents

This section of the Agreement primarily identifies all of the other components of the contract with the greatest specificity available. Do not state, for example, that the Contract Specifications are *the most-recently revised* edition; rather, identify the authors and give the exact date of that revision because there may be later revisions that are not widely disseminated.

Persons who prepare this section of the Agreement must ensure that all of the identified components of the contract are applicable, current, up-to-date, and easily available to the other party.

Another facet of this section of the Agreement is the hierarchy clause, which states in essence that in the event of an error or inconsistency between different components of the contract, certain identified components shall be superior to the others. The Agreement has to address the possibility that the Contract Specifications may require less than is required by the identified regulations or classification rules. To cover such situations, it is best to state that it does not constitute an inconsistency, but that the Contractor must comply with both of them; the ship shall include the greater of the two sets of requirements.

This section of the Agreement should also state that the inclusion of information in one component of the contract and its absence in another component does not, in fact, constitute an inconsistency or error; rather, it shall be interpreted to be equally present in all components of the contract.

9.2.6 Definitions, Abbreviations, Interpretation of Terms

In order to ensure that there are no misunderstandings of how certain terms or words are intended to be used, it is

common to have a section of the Agreement which states the interpretations and definitions that are contractually binding. Typical definitions interpretations and abbreviations are listed in Table 9.III. Some of the technical definitions may appear in the Contract Specifications instead of the Agreement, which does not present a problem as long as there are, no inconsistencies between the two lists of definitions

As an example, the word *Install* can be defined to include the requirement that the item of equipment also be *furnished* or *provided* by the Contractor, even if such inclusion may not be apparent in non-contractual language.

Install or Installation—When the Contract Documents state that the Contractor is to install an item, the Contractor shall be responsible to Furnish the item and for providing all labor, tools, equipment, and material necessary to perform such installation, and for which the Contractor shall at no additional cost to Purchaser:

- *provide all appropriate structural or other foundations, electrical power, water service, piping, lubrication, lighting, ventilation, operating fluids and other facilities or means required for the installation,*
- *shall effect any and all connections to electrical service, water supply, drains, ventilation, and structural or other foundations, and*
- *shall deliver to Purchaser complete, tested and operable machinery, equipment or systems, including operating fluids.*

Other interpretations, definitions and abbreviations should be considered to ensure that there is no opportunity for misunderstandings between the contracting parties.

9.2.7 Delivery of Vessels, Options for Additional Vessels

This section of the Agreement establishes the Delivery Date of the Vessel and the place of delivery. Sometimes the place of delivery is other than at the shipyard in order to address taxes, operational limitations, costs of delivery to the region of intended use, or other factors. In the event a single contract covers the construction and delivery of more than one vessel, it must be clearly addressed within the Agreement. If the number of vessels is fixed but more than one, the construction starting date and the Delivery Date for each will have to be defined. (The price for each additional vessel must also be defined in the section on Contract Price.

Whether or not the Contractor has to submit separate drawings for the Purchaser's approval for each vessel must be considered and addressed. Sometimes details for sister ships are not the same (they are not identical twins, only

sister ships). The parties must agree as to how much variance can exist without calling such variance to the particular attention of the Purchaser, and if there are some areas for which no variance is acceptable.

If there is a minimum number of vessels, with options for additional vessels, the appropriate dates for those option vessels also need to be defined. These other dates would include the dates by which successive options must be exercised by the Purchaser, the official start of construction for each option vessel (as it affects progress payments), the number of days allowed for construction of each option vessel, and the Delivery Date for each option vessel.

9.2.8 Scope of Work and Representations

Usually there are two major aspects to the statement of the Scope of Work, and several lesser ones. The first major s-

TABLE 9.III Typical Subjects for Definitions, Interpretations and Abbreviations

According to	FCC
ANSI	Furnish
Approval	Good Commercial
ASHRAE	Shipbuilding Practice
ASME	Guidance Plans
ASTM	IEEE
AWS	Install, Installation
Builder	Or equal
Buyer	Owner
CFR	Owner-furnished
Classification Organization,	Equipment (OFE)
Agency or Society	Owner-furnished
Compliance with	Information (OFI)
Contract	Progress Payments
Contract Change, Change	Provide
Contract Documents	Regulation(s)
Contract Drawings,	Regulatory Body
Contract Plans	Requirements
Contract Price	Regulatory Bodies
Contract Retainage	SOLAS
Contract Specification	Special Retainage
Contract Time, or Contract	SSPC
Period	Surety
Contract Work, Work	The Vessel Design
Contractor	UL
Date of Delivery, Delivery Date	USCG
Day(s)	USPHS
Documentation	Warranty Deficiencies
Excessive Vibration, Noise	Working Plans, Working
Excessive temperature levels	Drawings

ment focuses on the creation of the “hardware” aspects of the ship construction project. It assigns certain responsibilities solely to the Contractor with Purchaser having no concurrent responsibilities. These include the provision of all engineering, labor, equipment, materials, fuel, lubricants, electricity, energy, machinery, facilities, services and supervision necessary for the completion of the design, the construction, outfitting completion, testing, delivery and documentation of the Vessel in accordance with the requirements of the Contract Documents. It should be clearly stated that Purchaser has no responsibility to provide any engineering, labor, equipment, materials, electricity, energy, machinery, facilities, services or supervision, unless there is some well-defined ship owner-furnished information and/or equipment. Further, it can be stated that Contractor shall be responsible for fuel and lubricants needed for tests, trials and filling of all operating systems and piping up to Delivery, but not for filling of reserve and supply tanks.

The second major segment of the Scope of Work addresses the non-hardware, or documentation, aspects, which are a vital part of the completed ship. This part addresses the necessary and/or requested certifications documents, booklets, letters, drawings, calculations and other contract data deliverables that are to be provided both during construction and upon Delivery of the Vessel by the Contractor, again at no additional cost to the Purchaser. It is important for shipyards to appreciate that the development and acquisition of this documentation must be carefully budgeted, because it can account for a measurable portion of the total contract price. A list of typical Contractor-provided certifications to be provided with the Vessel is shown in Table 9.IV. Other contract data deliverables are not included in that list (see Figure 9.10 in Section 9.3 Specifications, for a suggested list of such documentation).

The secondary aspects of this section of the Agreement can include supplementary requirements for fulfillment of the work scope, such as that all engineering, labor, equipment, materials, fuel, lubricants, electricity, energy, machinery, facilities, services and supervision that may be reasonably inferred from the Contract Documents by professional ship builders/repairers as being required to produce the intended result as contemplated by the Contract Documents shall be supplied by the Contractor whether or not specifically called for in the Contract Documents and Purchaser shall not be liable for any increase in Contract Price or Contract Time as a result therefrom. Further, this section of the Agreement can state that any items of design, engineering, purchasing, manufacturing, installing and testing that are necessary to satisfy the Regulatory Body requirements, the Classification requirements and/or the performance and design criteria shall be incorporated into

the Contract Work at no additional cost to Purchaser whether or not they are otherwise indicated in the Contract Specifications and/or Contract Plans. Some Purchasers seek a specific warranty from Contractor to the effect that Contractor warrants that it has reviewed all of the Contract Documents and all other documents and materials which it deems necessary or advisable to determine the nature and scope of the Contract Work and has determined that the Contractor can complete the Contract Work by the Delivery Date, all at no additional cost to the Purchaser. However, this may not be appropriate if the regulatory or classification requirement exceed those of the express language of the Contract Specifications and Contract Plans

9.2.9 Intellectual Property Rights

A sometimes overlooked aspect of contracting is the matter of ownership of the vessel’s design or selected aspects

TABLE 9.IV Typical Certifications Provided By Contractor

International Load Line Certificate	USCG certification and documentation
ABS Certificate of Classification	Maltese Cross, Full Ocean Service
Safety of Life at Sea Convention Certificate (SOLAS)	USCG Stability Letter
ABS Stability Booklet and Loading Manual	USCG Approval of ABS Stability Booklet
ABS Certification of all pressurized tank	USCG Safety Equipment Certificate
FCC Certificate of Radiotelephony	USPHS Certificate of Deratization
USPHS Certificate of Sanitary Construction	ABS Certificate of US Regulatory Tonnage
ABS Certificate of International Tonnage	ABS Certificate of Suez Canal Tonnage
ABS Certificate of Panama Canal Tonnage	Builder’s Certificate in customary form
Safety Construction Certificate (SOLAS)	Safety Equipment Certificate (SOLAS)
MARPOL Annex 1 (SOLAS)	Stability Certificate (IMO)
Equipment Certificates (engine gensets, pressure tanks and the like as required by Regulatory Bodies)	

of the vessel's design that are not already controlled by copyright laws and/or patents. Some aspects may be as general as the basic ship design or the hull form, or may be as specific as the design of the computer hardware and software for either the propulsion control system or the dynamic positioning system. Many other aspects of the ship's design may also have been initially developed for this particular vessel, but could be used for other vessels as well.

The Purchaser may expect that it has sole ownership of those intellectual property rights because the Purchaser paid for their development through the contract price. On the other hand the Contractor may expect that it has sole ownership because it has invested more than the design portion of the contract price into the development of those features. The parties should ensure that these matters are addressed in the Agreement.

Some commercial agreements have stated that the Purchaser owns the title to the Vessel Design, but Contractor can use it for other purchasers provided a royalty fee is paid to the Purchaser for each additional vessel constructed for other purchasers, thus recovering, in part, the portion of the Contract Price for the initial design costs. If a shipyard's subcontractor is involved, this matter may be more complex and difficult to resolve, but it is best addressed in the Agreement, rather than allowing it to become the subject of litigation.

9.2.10 Materials and Workmanship

This section of the Agreement typically sets forth the requirement that all materials, machinery and equipment furnished by the Contractor and incorporated into the vessel shall be new, of current production and currently supported by spare parts available in a designated geographic region. Additionally, the Contractor warrants that all design engineers, workmen, subcontractors and others, engaged by the Contractor in the performance of the Contract Work possess suitable professional skills and are appropriately certificated.

This section usually addresses several other aspects of the materials and workmanship, including, among others, the Purchaser's right to reject, and the Contractor's obligation to correct, at no additional cost, any materials or workmanship whenever found to be defective, or otherwise not in accordance with the requirements of the Contract Documents. If no specific aspects of the Contract Document provide such a basis for rejection, published industry standards sometimes may be used as a basis for rejection. Note, however, that if Purchaser cannot point to a documented requirement as the basis for such rejection, the materials or workmanship cannot be summarily rejected.

Broad requirements pertaining to the materials and equipment can also be addressed in this section of the Agreement. Some of these may be:

- the flushing of all piping
- the provision of all working fluids in systems
- the provision of all fuel for testing,
- the installation of safety guards around rotating and sliding equipment,
- the use of only materials and equipment approved by the designated regulatory or classification organization, and
- the use only of certified welders; among other possibilities.

This section of the Agreement could also state that the failure of the Purchaser to discover any non-conforming materials or workmanship does not constitute a waiver of any contractual rights or requirements.

9.2.11 Regulatory and Classification

The Agreement should state with which particular sets of regulations the design and construction of the ship must comply. These regulations will usually include both domestic and international requirements; domestic because the ship will fly the flag of a particular nation and international because the ship will be trading with other countries, for which port entry is keyed to compliance with certain international regulations. The Agreement generally does not address, however, matters of financial responsibility for potential environmental damage, training of watch standing crew, or other similar matters which are solely the domain of the ship operator, charterer or shipowner.

The Agreement also should clearly identify under which classification organization the ship is to be classified; and if that classification organization has more than one set of rules, identify the particular rules with which compliance is to be achieved by the Contractor.

These two segments often are then supplemented by the requirement, if it is not an unusual contract, that all engineering, all arrangements for plan approval, all arrangements for inspections and any other requirements of the regulatory agencies and the classification organization are to be carried out by the Contractor, again, at no additional cost to the Purchaser.

If the ship is a newly developed form or will contain innovative technology that has not been previously approved by either or both regulatory agencies and classification organizations, the Purchaser's designers may have to remain involved in the plan approval stage. This serves to complicate matters of schedule, payment of fees, and perhaps even warranties.

Some regulatory agencies have agreements with one or two classification organizations to the effect that the classification organization can perform some of the regulatory

approvals. The intent is to streamline the regulatory approval process as well as reduce the workload of the regulatory agency. Purchasers should be aware that sometimes the relevant regulatory agency may not have a regular, working relationship with the nominated classification organization; this may create delays in approvals, likely require additional submittals, at extra cost, and may result in unexpected adjustments to the Contract Plans or Contract Specifications. The Purchaser should investigate and, if necessary, resolve these matters prior to contracting.

As regulatory and classification requirements are often incorporated by reference, the Agreement should address the potential for conflict between the express language of the contract documents, on one hand, and the referenced requirements, on the other. For bidding purposes, the Contractor is allowed to rely on the express language of the contract documents as being consistent with the nominated regulations and classification rules. If, however, the Contractor finds that it has to incorporate a greater content in order to comply with the regulations or classification rules, those extra costs are usually for the Purchaser's account. However, if the express language of the contract documents is silent about certain matters, and the Contractor makes an erroneous assumption for bidding purposes, the Contractor will have to absorb the cost consequences of that erroneous assumption.

These two matters, regulatory and classification are examples of why the Agreement should be developed primarily by the project technical personnel, not the attorneys. Knowledge of classification rules, relevant regulatory agencies, procedures for obtaining their approvals, the existence of working relationships between them, and similar matters, all are essential in the development of the Agreement. If those matters are not addressed with adequate precision, there is a strong likelihood of misunderstandings at a later time.

9.2.12 Industry Standards

Any standards with which compliance is to be achieved in the design and construction of the ship, other than those included within the regulatory requirements and classification rules should be clearly identified in the Agreement or in the General Section of the Contract Specifications. It is not as important as to whether they are listed in the Agreement or the Contract Specifications but it is important that they appear only once, since listing them twice will likely result in some inconsistencies; and then misunderstandings will arise.

The types of standards, which could be invoked, are, for example, IEEE 45, a recommended industry standard for marine electrical installations. Note, however, that unless otherwise mentioned in the contract documents, it is only a recommended standard. If it is to be binding on the Con-

tractor, the Agreement should state that the identified standard should be treated as obligatory for this contract.

Other standards may address aspects of design, selection of materials, or quality of workmanship. Some other examples are: welding and brazing; electromagnetic interference; coatings; lighting and illumination; audio noise levels at various locations on the ship; vibration levels; air circulation in selected spaces; labeling of cables and piping; means of inspecting or testing components; and resilient mountings for machinery components, among others.

Often, shipyards will be familiar with particular standards in some of those example areas, in which case it probably would be reasonable to negotiate to accept that standard in place of a comparable one otherwise selected by the Purchaser.

The selection of which standards for detail design, material selection and workmanship should be made from this perspective: if an aspect of the Contractor's detail design, the quality of Contractor-selected materials or the workmanship of installation is going to be challenged by a Purchaser's inspector, there must be a documented standard which supports the challenge. There can be no dispute as to whether a standard applies if it is specifically named in the Agreement. As mentioned previously, however, including a non-applicable standard will only serve to confuse issues.

9.2.13 Contract Price

Under fixed-price contracts, the price for the Vessel has to be established, and the currency in which it is payable has to be stated as well. Working under a fixed-price contract, the Contractor has accepted considerable risk; but as discussed below, there are other alternatives. Some contracts will include additional protection for one party or the other in the event of large currency fluctuations; that is there may be some mechanism to share the risks of currency fluctuations if the Contract Price is payable in a currency not normally used by one of the parties. The payment of the Contract Price is separately covered by the Agreement's section on progress payments, as discussed below.

If the form of the contract is other than fixed-price, such as cost-plus-fixed-fee, the exact mechanisms or procedures to determine the total of all payments must be described with specificity to avoid later disputes. Whether or not the Purchaser has the right to audit the Contractor's books to confirm such final pricing should be stated as well. The use of a form of contract other than fixed-price essentially alters the assignment of risks to suit the needs and acceptances of the parties. When the ship incorporates experimental or new technology about which the Purchaser has knowledge superior to that of the Contractor it may be reasonable for the Contractor to avoid specific risks associated with imple-

menting that technology; but in such cases, the Purchaser may also wish to exercise greater oversight in the implementation of that technology.

It is not uncommon for the Contract Price to be subject to automatic adjustment, without formal change orders. There is no risk associated with this provided the mechanism for the automatic adjustment is clearly stated. For example, if the quantity of a special material is not known with precision at the time of contracting, because the detail drawings have not been completed, the Contract Price may be automatically adjusted upon a material take-off after completion of the detail design.

The Contract Price includes allowance for the acquisition and installation into the Vessel of [W] thousand pounds of [material name], and shall be adjusted at the rate of [X] dollars and [Y] cents per pound in excess of that estimated weight, or eighty-percent of that rate of adjustment per pound if less than that estimated weight, upon completion by Contractor of detailed, as-installed, material take-off, subject to approval by Purchaser, which adjustment includes both material and labor costs.

The provision of spare parts may also lead to automatic adjustment of the Contract Price, if the quantity of spare parts which Purchaser wants is not known at the time of contract execution. Often, a Contractor will provide a list of recommended spares, and Purchaser will then determine which ones and how many are to be acquired. Because the Contractor did not know that quantity in advance, the price of the spare parts is added to the Contract Price, but the cost of acquisition and loading them aboard the ship are already included in the basic Contract Price.

Some Purchasers may wish to have the Contract Price stated in several components, but for new ship construction that is best addressed in the progress payments section of the Agreement, as discussed later in this section. For ship conversion or repair, line item pricing is often used, so that if the entire item is canceled, the adjustment of the Contract Price is known.

If the number of vessels is fixed but more than one, the Contract Price for each additional vessel must also be defined in this section. When the construction of a series of vessels being purchased under a single contract will extend for several years, the parties may agree to an escalation clause. Typically, after agreeing to the portion of the total price, which is labor-based, material-based and subcontract-based, the cost of labor can escalate over time in accordance with an appropriate index, and the cost of materials and subcontracts can similarly escalate in accordance with perhaps a separate index. Usually the indices on which the escalation clauses are based are government-determined and widely published.

Of course, the Contract Price will also be subject to adjustment as the result of Change Orders, as discussed later in this subchapter.

9.2.14 Unit Prices

In anticipation of possible growth of the Contract Work Scope, negotiated through Change Orders, the Purchaser will have to utilize additional materials, subcontractor efforts, engineering and production labor. Further, extensions of the project schedule may necessitate the provision by the Contractor of additional days of shipyard services. If there will be significant shipowner-furnished equipment, the necessity of such additional items is more likely.

The cost impact of a Change Order may require negotiation of at least nine elements:

1. material costs,
2. subcontractor costs,
3. additional engineering hours,
4. production labor hours,
5. mark-up of material costs,
6. mark-up of subcontractor costs,
7. hourly rate for engineering,
8. hourly rate for production labor at straight time and overtime, and
9. daily cost of shipyard services. (Indirect effects of Change Orders, expressed as additional labor hours or other cost allowances may also have to be negotiated.)

The first four items will depend on the details of the Change Order itself. However, items 5–9 should be uniform for all agreed-upon Change Orders. Since those five items will have to be either competitively bid or negotiated, it is best to include their specific values in the Agreement. This avoids the necessity of negotiating them repeatedly or of negotiating them when other variables have to be negotiated as well.

In ship conversion and repair contracts, there may be a greater array of unit prices, such as for steel work, for piping, for blasting and coating, due to the increased likelihood that such changes will arise in those types of contracts.

9.2.15 Delivery of the Vessel(s) to Purchaser

The place and condition of delivery of the completed ship should be identified in the Agreement. Usually, the place of delivery is alongside the shipyard's dock; but sometimes for tax or financial reasons the place of delivery may be at another location. If the vessel is not designed for open ocean service, it may require some temporary contractor-installed modifications to sail to the place of delivery. Also, some gov-

ernment agencies, in seeking competitive bids from geographically diverse shipyards, will require delivery from the successful bidder, wherever located, to be at the agency's service dock.

The condition of delivery is usually that of a *warm* ship; that is, one that is not *cold* with none of the auxiliaries running and no heat or other services already in operation on the ship. For smaller vessels, such as tugs or other service craft, this differentiation is minor; but for larger ships, especially if steam powered, it may be more significant

9.2.16 Project Schedule

The purpose of a shipbuilding project schedule is to give the shipyard a project monitoring and control mechanism. If properly developed and maintained (updated), it will enable the shipyard to see where it needs to redeploy its resources in order to keep the time-critical activities on schedule, and not inadvertently give priority of resources to non-critical activities.

The Agreement usually requires that the Contractor develop a detailed project schedule within a certain period of time after contract award, and that the Contractor provide copies of it to the Purchaser. Thereafter, the Contractor is usually obligated to update the schedule both periodically and if there are significant impacts due to Change Orders and to timely provide copies of the updated schedules to the Purchaser. This requirement in the Agreement is sometimes supplemented by some technical details in the Contract Specifications. The maintenance of a project schedule can become quite important if the Purchaser is going to allege Contractor default as evidenced by comparing the actual status to a planned schedule.

Whether or not this clause is within the Agreement, the Contractor always has a duty to complete the ship by the Delivery Date stated in the Agreement. There are several reasons, however, to include this requirement within the Agreement.

First, by putting into the Agreement some minimum scheduling and updating requirements, the Purchaser is assured that the Contractor has allocated within its budget the resources for those actions.

Second, this assures the Purchaser that it will be entitled to see copies of the schedule and all updates.

Third, this enables the Purchaser to identify the Contractor's interpretation of latest requested dates for the arrival of shipowner-furnished equipment or materials or for other shipowner-responsible actions. The dates in the Contractor's schedule for shipowner-responsible actions may not be contractually binding if they have not been separately agreed upon at a prior time. However, the Purchaser should not ignore those dates when advised by receipt of a copy of

the schedule, but rather should confer with the Contractor to establish dates that can be agreed upon, after which the Contractor may have to further revise its schedule.

Fourth, this allows the Purchaser to plan any necessary variations in the staffing of its inspection staff and, ultimately, the ship's crew.

Some agreements call for a *Key Event Schedule*. Key events could be the start of engineering, start of fabrication, start of hull erection, launching, sea trials and delivery

Some agreements authored by government agencies provide detailed requirements for the content and form of the project schedule, while some commercial shipowners are intentionally vague about the schedule's content and form. The choice of Gantt charts or the use of a critical path network (CPN) is one of the possible elements of this section. However, it may not be productive to require a shipyard to develop a CPN for a simple project, especially if the shipyard is not used to developing and using a CPN. Whether a Gantt chart or CPN is used, there should be four separate groups of activities indicated on the schedule: engineering, purchasing, production and testing. Any blending of those separate types of activities leads to risks of loss of project control.

9.2.17 Liquidated and Actual Damages (Delivery)

The purpose of this section of the Agreement is to set forth an acknowledgment by the Contractor that if the ship is delivered later than either the original Delivery Date or an agreed upon contract extension, the Purchaser will incur financial damages; and the parties agree in advance that the damages are approximated by a certain sum per day of delay payable by the Contractor. For legal reasons, this is not necessarily a penalty clause, although it may give the Contractor similar incentive to achieve timely delivery. If, however, it is phrased as a penalty clause for late delivery, then there should be a bonus clause for early delivery. If it is phrased as a liquidated damages clause, a bonus clause is unnecessary. Some contracts may include a clear statement that the Contractor is not entitled to any bonus for early delivery.

Another way of looking at this same clause is that it protects the shipyard in two ways. First, the shipyard knows in advance that its liabilities for delay in delivery are limited to the liquidated damages; and that the Purchaser cannot suddenly claim significantly-greater damages if the delivery is late, provided it is within the *cap* on liquidated damages, as discussed below. Second, the shipyard can view the daily amount of liquidated damages as the cost of *buying* a day of contract extension when it is not otherwise entitled to a contract extension. In some instances, that daily cost is less

than the cost of accelerating the work to complete the ship on time.

Some shipbuilding contracts include several levels of liquidated damages. One form is to have a lower daily rate if the delay is identified to the Purchaser several months in advance, so the Purchaser will not incur costs of prematurely preparing the ship and its crew, or committing the ship for a charter or voyages. In that instance, the higher daily rate would apply if the delay is not identified until the last several months of the contract period.

Another form of multi-level liquidated damages is to use progressively higher daily rates for each successive groups of days. For example, each of the first ten days of delay may be at a specified rate; each of the second ten days of delay may be at, say, 125% of that rate; with similar progressions for several other groups of days, until the maximum number of days for which liquidated damages accrue is reached. This is illustrated for other percentages in Figure 9.2.

The liquidated damages may accrue for a stated maximum number of days, thus placing a cap on the liquidated damages. The existence of a cap on liquidated damages does not, by itself, limit the damages that a Purchaser may claim from the Contractor if the delay extends beyond the number of days used to achieve the cap.

Unless further provisions are stated, the cap means that the Contractor is exposed to additional, *provable* damages that the Purchaser incurs after the cap is reached. The contracting parties may wish to negotiate on this matter, possibly eliminating such *consequential* damages for the Purchaser if the Contractor is similarly prohibited from seeking consequential damages due to the actions of the Purchaser.

Occasionally, shipbuilding contracts will allow the Purchaser to not take delivery of the ship if the delivery date is

unilaterally extended by the Contractor without Purchaser's agreement, beyond a stated number of days; in which case the Contractor refunds to Purchaser all progress payments.

9.2.18 Liquidated Damages (Performance, Design)

The Contract Specifications and Contract Plans may provide target quantities, amounts, or dimensions for various aspects of the ship. Many of them will undoubtedly be achieved because of the design process. Some of them, however, may not be exactly achieved, such as maximum trial speed, minimum continuous operating speed, fuel consumption rate at design speed and draft, maximum deadweight, draft at maximum deadweight, or liquid capacity in certain tanks, among other possibilities. These possibilities are more likely to arise if the ship incorporates a new hull form, new technology or significantly greater powering than routinely installed in a similar ship, or if the shipyard has not previously constructed a similar vessel.

The essential point is that while the process of ship design and construction continues to advance, in some technical areas there are still no absolute assurances as to the net result or outcome that is built upon numerous engineering and design decisions. This matter is discussed more thoroughly in (4).

When the completed vessel does not achieve all of its intended design or performance parameters for which the Contractor was responsible, the Contractor and Purchaser have to negotiate a resolution to the discrepancies because the requirements of the contract strictly have not been fulfilled and the Purchaser is not getting all that was bargained for. Absent a harmonious negotiation, litigation is a distinct likelihood.

To avoid litigation, the Agreement can identify liquidated damages that would be payable by Contractor to Purchaser if the specific design or performance parameters are not achieved. For example, a certain sum of damages could be payable for each one-tenth knot less than the intended trial speed for up to a half knot deficiency. Then twice that amount per tenth of a knot for a speed deficiency between a half-knot and a full knot. Similar progressive liquidated damages could be stated for greater deficiency.

The Purchaser may insist, however, that if the trial speed deficiency exceeds a stated amount, the Purchaser has the right to not take delivery of the ship and to be repaid all progress payments. The Contractor can be offered a bonus for achieving a higher speed, but the bonus may be limited to a modest amount, regardless of the extra speed achieved, because the operator cannot use that speed or cannot afford the fuel to achieve it. A graphical illustration of this form of performance-based liquidated damages is shown in Figure 9.2.

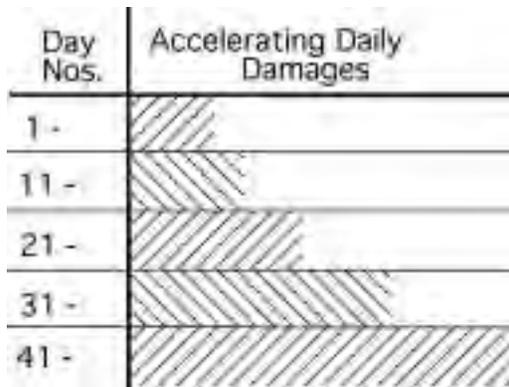


Figure 9.2 Daily Liquidated Damages (adjust days and \$\$\$ as appropriate)

ure 9.3. Similar progressive, or linear, liquidated damages and bonuses can be assigned to other key design or performance parameters, which are the net result or outcome of numerous engineering and design decisions.

9.2.19 Representatives of the Parties

The matter of identifying in the Agreement the person who constitutes the official representation of each party for contract purposes appears to be a fairly straightforward matter. However, during the completion of the design by the Contractor and during construction of the ship, numerous communications between the parties will be necessary (see Section 9.4 for identification of the types and management of those communications).

Each of the parties may wish to designate a single person to be the recipient of legal notices and other higher-level communications; but may also wish to designate other persons to be the recipient or authority for technical matters.

For example, one person may have the decision-making authority pertaining to engineering and design developments; another may have authority to accept or reject the Contractor's material and equipment selections and its workmanship; and another may have authority to approve or negotiate progress payment invoices. There are additional functions, which can be assigned to other decision-making authorities for each party.

Perhaps the most important authority to designate is the

one who can negotiate and accept amendments to the contract in the form of Change Orders. Each Change Order may modify the contractual statement of work, the Contract Price and the Delivery Date. Of comparable importance, the Agreement can also state that no persons other than the indicated representatives have any authority to modify the work scope, price or schedule, or accept design decisions or the workmanship of the Contractor.

9.2.20 Examination of Plans

It is customary to arrange for the Contractor to give to the Purchaser copies of its detail plans and working drawings in advance of their need for production. This allows the Purchaser to examine the drawings and inform the Contractor of any comments or suggestions that may be appropriate, prior to the use of those drawings by the production department. As simple as that may sound, there are a significant number of issues that will have to be addressed, preferably within the Agreement, although some contracts address such matters in the general section of the Contract Specifications. The following discussion is a distillation of a thorough discussion of this subject in (1).

The purpose of the Purchaser's examination of the working drawings or detail plans should not be miss-stated; it is important to not give more responsibility to the Purchaser than is appropriate, nor to relieve the Contractor of its responsibilities through that drawing examination process. Some words used in contracts to describe this function of the Purchaser have been: audit; examine; review; or approve. The use of the word *approve* should be avoided because such *approval* of a working drawing could be interpreted to relieve the Contractor of responsibility for any errors in the drawing or any inconsistencies with the Contract Work Scope as already defined by the Contract Plans, Contract Specifications and other components of the contract. If the Purchaser has approved the drawing, the Contractor may assume, among other possibilities, that the Purchaser has compared the drawing to classification rules regulatory requirements, the Contract Specifications or the Contract Plans, and that the Purchaser found that the drawing is in full compliance with all those requirements. The Contractor has already been assigned that responsibility in the Agreement; so the Purchaser should not relieve the Contractor of it through an *approval* of working drawings.

Agreements typically state a maximum number of days for the Purchaser to examine a working drawing before issuing any comments or suggestions to the Contractor pertaining to that drawing. The inclusion of that particular maximum duration in the Agreement ensures that the Contractor either will not start the related production work until

Trial Speed vs. Specs	Speed Bonus or Penalty	
	+\$	-\$
+0.1 and		
+0.0 to +0.1		
-0.0 to -0.1		
-0.1 to -0.3		
-0.3 to -0.5		
-0.5 to -0.7		
-0.7 to -0.9		
-0.9 >>>	Ship Not Accepted	

Figure 9.3 Trial Speed Bonus or Penalty

taking into account the comments and suggestions as appropriate, or may start the production work but at the risk of having to revise it to accommodate the comments and suggestions. The Contractor also must allow sufficient time for regulatory and classification reviews of its drawings.

The Contractor usually is required, per the Agreement, to provide to the Purchaser in advance a drawing schedule, listing the drawings that will be developed and passed to the Purchaser for examination, as well the approximate dates by which those drawings will be completed. The scheduling of the completion of those drawings must be consistent with both the periods of time for examinations by the Purchaser, classification and regulatory bodies, as well as the timeliness requirements of the physical production department of the shipyard.

As discussed previously, the Contractor may have the authority to develop interpretations, design and details that are not already spelled out by any of the Contract Specifications, Contract Plans, applicable regulations, the nominated classification rules or identified standards. The Purchaser must avoid using the drawing examination process to second-guess the Contractor's decisions that have been exercised within its authority. Any attempt by the Purchaser, whether intentional or not, to micro-manage the design development process in areas for which the Contractor has that sole authority likely will result in extra costs, delays or disputes. Perhaps the Contractor will accept an occasional preference by the Purchaser, but more extensive imposition by the Purchaser will be a burden that the Contractor need not accept. The drawing review process is not intended to be a mechanism for the Purchaser to direct the remaining development of the detail design.

This brings out a significant lesson that Purchasers have learned. The authority for design details that are not spelled out in the contract documents is typically given to the Contractor. When multiple *solutions* to a detail design requirement are available, there is no basis to expect that the Contractor will choose a solution that is exactly the same as desired or anticipated by the Purchaser. Accordingly, if a particular aspect of the vessel's detail design is important to the Purchaser, it should be completely addressed in the Contract Specifications and/or Contract Plans. It is not realistic to expect the Contractor's engineers and designers to be able to read the minds of the Purchaser's operating staff as to what those details are to be if they are not defined in the contract documents. Clearly, the process of examining or reviewing the Contractor's detail plans is not the mechanism the Purchaser should use to impose on the Contractor details that are not already defined in the contract documents.

During development of the detail design by the Con-

tractor, the Contractor may wish to implement work which appears to achieve the *intent* of the contract design but which, in fact, strictly requires a change to the Contract Specifications or Contract Plans. Agreements usually state that a Change Order or waiver affecting the Contract Specifications or Contract Plans cannot be authorized by Purchaser's acceptance of a detail plan or working drawing, which incorporates such a change. This ensures that a change in the Contract Specifications or Contract Plans is not effected through the drawing review process, but only through the formal Change Order procedure.

9.2.21 Inspection of Workmanship and Materials

When the Contractor is selecting major items of equipment to satisfy the Contract Specifications, the Purchaser may wish to include in the Agreement the creation of a review process that occurs before the purchase is executed by the Contractor. In that case, the Purchaser would have an opportunity to examine in advance the technical aspects of the Contractor's purchase order, but not the pricing. The Purchaser should have to return an appropriate comments within a specified time so the Contractor's purchasing of the equipment will not be delayed.

One issue that often arises is the Contractor's selection of equipment, which is identified in the Contract Specification with the notation that the Contractor can select that particular item of equipment or its equivalent, or its equal. That selection is subject to review by the Purchaser in the same general manner as other equipment acquisition, which is subject to advance review by the Purchaser. However, there are several often-disputed aspects of the use of the *or equal* wording, which are discussed in greater detail in Section 9.3 Formation of Specifications and in particular in the section on *Review of the Contractor's Equipment Selections*.

The right of the Purchaser to inspect work in progress, not just completed work should be clearly stated in the Agreement. In further support of that concept, either the Agreement or the General Section of the Specifications can establish a mechanism for inspection, or quality, deficiency reports being issued by Purchaser to Contractor. The Agreement or Specification may require that once such a report is issued by the Purchaser, the Contractor must respond within a defined period of time as to how and when the Contractor will correct that deficiency. Related to this is the matter of Special Retainages, discussed in a later part of this section.

An important aspect of the Purchaser's inspection and possible rejection using an inspection deficiency report is establishing, in the contract documents, the basis for such possible rejection. This is discussed in greater detail in Section 9.3, Formation of Specifications and in particular in the sec-

tion on *Inspection of Contractor's Workmanship*. The necessity of understanding all the possible problems associated with equipment selection and review and with inspection of the Contractor's workmanship presents another example of why technical personnel, not lawyers, should be the primary developers of this aspect of contract documents.

9.2.22 Changes in Specifications, Plans and Schedule

A Change Order is a formal amendment to the contract, which may incorporate changes in any of the Contract Work Scope, the Contract Price, the Delivery Date, the Terms and Conditions, or procedures set forth in the any of the contract documents. The area of greatest concern is that of changes to the Contract Work Scope, along with the associated cost and/or schedule impact.

When dealing with a government contract, it is more difficult to amend or change anything but the work scope, price and schedule, since many of the other facets of the contractually defined relationship are controlled by procurement regulations with which the government agency must comply in its contracting procedures.

This section of the Agreement is intended to define the procedures and mechanisms by which the parties can implement a change to any of the Contract Specifications Contract Plans and/or Delivery Date. The three parts of the process are the request by the Purchaser, the proposal by the Contractor, and the bilateral Change Order, which either accepts the proposal or results from negotiations over that proposal.

Sometimes, but rarely, work scope changes come about due to requests by the Contractor, usually on the basis of being able to reduce costs if the ship yard is allowed to alter some aspect of the Contract Specifications and/or Contract Plans.

Primarily, work scope changes come about because the Purchaser has requested them. That request is usually based on the Purchaser, after the contract was executed, either changing its mind about some features on the vessel or having contracted before finalizing decisions about what it wanted. Some changes come about due to errors or inconsistencies in the Contract Specifications and/or Contract Plans. A separate textbook could be written about Change Orders; but the intention of this section is to describe only what aspects need to be addressed by the Contract Agreement.

It should be noted, too, that some Change Orders have no impact on work scope, but may require additional shipyard engineering, which is accomplished through a Change Order. For example, assume the Contract Plans show that a pair of generators is to be transversely mounted, but before the work begins the Purchaser requests they be longitudinally mounted. There may have to be additional engineering to alter the de-

sign of the foundations, supporting structures and connections; but the actual production costs essentially will be the same for the transversely mounted generators as for longitudinally mounted. Thus, if accomplished in a timely manner, an engineering Change Order would be appropriate with no production cost or schedule impact.

The Agreement establishes the mechanisms needed to formally achieve the Change Orders. First it has to address the matter of the request by the Purchaser for a change proposal from the Contractor. The Agreement must consider whether or not the Contractor has a duty to make a change proposal in response to a change request from the Purchaser or if it can decline to make a change proposal. The Agreement must then indicate the normal period of time allowed for the Contractor to prepare the change proposal after receipt of the change request.

The period of time during which the Purchaser has to accept, cancel or negotiate the proposal after the change proposal is given to the Purchaser should be defined by the Agreement. If this is not a defined period of time a risk develops that the Purchaser may accept the proposal much later than the Contractor anticipated when developing the price and schedule impact of the proposed change.

The Agreement should also provide that the Contractor can also make an unsolicited change proposal. Thereafter, the same procedures and mechanisms would be utilized to convert that change proposal into a Change Order.

9.2.23 Adjustment of Contract Price and Schedule for Change Orders

Agreements almost always require that the Contractor not proceed with the changed work until there is a bilaterally signed Change Order authorizing the change to the work scope. Thus, both parties will have had to consent, in writing, to the revised Work Scope, the impact, if any, on Contract Price, and the impact, if any, on Delivery Date. This section of the Agreement defines the process of achieving mutually agreed Change Orders. This sounds simple in theory but is often difficult to implement. This section of the Agreement may also define that if the Contractor proceeds without such agreement, it is at the Contractor's risk.

There may be circumstances in which it appears to make good sense from a ship production perspective to begin implementing the change to the work scope prior to formal authorization of a mutually agreed upon Change Order. Proceeding in good faith with the change work, assuming the parties will eventually agree upon price and schedule impact, may create significant risk for either or both parties.

Some government contracts define the government's

right, as Purchaser, to *direct* the Contractor to proceed with change work even when there is no agreement as to price and schedule impacts. The idea behind this is to ensure that the government will not be abused by a Contractor that may be perceived as trying to take advantage of the necessity of the change work. The intent, as may be defined by the Agreement, is that at some later time the parties will negotiate the price and schedule impacts; and if that negotiation is not successful, the Contractor can resort to other mechanisms to seek compensation for the work. Other mechanisms may be a Request for Equitable Adjustment or the use of the Disputes Clause within the Terms and Conditions. In some government contracts, if the parties cannot agree as to price and schedule impact, the government agency will unilaterally assign a price and schedule impact in order to have a basis for making progress payments for that work; but the unilaterally determined price and schedule impacts are inevitably less than those sought by the Contractor.

Some commercial contracts, especially in time-sensitive projects, include a similar right of the Purchaser's representative to *direct* the Contractor to achieve some previously undefined work before agreeing on price and schedule impact.

If a Purchaser, whether it be a government agency or commercial entity, *directs* a Contractor to proceed without prior agreement, even if the contract gives the Purchaser the right to direct the Contractor to undertake the change work, the risks associated with costs and schedule impact have to be considered. If the Agreement does not otherwise clarify which party is assuming which risks when there is a directed change, most likely the risk is being assumed by the party doing the directing, namely, the Purchaser. In view of that, the inclusion in an Agreement of the Purchaser having the right to direct changes should be carefully considered, and probably rejected, from the outset.

Changes, which come about due to regulatory, or classification requirements that must be achieved but which became enacted after the contract was first executed are considered a basis for a price and/or schedule adjustment. This section of the Agreement defines the conditions under which such adjustments may come about. In actual practice, the *interpretation* of such regulatory or classification requirements may change, causing the Contractor to incur extra costs, but the written requirements may not have been altered, in which case the Agreement usually states or implies that the Contractor is not entitled to an adjustment of price or schedule.

9.2.24 Extension of Time

This section of the Agreement addresses extensions to the Contract Delivery Date due to events beyond the control of the Contractor. These are sometimes known as *force majeure*

events, such as unusually severe weather, acts of the government, riot, strikes and labor disputes, among other possibilities. Some Agreements do not allow supplier failures or subcontractor defaults to be the basis of such excused delays, while others may allow such a basis for excused delays if the Contractor can demonstrate a direct impact on vessel completion schedule. This section of the Agreement also identifies the communications which must be accomplished by the Contractor if a *force majeure* delay is appropriate.

Some Agreements also address possible schedule impacts resulting from interpretations to the applicable regulatory and classification requirements. This is likely to be a focal point for disputes, because these problems may not arise from changes or alterations in the applicable regulatory or classification requirements. The problem may be in the third-party inspector's interpretation of those requirements. It is recommended that impacts arising from *interpretations*, but not from changed regulatory and classification requirements should not be a basis for extensions of time, since the Purchaser has not defined a very specific interpretation in advance. In such instances, any interpretation by the third party, whether expected by the Contractor or not, is still consistent with the Contract Specifications, the Contract Plans and the referenced documents.

9.2.25 Final As-Built Drawings and Calculations

The as-built, or as-fitted drawings and the final calculations and test data form an engineering database for the ship. Most Purchasers' require, through this section of the Agreement, that the Contractor is to provide such information as to form that engineering database.

These *deliverables* from Contractor to Purchaser have to be defined to ensure that the Contractor allows for their development in the project's budget and schedule. These may be defined as a combination of

- various certificates to be issued by regulatory or classification organizations,
- standard calculations in formats defined by professional societies such as SNAME, and
- documentation that is unique in format or content to the particular contract or ship. The Agreement should also define whether each element of the documentation is to be transmitted only in hard copy (on paper) or if it also is to be transmitted electronically in computer-readable format. The Agreement may refer to a particular section of the Contract Specifications for the detailed format of those calculations and drawings.

The timeliness of delivery of those documents from Contractor to Purchaser should be defined within the Agree-

ment; otherwise the Contractor has little motivation to accomplish them promptly if its engineering resources are temporarily needed for other projects. Part of that motivation may be generated through the progress payments section, as discussed below.

Some Agreements provide a schedule for delivery of the documentation in draft form to the Purchaser, and then delivery in final form after the Contractor's correction of the documentation in accordance with comments from the Purchaser.

It is not uncommon for disagreements to develop over the quality and/or accuracy of the *as-built* drawings. In order for those drawings to be accurate, personnel from the shipyard's drafting department must go on the completed ship to ascertain how the production department had to vary from the production plans in order to remedy interferences between structure and the various distributive systems, if composite drawings were not used. Typically, not wishing to incur those extra costs, shipyards will provide *as-built* drawings that the shipyard deems as adequate and of sufficient accuracy. If the Purchaser expects to receive accurate *as-built* drawings, appropriate controls over the process have to be included in the contract documents, including use of the progress payments clause.

9.2.26 Operating and Technical Manuals

The Contractor must also know the extent of operating and technical manuals that are to be provided with the ship. Some Purchasers are content to accept the manuals that are provided by the equipment manufacturers only. Other Purchasers, however, require system manuals, that is, manuals for the concurrent and interdependent operation of groups of components that form a system. Whatever the preference of the Purchaser, it must be defined in either the Agreement or, by reference, in an appropriate section of the Contract Specifications.

Absent such a requirement in the Agreement, the Contractor may perceive that it is not required to provide such technical documentation. If system manuals are required, they usually have to be developed by the Contractor or a specialist subcontractor, either of which may represent a significant cost to the Contractor.

Government contracts, especially for Navy and Coast Guard vessels, may require even greater *logistic support* technical documentation for which the cost of development may be a measurable percentage of the cost of the physical vessel. If these requirements are not defined within the Agreement or, by reference, within the Contract Specifications, it may become impracticable for the Purchaser to obtain them at a later date.

9.2.27 Tests and Trials

There are a significant number of tests and trials to which the vessel must be subjected in order to prove the workmanship and the operational capability of each component, and then each system, and then finally the entirety of the vessel. Many of these tests and trials are needed to obtain regulatory and classification approvals, but others are needed to give the Purchaser assurance as to the satisfactory completion of the work by the Contractor.

Each test and trial has cost and possibly schedule impacts. In order to include each of them in the Contractor's price and schedule, they have to be defined in the Agreement or, by reference, in the Contract Specifications. If special instrumentation or equipment is needed to accomplish the tests, it should be stated that Contractor is to provide those items, such as water bags or test weights for crane load tests and load banks for generator electrical load tests.

For some of the more complex trials, a definite, draft trial agenda should be developed by the Contractor in advance, provided to the Purchaser for review and comments, and then finalized prior to those trials. The Agreement should establish the schedule and mechanisms for such developments. Several organizations, including SNAME and ASTM as well as the Navy and Coast Guard, have standard test and trial agendas which may be the basis of the specific agendas developed for the new ship's trials.

The details of any tests and trials, as well as the standards to be used for test and trial agendas, should be in the Contract Specifications but the necessity of them, especially those in excess of regulatory and classification requirements should be identified in the Agreement.

9.2.28 Warranty Deficiencies and Remedies

The warranty clause of the Agreement must address several specific issues but the order in which the issues are addressed is not significant. It should be understood, however, that a warranty claim can apply only to an item, which was working or completed at the time of Vessel Delivery, and subsequently broke or ceased to work sometime during the Warranty Period. An item which was not working or not completed at the time of Vessel Delivery may be corrected or completed during the Warranty Period, but it is financially treated in a different manner, as described below in the section on Special Retainages.

The duration of the warranty period should be defined. Related to that, the warranty clause should address how, if at all, the warranty period pertaining to some equipment, or perhaps the entire ship, is extended if that item or the entire ship is out of service due to a warranty defect.

The warranty clause must also define what is subject to

the warranty: the Contractor's workmanship, the materials and equipment supplied by the Contractor or both. Further, the warranty clause must define which entity is giving the warranty on each particular aspect of the ship. The clause may allow the Contractor to *pass through* any manufacturing warranties from vendors, such as pump manufacturers or coating suppliers, and provide that the Contractor does not otherwise warrant that item; however, the Contractor always warrants the workmanship of installing or applying those items. This may present some risk to the Purchaser if the manufacturer's warranty expires before the balance of the contractual warranty is to expire.

If an item of equipment is subject to the manufacturer's warranty, the Purchaser may find subsequent to a breakage, that the manufacturer identifies the cause as one of improper installation. That is, for the Contractor to remedy, and the Contractor identifies it as a manufacturing defect. That is, for the manufacturer to remedy. This will create for the Purchaser a potentially unsatisfactory situation, which is best addressed by a contract retainage, as, discussed in Sub-section 9.2.30.

The matter of which party is to expend resources to correct a warranty item must also be defined. This can be complex since it must allow for:

- emergency repairs,
- possible remote location of the ship relative to the shipyard,
- timing of notification by the Purchaser to the Contractor of the existence of a warranty defect, and
- location at which it is possible to effect the warranty correction.

Subsection 9.2.30, Contract Retainages, addresses possible use of those retained funds to effect warranty repairs.

9.2.29 Progress Payments

A shipyard needs progress payments to cover the significant cash-flow requirements that are incurred by the shipyard during ship construction project. The cash flow relates to the regular payroll for all those working on the vessel's construction, the subcontractors, the vendors and suppliers, as well as for a portion of the overhead costs for the facility and organization. The shipyard's need for progress payments is not eliminated if the Purchaser decides to finance the construction by a mechanism, which is separate from the final vessel mortgage financing. Either the Purchaser or the institution providing the construction financing will allow the Contractor to draw down against the arranged funds on a progress basis, which is pre-established in the Agreement.

It is in the best interest of the Purchaser to ensure that progress payments are made only for work already completed or materials and equipment already received by the Contractor. In some instances, all progress payments have been linked to purely physical construction, but that is not recommended due to the risks it creates. The engineering, the component tests, the system tests, the dock trials, the sea trials, and the certificates and documentation to be provided with the ship all require expenditures by the Contractor. If progress payments are made on the basis of physical progress only, the Contractor has reduced incentive to fully and timely complete all of those tasks, which are not direct production work. Thus, an appropriate part of progress payments can be linked to those aspects of the Work Scope, which are not physical production of the ship.

Consistent with Mr. Blakeley's words cited in the introduction to this chapter, there have been major contractual disasters brought about due to premature physical construction of ships, in the extreme, some resulted in scrapping of the ship after construction but before ever being put into service. The construction was premature due to inconclusive or incomplete models tests, research, engineering calculations or other activities affecting design development.

Progress payments can be used as a mechanism to discourage premature physical construction, which might otherwise be undertaken prior to completion of activities, which are best, completed prior to the start of physical construction. For example, the Agreement can state that no progress payments associated with physical construction will be made until the delivery to the Purchaser of a satisfactory, detailed-but-preliminary trim, weight and stability booklet. On some vessels, damage stability may be more relevant. Similarly, progress payments against any electrical production work can be subject to completion of satisfactory electrical load and fault-current analyses. Other linkages between non-production work and progress payments may be appropriate, depending on the specifics of the project.

Non-production work items that do not have to precede production work, such as completion of as-built drawings, tests and trials, among other functions, can have their own progress payments associated with them. Simply if the Contractor has received all the progress payments prior to delivery of the as-built drawings, for example, the Contractor has reduced incentive to apply its resources to proper up-dating and completion of those drawings once the ship has departed the shipyard.

The amount of the progress payments is based on contractually defined mechanisms. Some contracts break-down the total work into small percentages for each structural module, major components, mechanical or electrical sys-

tem, and for each major part of the distributive systems (supply piping, return or drain piping, HVAC, electrical distribution). The parties then periodically agree as to the percentage that each of those systems has been completed and a progress payment against that percentage completion is paid. This methodology for quantifying progress payments may not be accurate near the start of the project, but typically becomes fairly accurate near the end of it, as long as the non-production activities are being paid separately by their own progress payments.

Other contracts use well-defined milestones as the basis for progress payments. Depending on the nature of the ship construction project, a total of thirty to one hundred separate milestones may be defined—each having a particular percentage of the total Contract Price associated with its completion. At the end of every month, each of those milestones, which are 100% completed within that month become eligible for the associated progress payment. The non-production activities have their own set of progress payment milestones associated with them, too. For example, a particular progress payment may be for the structural machinery space module; another may be for receipt of all the tonnage and classification certificate.

The developers of the Agreement must have a clear understanding of the ship construction process—both production and non-production work, in order to develop an appropriate set of progress payment criteria. This is another basis for technical personnel to be controlling contract formation. Sometimes it appears that the Contractor wishes to negotiate into the Agreement earlier payment than the Purchaser is willing to allow. Although the cash flow requirement for the shipyard may be essential to its financial ability to timely finish the project, there is more risk to the success of the project if payment for not yet completed work is allowed.

9.2.30 Contract Retainage

Many Agreements provide for the Purchaser to retain a defined percentage of each progress payment. Thus, at the time of vessel delivery to the Purchaser, assuming all the deliverables other than the ship have also been completed, the situation is this: the Purchaser receives the ship and 100% of the other deliverables, but the Contractor has received a lesser percentage of the total contract price.

The purpose of the contract retainage is to provide for the circumstance in which the Purchaser may have to pay for a warranty correction when the Contractor is not able to timely accomplish it or when the Contractor allows the Purchaser to effect that correction. Another purpose of the contract retainage may be to protect the Purchaser in the event of a lien or claim by a supplier, vendor, subcontractor

or other party which has contributed to the construction of the ship but has not been fully paid by the Contractor. To minimize the likelihood of such liens or claims, the Terms and Conditions usually require that the Contractor certify that the Vessel is being delivered free and clear of all liens, claims and encumbrances, and certify that all suppliers, vendors, and subcontractors have been fully paid.

For commercial contracts, the amount of the retainage, as a percent of the Contract Price, is negotiated during contract formation. On new commercial construction, it is usually no higher than ten percent, often five percent. Some Purchasers do not require any contract retainage. The absence of any contract retainage creates a risk, however minor it may be, that the Purchaser will have to disburse money for warranty corrections that properly should have been expended by the Contractor, with no cost-effective recourse to recovering that outlay.

For government contracts, the amount of the retainage is established in the request for proposals, or solicitations. Some government agencies require more significant retainages, which, in practice, may only serve to cause bidders to seek higher prices in order to deal with the impact on cash flow that such large retainages may have. From a government agency's perspective, a larger contract retainage allows longer payout for the ship; but in fact it may only serve to increase the cost of the ship.

The Agreement defines when the Contractor will receive the balance of the Contract Price, provided the Purchaser has not spent part of it in a manner allowed by the Agreement. The Contract defines a temporary business and legal relationship. From the outset, it is intended that the relationship will terminate upon the end of the warranty or guaranty period. Thus, all contract retainage should be finally paid to the Contractor no later than the end of the warranty period.

Some contracts provide that half or some other portion of the contract retainage be paid prior to the end of the warranty period, and the balance paid at the end of the warranty period.

9.2.31 Special Retainages

It is not uncommon that some items on the ship are incomplete or not fully functional at the time the ship is otherwise ready for Vessel Delivery. If those items do not affect ship safety, the ability of the ship to achieve its mission or perform its service, and if the correction or completion does not require the presence of the ship at a full-service shipyard, the parties may agree that the delivery of the Vessel will not be delayed by those deficiencies.

However, this creates a situation that is inconsistent with

the intent of the contract, which intent was stated above, namely, at the time of Vessel Delivery the Purchaser receives the ship and 100% of the other deliverables, but the Contractor will have received a lesser percentage of the total contract price per the contract retainage. In other words, the Contractor is implicitly seeking a waiver of the requirement to deliver the ship in a complete and fully functional condition. In that case, the Contractor should not receive all the funds that otherwise would have been paid at the time of Vessel Delivery.

The Purchaser may grant that implicitly requested waiver if the contract retainage is ample to cover all of:

- the correction of those deficiencies
- all warranty corrections, and
- any possible liens or claims by subcontractors and vendors. However, such granting of a waiver creates risks if the Contractor does not correct the outstanding deficiencies. Under other clauses, the Purchaser may not have the right to use the contract retainage to rectify items, which clearly were not warranty items, because they didn't break *during* the warranty period.

It is recommended that the Agreement allow the Purchaser to create a special retainage for each such uncorrected pre-delivery deficiency in order to give the Contractor incentive to have that deficiency corrected during the first half of the warranty period. At the end of the first half of the warranty period, any such special retainages are paid to the Contractor if the corresponding deficiency has been corrected. If it is not corrected by that time, the Purchaser can use those funds to have it corrected during the second half of the warranty period. The reason for that time limit on the expenditure by the Purchaser is, again, that the temporary business and legal relationship is expected to conclude at that time.

9.2.32 Technical Project as Basis of Agreement

The previous sub-sections of this section on Formation of the Shipbuilding Agreement have discussed the purpose and concerns of a number of the clauses of a typical commercial shipbuilding agreement. Other clauses may also be appropriate if they are not already included in the Terms and Conditions of the contract documents. Government contract forms will vary considerably among the many possible government agencies (federal, state, local, educational institutions, quasi-governmental agencies, etc.), but will all contain the equivalent of the clauses discussed above, as well as possibly others that are required by the agency's procurement regulations.

When a set of contract documents is being developed, the Agreement and Terms and Conditions are usually built up from a previous set of similar documents. If, however,

the nature of the vessel acquisition is going to be significantly different, then the use of the prior documents as a starting point has to be addressed more carefully. For example, if the prior acquisition was for a ship of the Contractor's standard design, and the new acquisition is for a unique design, there are many aspects of the Agreement that will have to be modified. If the contractor has never constructed a ship of the type being acquired, a more-rigorous set of checkpoints may have to be incorporated into the Agreement and the supporting Specifications

Essentially, besides establishing a temporary business and legal relationship between the Contractor and Purchaser the Agreement and the supporting documents should identify potential risks (technical, financial and schedule) assign responsibility for avoiding those risks, and address the consequences if those risks are not satisfactorily avoided. Thus, the nature of the technical project and the risks associated with its achievement are the most important factors in the creation of the contract documents. The entire set of contract documents must be integrated and consistent with each other, but primarily must be appropriate to the technical aspects of the project.

9.3. FORMATION OF CONTRACT SPECIFICATIONS AND PLANS

9.3.1 Introduction

The Contract Specifications and the Contract Plans are technical documents, which are non-ambiguously identified in the Agreement by those titles. The purpose of those documents is to define the technical products or deliverables, which the Contractor is to provide to the Purchaser. The Agreement, or perhaps, but not preferably, the General Section of the Specifications identifies the regulatory requirements and classification rules that are to be satisfied incorporation of certain design and construction features into the vessel. Those design and construction features arising from regulatory requirements and classification rules however, essentially are generic, not unique to the vessel being acquired under a specific contract. Many of the design and construction features identified by the Contract Specifications and Contract Plans are unique to the vessel, making it different from other vessels. These documents may also define other features that are not necessarily unique for this vessel, but are not included in the regulatory requirements and classification rules

Thus, the Contract Specifications and the Contract Plans as components of the contract documents, define the heart of the project and possibly make it different from other ship construction projects to the appropriate extent. This section

first addresses the intent and limitations of those documents and then generally addresses the components within those documents as well as special concerns associated with several of those components. This subchapter, however, is not a substitute for a course of study neither on specification preparation nor on the development of plans.

9.3.2 Non-Included Features

The Contract Specifications and Contract Plans define the unique features of the vessel and other non-unique features that are not already addressed by the appropriate regulatory requirements and classification rules. It is pointed out in the first section under the topic of Decision-Making Authority, that numerous details, which are not already defined in the Contract Specifications and Contract Plan will have to be developed by the Contractor after the contract is executed. Except for unusual cases, when the parties executed the shipbuilding contract, the authority to make those additional decisions as to the form of the numerous details was passed from the Purchaser to the Contractor. The Purchaser's naval architects and marine engineers who are developing the Contract Specifications and Contract Plan must keep in mind that they will have yielded to the Contractor the right to make those decisions.

Thus, if the exact form of any lesser details is important to the Purchaser, the Contract Specifications and Contract Plans should describe them to an appropriate level of detail. If such details are not already incorporated into the Contract Specifications and Contract Plans generally the Purchaser will have to accept the Contractor's *solution* to those details. The Purchaser's staff should bear in mind that it is most likely the Contractor will be seeking minimum-cost solutions to those technical details when working under a fixed-price contract.

The Purchaser's naval architects and marine engineers should not use the drawing review process as a mechanism to impose on the Contractor a more expensive solution if the Contractor's solution is in all regards consistent with the contract documents. For example, if the form of mounting an item of equipment on a deck is important to the Purchaser for reduced noise transmission, that form of mounting cannot be announced after the Contractor has prepared drawings or even after the contract has been executed. Rather, because the form of mounting to minimize noise transmission likely will cost more than another form of mounting, the Contractor should have been given the opportunity to consider it before developing its bid price for the work.

9.3.3 Identifying the Required Type of Specification

In general, there are three types of specifications

1. design or end product specifications
2. performance specifications; and
3. procedural specifications

Each of these three types of specifications leads to a different assignment of responsibilities between the Purchaser and the Contractor. A typical Contract Specification will include, for all the different aspects of the ship, more than one type of specification and may even include all three types. The type of specification used for the hull form for example, can be entirely different from the type of specification used for the ballast pumps.

A design or end product specification is a representation by either drawings or verbal descriptions or both, of what that aspect of the ship should look like upon completion. The use of a Contract Plan for the hull lines serves to define the form of the hull from which the Contractor cannot vary. The hull form may be subject to variance if confirming model tests are to be conducted by the Contractor. Another example of a design or end-product specification may be for hull coatings. The Contract Specification may define the type, composition and color of the coatings, as well as perhaps the manufacturer, and then go on to define the thicknesses of each of the primer, undercoat and topcoat. That is, the final configuration of the coating layer-by-layer, has been defined by the Contract Specifications. An associated procedural specification as discussed below, establishes the criteria for appropriate surface preparation and material application.

A performance specification on the other hand, does not in any way describe what the object will look like, but instead will describe how it is to perform. A specification for the ballast pumps on a ship, for example, could state that the two ballast pumps shall each separately be capable of pumping into and out of the ship's ballast tanks a certain number of tons of ballast water per hour. Thus, the shape, material content, and weight, among other parameters, for each of those pumps will be selected by the Contractor provided that each can pump the required number of tons of ballast water per hour. Note, too, that a loosely written specification for two ballast pumps of equal capacity may even result in two different brand names; it is all at the discretion of the Contractor under a performance specification. The Purchaser can write a *tighter* specification to void that two-brand possibility. See the sub-section, below, on Brand Names or Equal to supplement this discussion.

A procedural specification usually supplements one of the two other forms of specification by defining part of the procedure that is to be followed in achieving the other part

of the specification either in the design process or the construction stage. An example of a construction procedural specification pertains to coatings the design specification for the coatings, as described above, may be supplemented by a procedural specification that requires the Contractor to apply the coatings in accordance with the practices recommended by the coating manufacturer pertaining to surface preparation, air temperature, steel temperature, relative humidity, direct sunlight, wind speed, etc.

An example of a design procedural specification may relate to power and signal cables. The design of the cable trays may be solely at the discretion of the Contractor other than regulatory requirements and classification rules. That is, the cable trays are defined by a performance specification. However, that performance specification may be supplemented by an applicable design procedural specification which may state that when designing the cable trays, the Contractor shall also comply with the requirements of an identified electro-magnetic interference (EMI) standard to ensure that the EM emissions of power cables do not interfere with the signals within the control, alarm and monitoring cables.

The naval architects and marine engineers who develop the Contract Specifications and Contract Plans for the Purchaser can select whichever form of specification best suits the needs of the project for each item and each aspect of the ship. However, it is their responsibility to ensure that all of those specifications are compatible with one another. For example, if the EMI procedural specification requires two levels of cable tray to avoid the interference, the ship's basic design by the Purchaser's staff will have to provide ample space for those two levels; otherwise the requirements imposed on the Contractor may be impossible to achieve.

9.3.4 Standard Forms of Specifications

The technical Contract Specifications can be arranged in nearly any sequence; but there are standard sequences that have been used by industry in various countries. In the United States, for example, the U.S. Maritime Commission in the 1930s and 1940s, followed by the U.S. Maritime Administration in more recent years, have developed and used a standard set and sequence of section headings as indicated in Table 9.V. Each of those section headings includes multiple standard sub-headings (not shown herein due to size and number).

The value of using a standard group of headings and a standard sequence is that both shipowners and shipyards have become accustomed to using those standards. Of course, many of the section headings in Table 9.V may not be applicable to every project, and thus those section num-

bers should not be used. Other widely used standard specification headings can be used as well. A major benefit of starting with a standard is that it reduces the likelihood of inadvertently omitting some specification items. Additional sections for special shipboard features can be added by selecting section numbers that are not already used.

As to the actual content of the sections, distinct from the headings, it is noted that generic guideline, example or standard specifications also have been developed and published by many organizations worldwide. Sometimes those published specifications are quite helpful to persons developing specifications for a particular aspect of a ship for the first time. A review of such publications by specification writer will help assure that salient points will be addressed in the new specification though it is not necessarily as suggested by the guidelines. When the ship type, or the system within the ship, is innovative or represents a new application of existing technology, the final specification may have only faint resemblance to the previously published specifications.

The U.S. Navy, for example, has used its *Gen Specs*, being general or standard specifications for its use in defining particular aspects of the intended product in naval construction. With rapidly developing materials technology and innovative design concepts, however, those Gen Specs do not appear to be relevant to each new class of vessel as they once had been. Since the mid-1990s, the U.S. Navy has been relying less on these Gen Specs and more on specifications developed for the particular vessel design, materials technology and application concepts being employed in the development of its newest ships. That Gen Spec should not be confused with the section of general specification contained within most contracts.

The U.S. Maritime Administration has published *Guideline Specifications for Merchant Ship Construction*. The most recent edition (1995) is intended as a helpful generic package for ship operators and shipbuilders who will design specific commercial ships. That publication states, "*These specifications can be used as starting points for the preparation of construction specifications for any type of ship. [They] are intended to provide guidance to the maritime industry for the preparation of specifications. They cover all aspects of potential contract work, but may require modifications, as appropriate, to the ship design being contemplated.*"

Recognizing that the value of such specifications has diminished due to numerous developments, the U.S. Maritime Administration no longer intends to update its published specifications.

Because published specifications from any source, are only generic, guideline, example or standard, the contract specification has to be more supportive of the exact ship type

TABLE 9.V Possible Specifications Section Headings

1 General	53 Main Shafting, Bearings, Propeller	79 Ladders, Gratings, Floor Plates, forms & Walkways in Mach'y
2 Structural Hull	55 Distilling Plant	80 Engineer's and Electrician's shops, Stores And Repair
3 Houses And Interior	56 Fuel Oil	81 Hull Machinery
4 Sideports, Doors, Hatches,	57 Lubricating Oil	85 Instruments and Miscellaneous Boards—Mechanical
5 Hull Fittings	58 Sea Water	86 Spares—Engineering (Crating And Storage)
6 Deck Coverings	59 Fresh Water System	87 Electrical Systems, General
7 Insulation, Linings And Battens	60 Feed and Condensate	88 Generators
8 Kingposts, Booms, Masts, Davits	61 Steam Generating	89 Switchboards
9 Rigging and Lines	62 Air Intake, Exhaust and Forced Draft	90 Electrical
10 Ground Tackle	60 Feed and Condensate	91 Auxiliary Motors and Controls
11 Piping--Hull Systems	61 Steam Generating	92 Lighting
12 Air Conditioning, Heating and Ventilation	62 Air Intake, Exhaust and Forced Draft	93 Radio Equipment
13 Fire Detection And Extinguishing	63 Steam and Exhaust	94 Navigation Equipment
14 Painting and Cementing	64 Machinery Space	95 Interior Communications
15 Navigating Equipment	65 Air Conditioning & Refrigeration Equipment	96 Storage, Batteries
16 Life Saving Equipment	66 Ship's Service	98 Test Equipment, Electrical
17 Commissary Spaces	67 Cargo Refrigeration—Direct Expansion System	99 Centralized Engine Room and Bridge Control
18 Utility Spaces and Workshops	68 Liquid Cargo	100 Planning And Scheduling, Plans, Instruction Books,
19 Furniture and Furnishings	69 Cargo Hold Dehumidification	101 Tests And Trials
20 Plumbing Fixtures & Accessories	70 Pollution Abatement and Equipment	102 Deck, Engine and Stewards Equipment and Tools,
21 Hardware	71 Tank Level Indicators	103 Requirements For Structure-borne Noise
22 Stowage & Protective Covers	72 Compressed Air	
23 Miscellaneous Equipment Stowage	73 Pumps	
24 Name Plates, Notices and Markings	74 General Requirements For Machinery Pressure Piping	
25 Joiner Work and Interior	75 Insulation—Lagging For Piping and Machinery	
26 Stabilization	76 Diesel Engines Driving Generators	
27 Container Stowage and Handling	78 Tanks—Miscellaneous	
50 Main And Auxiliary		Appendix A: Owner Furnished Equipment
51 Main Diesel		
52 Reduction Gears and Clutches—Main		

and the newest materials technology to achieve the intended result. Also, because published specifications try to be applicable to multiple ship types and multiple situations, it is likely that the contract specifications could be briefer than the published ones. Specification writers should be cautious however, regarding the goal of achieving brevity in their work. It sometimes appears that due to the absence of information deleted for the sake of brevity, such shortened, and thus possibly ambiguous, specifications may lead to disputes

9.3.5 Contract Deliverables

At the beginning of this section it was stated that the purpose of the Contract Specifications and Contract Plans is to define the technical products or deliverables which the Contractor is to provide to the Purchaser. Note the use of the plural of "technical products or deliverables." The Purchaser is

paying the Contractor not only for the ship itself, but also for numerous other deliverables. Without many of those other deliverables, the ship by itself is not completely usable or maintainable by the shipowner. Some of those deliverables are defined by the applicable regulatory requirements and classification rules. The rest have to be defined by the Agreement, primarily the financial deliverables, or the Contract Specifications primarily the technical deliverables.

The contract deliverables, other than the hardware of the ship and spare parts, will take many forms. Some of the deliverables will be engineering calculations, trim, weight and stability calculations, finite element analyses, fatigue strength calculations, electrical load and fault-current analyses, heat-load and heat-balance calculations, among others.

Some will be drawings, detail plans for review, classification-approved plans, as-built/as-fitted drawings, and others; some deliverables will be copies of ship yard

correspondence with classification and regulatory bodies; some will be certificates from classification and regulatory bodies, and possibly from others. Some deliverables will be test and trial agendas and subsequent reports, and some will be warranty forms from vendors and others; and some deliverables may be shipyard scheduling information, hazardous waste disposal records, insurance information, among many other possibilities. This list is by no means complete.

The completion and delivery of each of those deliverables from Contractor to Purchaser represents a source of costs to the Contractor. If each of them is to be accomplished, the Contractor must know about them prior to bidding or pricing the work in order to have the budget available for each of them. Accordingly, the persons developing the Contract Specifications for the Purchaser must ensure that each such deliverable, hardware, drawings, calculations, correspondence, computerized files, etc. is identified as a required deliverable in the documents made available to bidding shipyards from the outset. All of the deliverables, besides the ship itself, have to be defined by the contract documents or they are beyond the work scope requirements of the Contractor.

9.3.6 Defining the Complete Scope of Work

In addition to the ship, the spares and all the other contract deliverables, the entire scope of work which the Contractor will have to undertake needs to be defined to the extent that there is sufficient information in the bid package or at the time of contract negotiations such that the Contractor can identify and estimate all sources of costs. In other words, if a shipowner's requirement for any information, materials or special tests will cause the Contractor to incur costs, such items must be separately identified in the contract documents as a Contractor responsibility.

Some examples of such items are:

- the payment of fees for classification and regulatory approvals, if needed,
- confirming model tests if they are to be accomplished after contract signing,
- maintenance of a detailed weights-and-centers spreadsheet for every item of equipment if appropriate,
- rental of testing equipment if it will be needed (test weights, electrical load banks, etc.), and
- any special testing requirements on shipowner-furnished equipment that the Contractor has to perform.

There are some aspects of technical specifications that cannot be glossed over without increasing the likelihood of some consequential disputes. A negative example, one to be avoided, is illustrated by the following wording taken from a recent specification. "*All work necessary to perform*

the specified work shall be deemed to be part of the specified work whether specified or not." This was an attempt by the specification writers to convey to the Contractor the responsibility to make everything complete and functional at no extra cost to the Purchaser. However, such wording is too broad to be usable for estimating and pricing, and thus likely could not be enforced in court.

The intent may have been to include, for example, the unspecified supply and installation of remote motor controllers for some of those electrical motors defined by the specifications. But inasmuch as the specification writer has information particular to the specified motor, that writer was in a better position to know if a remote motor controller would be needed. When estimating the work scope, the Contractor would not automatically know that a remote motor controller would be required, and thus the cost of it would not be included in the fixed contract price.

A Purchaser should not rely on requirements such as *first class marine practice* or *best marine practice* or other ill-defined phrases in order to ensure quality of material selection or quality of workmanship. Highly subjective requirements, phrased as those, are not conducive to quantitative estimating, and thus cannot be included in the price of the shipbuilding contract.

It should be remembered that, in soliciting bids or requesting pricing from a potential Contractor, the Purchaser is seeking quantities, quantities of production hours, material costs, subcontractor costs, facility and equipment costs, and schedule days. Accordingly, all aspects of the Contract Specifications and Contract Plans must be suitable for translation into such quantities. Broad concepts, such as the negative example given above, are not directly translatable into quantification prior to accomplishment of most of the remaining design development, and thus do not constitute well-defined specification.

9.3.7 Shipyard Schedule and Updates

Many requests for proposals or similar solicitations by shipowners from bidding shipyards require that a preliminary schedule be supplied with the bid to ensure that the bidder has an understanding of the work scope comparable to that of the Purchaser's staff. It is common, but not necessary, for the contract documents to require that the Contractor provide the Purchaser with a detailed schedule within a stipulated period of time after contract execution. There are many reasons why the Purchaser's staff wishes to see that schedule, some of which have been discussed in Section 9.2 (see the subsection on Project Schedule) and some of which are discussed in the following subchapter 4 on Management of Contracts During Performance.

The Contract Specifications may present more detailed requirements for the project scheduling to supplement the general requirements of the Agreement. The more detailed requirements may address, for example, the use of separate activities for each of engineering procurement, installation and testing for each item of equipment. The necessity of providing the Purchaser with updates may be supplemented by stating that such updates shall be made periodically; the period depends on the particular project, or more frequently if major changes have been agreed upon.

If both the Agreement and the Contract Specification address the Contractor's responsibilities regarding project schedule, it is essential to ensure that they complement one another and do not conflict.

9.3.8 Engineering Design Responsibilities

In Section 9.1, the subsection on Decision-making Authority pointed out that between the Contract Specifications and Contract Plans, on one hand, and the shipyard's detailed plans or working drawings, on the other, numerous developmental design decisions likely will have to be made. Some of them will be guided or controlled by the regulatory requirements, classification rules or identified standards such as industry standards or Mil Specs, but many others are not so guided or controlled. In almost all shipbuilding contracts, when the parties executed the shipbuilding contract, the authority to make those decisions was passed from the Purchaser to the Contractor. The only residual decision-making authority that the Purchaser retains is indirect confirmation through review of the detail plans or working drawings.

From the shipyard's perspective, however, that decision-making authority is a mixed blessing. It is appreciated by shipyards because it gives shipyards the authority to seek least-cost solutions to ship production. In contrast, however, it puts them at a disadvantage when bidding the work because each shipyard does not know with certainty how much economy, compared to the Contractor's competitors, it will be able to build into the vessel through the use of such opportunities.

A shipyard is put at a further disadvantage when it has responsibility for significant design development because it must use or hire naval architecture and marine engineering design staff or subcontractors to accomplish that design development. This creates risks for the shipyard because the naval architects may be more likely to perfect the vessel's performance attributes or operational efficiency instead of making the ship more economically producible (see Chapter 14—Design/Production Integration).

The Purchaser's staff, when developing the Contract Specifications and Contract Plans, should bear in mind the shipyard's general wariness at having to incur such risks arising

from undertaking significant design development. This does not mean that a Purchaser must allow the Contractor to avoid that responsibility, but it does mean that the Purchaser through the Contract Specifications and Contract Plans must ensure that it is perfectly clear that the Contractor will, in fact, have those responsibilities as appropriate to the project.

Accordingly, the Contract Specifications or the Agreement must clearly define the Contractor's responsibilities to perform all the engineering and design development tasks necessary to translate the requirements of the contract documents into material procurement, equipment procurement, detail plans, working drawings, and production plans, all of which are then used for ship production. If the Purchaser is not going to be providing any additional engineering or design support for the project, it might be best to clearly state, rather than merely imply that no additional design information is being provided by the Purchaser.

When the Purchaser is assigning to the Contractor such responsibilities, the Purchaser's technical staff should be mindful of the fact that they will no longer have control over those decisions. If the Purchaser's technical staff is concerned that the Contractor may find means of making the ship construction too economical to suit the Purchaser, then *tighter* or more-detailed specifications should be developed for those particular aspects of the ship that are of greatest concern to the Purchaser. A Purchaser's technical staff should be cautious when responding to a Contractor's request for additional design information by means of *clarifications*. This may be symptomatic of the Contractor's reluctance to undertake the design effort that it is contractually obligated to accept. Further, it may lead to allegations by the Contractor that the design information, if provided by the Purchaser, implies a greater work scope than otherwise required, thus necessitating a Change Order.

9.3.9 Brand Names/ Or Equal

One mechanism that is often used in Contract Specification developed by the Purchaser is to identify a particular brand name and model number of an item of equipment and then state that the Contractor must provide and install that particular item *or equal*. The intent, by the Purchaser, is to ensure that a certain quality is achieved. While this may be a worthwhile effort, it may not lead to the Purchaser's expected results for any of several reasons.

When an *or equal* mechanism is utilized in the specifications, the specifications usually reserve to the Purchaser the right to accept or reject the substitution proposed by the Contractor. The Purchaser can minimize the likelihood of a misunderstanding of what will or will not be acceptable by giving greater definition. In particular, the Contract Spec-

ifications could define what parameters are going to be considered when determining if a shipyard-offered substitution is truly *equal*. For example, the parameters that could be important for a motor/pump combination on a high-speed passenger ferry likely would be different than those being considered for a large tanker. Table 9.VI presents a partial list of parameters that might be considered in such situations; other parameters would be appropriate for other forms of equipment.

Another mechanism used in shipbuilding contracts to limit the choices for equipment that will be made by the Contractor is to negotiate or include a *maker's list* for various items. The maker's list identifies the brand name and model of equipment that is included in the base-line design.

Some maker's lists will include more than one possible brand name and model for several particular items of equipment. Whether or not the Contractor has the right to seek an equivalent to the items on the maker's list must be defined in the contract documents; without such clarification the Contractor may interpret that it does have such rights and the Purchaser may interpret that it does not.

TABLE 9.VI Selected Parameters for Determining Equivalency of Combined Pump/Motor

Maximum Continuous Rate of Output
Maximum Peak Rate of Output
Pressure at Various Rates of Output
Materials of Construction
Weight
Audible Noise
Vibration Transmission
Mean Time between Failures
Metric or Non-metric Fittings
Electrical Feedback Characteristics
Controllability of Rate of Output
Power Requirements and Efficiency
Availability of Spare Parts
Availability of Tech Rep's
Proven Marine Experience
Manuals in the Selected Language
Ease of Maintenance
Commonality with Purchaser's Fleet

9.3.10 Review of the Contractor's Equipment Selections

In Section 9.2, the Purchaser's review of the Contractor's detail plans and/or working drawings has been discussed. In a similar manner, some Purchasers may seek to review the Contractor's selection of major items of equipment that are not already identified by brand name and model number, or are not covered by an *or equal* clause, or are not included in a maker's list. The purpose of the Purchaser's pre-purchasing review of the Contractor's purchase technical specifications that will accompany a purchase order is to ensure that the Contractor's interpretation of the Contract Specification's requirements pertaining to that item of equipment is compatible with the Purchaser's interpretation. If the Purchaser seeks to have this right of an advance review of the purchase technical specifications for selected item of equipment, the contract documents should create that right, remind the Contractor to provide the purchase technical specifications on a timely basis so as to not delay the schedule, and indicate the period of time that the Purchaser has to conduct such review.

As with the review of the Contractor's detail plans and/or working drawings, some Purchasers may try to use this review process to *persuade* the Contractor to adopt the Purchaser's interpretation when, in fact, alternate interpretations may also be valid. When the contract was executed, the Purchaser not only gave the Contractor the responsibility to select that item of equipment, but also gave the Contractor the right to select it to maximize the benefit to the Contractor. The burden of demonstrating that the Contractor-selected item is not compatible with the contract documents lies with the Purchaser. If the Purchaser can show that the Contractor-selected brand name and model does not satisfy the contractual requirements, the Contractor must revise its purchase order to achieve such compliance.

In some cases, the process of such review may lead the Purchaser to appreciate that, although the Contractor's selection is consistent with the contract documents, the Purchaser now sees that such a valid, alternate interpretation of the contract documents leads to a less-than-satisfactory equipment selection. The Purchaser may then seek to use this review process as a basis for requesting a Change Order to achieve a more-satisfactory equipment selection. However, this action by a Purchaser may result in higher costs, delays, impacts on drawings and engineering, and secondary impacts on other contract deliverables.

9.3.11 Resolution of Interferences

Composite drawings present isometric views of spaces or compartments within the ship, including scaled representations of all structure, equipment items and distributive sys-

tems. If prepared in advance of physical construction, composite drawings can identify physical interferences that would result from the use of unmodified Contract Specifications and Contract Plans. Today 3D product models can perform the same function. It is not a common practice for the shipowner's naval architects and design engineers to prepare composite drawings of the structures, items of equipment and distributive systems shown in and/or described by the Contract Specifications, Contract Plans or other contractually-defined standards. Thus it is possible, if not likely, that interferences between elements of the contract design will result from a strict interpretation of the contract documents.

In the event that the resolution of such interferences has an impact on the productivity of the shipyard's crafts, the Contractor may look to the Purchaser for compensation for that rework or temporarily-reduced productivity. To avoid that situation, either the Agreement or the Contract Specifications could advise the Contractor of the possibility of such interferences, require the Contractor to not undertake physical construction until the possibility has been examined and addressed, and further require that the resolution of such interferences are to be achieved by Contractor at no additional cost to Purchaser. In ship conversion or repair, the Contractor could be given access to the vessel for a pre-bid ship check to identify potential interferences if the Contractor is responsible for the correction of them at no additional cost.

9.3.12 Inspection of Contractor's Workmanship

The Agreement, as discussed in Section 9.2, usually includes a clause which establishes the right of the Purchaser's representatives to have access to the vessel and shops, including subcontractor sites, and to inspect work in progress. The use of inspection deficiency reports, or quality deficiency reports, has also been addressed in Section 9.2 in the section on Inspection of Workmanship and Materials. Inspection deficiency reports should only be issued if the Purchaser's representative can point to a part of the Contract Specifications or Contract Drawings with which compliance has not been achieved.

Many Contract Specifications state that the Contractor's workmanship shall be adjudged by the Purchaser's representative, and only that individual shall have the authority to make a determination of satisfactory workmanship. However, if there is no other identified standard against which the workmanship will be measured, the Contractor is effectively being asked to work to the unwritten standards in the mind of that Purchaser's representative. This is often an unsatisfactory mechanism, since the Contractor cannot know in advance what standard will thus be applied.

Accordingly, the Contract Specifications should include

sufficient information to provide a non-ambiguous basis for determining if the Contractor's workmanship is adequate. Certainly the workmanship must satisfy the applicable regulatory requirements and classification rules. The workmanship must also satisfy any applicable standards that are identified in the contract documents—usually in the Contract Specifications or in the Agreement. These referenced standards may be marine industry standards, professional society standards, such as SNAME standards, well-distributed government standards, such as U.S. Navy Mil Specs, or even standards that are applicable but not necessarily unique to the marine industry. The Agreement or the General Section of the Specifications typically contains express language requiring the Contractor to correct, at no additional cost to the Purchaser, any workmanship or materials which fail to meet the standards.

The lack of an identified standard against which workmanship can be judged creates risks for both parties, which risks may result in disputes, an unsatisfactory product, rework and delay. Thus, the developers of the Contract Specifications should take the time and effort to include therein the standards against which the on-site Purchaser's inspectors will determine the acceptability of workmanship that is not already covered by applicable regulatory requirements and classification rules.

9.3.13 Identification of Item's Entire Work Scope

This is the heart of technical specification writing. It is a fairly complex matter, and not to be undertaken lightly or by unpracticed personnel. The history of risks and consequences that are associated with incomplete or misleading specifications is a sufficient basis for many books. The previously mentioned *contractual disasters*. As a foundation for discussing this subject, four points that have been already discussed are brought to the forefront.

First, at the beginning of this section, the three basic forms of specifications were discussed: design or end product; performance; and procedural.

Second, the desirability of a voiding too-broad specification language was also discussed. The negative example was given, *all work necessary to accomplish the specified work*....

Third, the fact that the Contractor is given rights, not just responsibilities, to make decisions about details and materials after the contract is executed has been discussed several times in Sections 9.2 and 9.3.

Fourth, the shipyard's decision-making authority gives it the right to implement least-cost solutions in design development and materials selection as long as it remains consistent with the Contract Specifications, Contract Plans, the

defined regulation, the selected classification rules and the identified standards

The identification of the entire work scope for each item requires that those four points be kept in mind when each element of the technical specifications is developed. For each element of the technical specifications the specification writer must be able to express in words and in supporting sketches or drawings what is important, and therefore stated unambiguously, and what is also to be included but is not as important, allowing the Contractor to make detail decisions.

Each technical specification must reveal whether the performance is important to the shipowner, or if the form/design/configuration is more important. If the specification is design or end product, generally the Purchaser is responsible for performance. A contract which includes a *design certification process* by the Contractor may serve to alter the assignment of certain risks. Precisely which risks and responsibilities are different from the usual form of contract will depend on the specific wording of the section of the Agreement which describes the design certification process. If certain procedures and/or standards are to be used or achieved in the development of details or the execution of the work, those procedures and standards must be clearly identified.

The writer of technical specifications must also understand what decisions the Contractor may be able to make with respect to each technical aspect while still being consistent with the contract documents, and determine whether a possible *least-cost* solution will be acceptable; if not, a more tightly defined solution is to be specified.

All of the elements of the workmanship and materials must be adequately defined to enable a shipyard to translate the technical specification into quantities, labor hours, material costs, and subcontractor costs, or the performance capabilities of the technical item must be translatable into such quantification after the Contractor's suitable pre-bid design effort.

There is no single style or form of technical specifications that is superior to other possible styles or forms. Each organization developing Contract Specifications and Contract Plans should use the style and form with which it is most comfortable, provided that such style and form has not resulted in prior contractual disasters or near-disasters. Individual styles or forms should give way to corporate styles and forms, so that a Contractor is not confronted with different styles or forms in the same Contract Specification.

A specification-related risk that is too often encountered is that of *pride of authorship*. Even if a contractual disaster or near-disaster has previously resulted from the use of a particular wording of a specification the writers of it may continue to believe that the troubles were not due to the

specification but rather due to an alleged intransigent attitude by the shipbuilder. This pride of authorship has no place in a professional engineering environment; if the wording of a specification has proven unsatisfactory in the past, instead of pointing the finger of responsibility at some other party, the wording should be changed, based on a *lesson-learned* analysis of the disaster or near-disaster.

9.3.14 Technical Documentation Requirements

In addition to the hardware of the ship itself and spare parts, Purchasers usually require substantial, supporting documentation. This documentation is additional to the certificates from regulatory agencies and classification which have been described in Section 9.2 with a sample listing of them.

Some of the required documentation is short-lived, such as megger readings after installing (pulling) electrical cable or steel and air temperature readings when applying coatings. Once ship construction and testing is satisfactorily completed, no one will be interested in that documentation. Other components of the documentation are long-lived, such as the sea trial results for all the machinery, forming a lifetime engineering database for those items. Examples of the types of documentation which may be required are listed in Table 9.VII.

The development of each of those items of documentation represents additional cost to the Contractor. Some of those documentation items may be generated by the Contractor or its naval architects and design engineers in the course of obtaining regulatory and/or classification approvals. For those documentation requirements which are not needed for such purposes, the Contractor cannot be expected to prepare them unless the need for them is clearly stated in the Contract Specifications or in the Agreement, so that they can be included in the Contractor's budget. Even for those documentation items generated in the course of obtaining regulatory and/or classification approvals, the Contractor may not be obligated to go the extra step of providing them to the Purchaser unless they, too, are identified in the contract documents as being *deliverable* to the Purchaser. If any of those documentation deliverables are to be provided to the Purchaser in computerized form, the Contract Specifications should clearly state that requirement in order to avoid disputes over interpretation of what constitutes usual practice.

9.3.15 Common Problems with Specification Language

The work scope of shipbuilding contracts is sometimes beset by problems with grammar and word usage. The idea of

using a common language between the Contractor and Purchaser is to ensure complete understanding. Contract documents between, say, a European shipowning organization and an Asian shipbuilder may be in English because both parties are reasonably fluent in English as well as their own language, but not fluent in the other party's language. Once a common language is selected, it is important that both parties use it in the same, correct manner.

Significant problems have arisen over colloquial word usage when involving two parties that both use English. For example, when a project involves a British naval architect and an American shipyard, both parties speak English as their native tongue, but in fact the colloquialisms that each

use sometimes have significantly different meanings. For example, Americans *pull* cable when installing it, whereas the British *pull* cable when removing it. The point made here is to avoid colloquialisms for which others may not have the same working definition.

Words and phrases such as *workmanlike*, *first-class marine practice* and *good shipbuilding practice* cannot be relied upon and should generally be avoided. The very subjective nature of these phrases, coupled with the differing perspectives and expectations of the Purchaser and Contractor, effectively renders such phrases useless; they do not adequately support the Purchaser's interests or bind the Contractor to any meaningful extent.

The words *any* and *all* are not equivalent. *Any* is an indeterminate number or amount, which may mean one, some or all. It is usually better to use *all* or *any and all* to preclude the shipyard from misconstruing the work scope. In ship repair, phrases such as *as necessary*, *as required*, *to suit* and *as directed* must be used with extreme care in order to avoid ambiguities. Those phrases do not lend themselves to development of estimates of quantities, which is basis of a bid and contract. In cases where the extent of repairs cannot be known beforehand, the specification should be carefully drawn and a procedure should be implemented to handle open and inspect items and other conditional work.

TABLE 9.VII Examples of Documentation Required by Shipowner for New Ship Construction

Hull Model Test Results	Responses to comments on drawings
Propeller Model Test Results	Finite Element Analyses
Propeller-induced Vibration Studies	Fatigue Analyses (Structural)
Preliminary Weights and Centers Reports	Heat Load Calculations
Preliminary Trim, Weight and Stability	Electrical load Calculations
Final Weights and Centers Reports	Fault Current Analyses
Final Trim and Stability Reports	Inspection Deficiency Reports
Damage Stability Analyses	Responses to inspection Reports
Tank Capacity Tables	Temperature/Humidity during coatings
Correspondence with Classification Organization	Megger readings (electrical cable)
Correspondence with Regulatory Agencies	Noise Level Readings
Detailed Initial Schedule (engineering, procurement, production and testing)	Test Results (numerous types)
Updated Schedules as appropriate and per contractual requirements	Vibration readings
Working Plans	Crane and Trolley Test Results
Detailed Drawings	Dock-trial Test Results
Production Sketches	Sea-trial test Results
Drawings submitted to Classification	Operational Placards on the Bridge
Drawings submitted to Regulatory Agencies	Safety Placards throughout the ship
P.O. Technical Specification	Progress photographs
	Component Manuals
	System Manuals
	Final photographs
	As-built (as-fitted) Drawings

9.3.16 Shipowner-Furnished Equipment

The decision by the Purchaser to supply shipowner-furnished equipment (OFE) to the Contractor for installation aboard the new ship may be based on any of several possibilities:

- long lead time procurement requirements,
- already-stocked by the shipowner's organization,
- absolute control over equipment selection;
- potential savings, and
- easier procurement than by shipyard, among other possible reasons.

Regardless of the motivation and/or reasoning by the Purchaser, which results in the use of OFE, none of them can guarantee a risk-free relationship between the Purchaser and the Contractor.

The incidence of disputes and/or misunderstandings associated with OFE is far too common to dismiss as an aberration. Rather, analysis of past OFE-related disputes indicates that there are six aspects of OFE that often are not adequately addressed in the specifications thereby causing disputes and/or misunderstandings: content, form, place of delivery, schedule of delivery, vertical integration, and horizontal integration.

Each of these elements of OFE are discussed herein to promote an understanding of the potential problems that must be circumvented by appropriate specification language.

The content of the OFE needs to be defined with sufficient precision so that the Contractor knows what is and what is not being provided. The Contractor will be responsible for supplying all of the necessary fixtures/fittings and connections that are necessary to incorporate the OFE into the ship; but the Contractor must base its bid price on an understanding of what hardware it has to provide. Consideration of the interface hardware provides examples: foundations; conversion fittings (metric to imperial units) connector cables and hoses; and resilient mountings; among others. Some Purchaser's have supplied the entire propulsion system as OFE, in which instances questions arose over which shaft bearings and which foundations were also to be OFE. One shipowner thought the rudder and its control mechanism were part of the propulsion system that was being purchased separately from a vendor. Other shipowners have mistakenly thought that the governor is always part of the shipowner-supplied diesel engine; this is not necessarily correct. These examples are mentioned to illustrate that what is going to be supplied as part of the OFE may be obvious to one party may be far from obvious to another.

The form in which OFE will arrive at the shipyard should be communicated to the Contractor by the specifications to ensure that all costs and schedule impacts arising from the OFE can be included in the bid price. The extent of assembly work that will be required if the OFE arrives in pieces is important to the Contractor. The need to provide temporary protective covering or other maintenance services prior to shipboard installation may also be a cost basis to the Contractor. Any other aspects of the form of OFE that may require labor or materials to prepare the OFE for shipboard installation should also be addressed in the specifications.

The place of delivery of OFE is usually addressed in the Agreement, such as the Contractor's warehouse at a specific street. However, if it is not addressed in the Agreement, the point of delivery should be included in the specifications. If some of the OFE is being delivered at a near-by seaport or airport, and other OFE is being delivered to the shipyard, that differentiation should be made. If the Contractor has to provide transportation of the OFE from a remote (non-shipyard) location, the Contractor may wish to include those costs in its bid price (drivers, insurance, truck rental, etc.).

The Contractor is usually required, per the Specifications, to provide to the Purchaser a report on the condition of the OFE upon its delivery to the shipyard, identifying any damages or unexpected conditions. The Purchaser is usually responsible for correction of those damages or condi-

tions, and the Contractor becomes responsible for any subsequently noted damages.

In order to plan the work appropriately, the schedule of delivery of OFE must be communicated to the Contractor if it is not already stated in the Agreement. If the schedule of delivery is not identified by the contract documents it may be established by the Contractor and communicated to the Purchaser through development and transmittal of the detailed project schedule. If this occurs, the Purchaser may face OFE delivery commitments that cannot be achieved, in which case the Purchaser must advise the Contractor of more appropriate OFE delivery schedules before the project is substantially underway.

Vertical integration of OFE refers to the process of integrating each item of OFE with all those parts of the ship which the Contractor has responsibility to supply. This integration may include consideration of piping and electrical connections, air and exhaust connections, fuel and lube oil supply, water and steam connections, the structural foundation, as well as the control, alarm and monitoring systems. Before the physical integration takes place, the design integration requirements have to be addressed by having the Purchaser supply to the Contractor all relevant connectivity and interface information. The vertical integration also addresses the need for component, system and ship testing as appropriate. The Contractor will need to know, for scheduling purposes, if the vendor's technical representative will have to conduct independent tests to ensure proper installation as a basis for issuing the vendor's warranty.

Horizontal integration of OFE refers to the process of integrating each item of OFE with other items of OFE, as appropriate. When the Purchaser is supplying multiple components of a system as OFE, responsibility for the compatibility and connectivity of all those components with one another usually rests with the Purchaser, not the Contractor. For example, if the OFE includes a diesel engine as well as a torsional coupling, the compatibility of the physical mating of the torsional coupling to the engine's flywheel may have to be assured by the Purchaser, not by the Contractor. If hydraulic cylinders as well as a hydraulic power pack are being supplied as OFE, the hydraulic, electrical, control and alarm connections between them need to be addressed, since the Contractor may otherwise believe that the Purchaser is supplying and arranging for all those connections to be completed by the vendor of the equipment.

Accordingly, specification writers must thoroughly investigate, understand and communicate in the written Contract Specifications all aspects of OFE that may cause the Contractor to incur costs and/or schedule impacts. If any assumptions have to be made by the Contractor to price the OFE-related work, the specification writer should realize that

the assumptions will be “least-cost” ones, placing a greater burden on the Purchaser and the vendors of the OFE, at the expense of the Purchaser unless clearly stated otherwise in the Contract Specifications

9.3.17 Identifying Necessary Tests and Trials

The process of conducting any test or trial represents a cost to the Contractor. In order to prepare a complete bid, the Contractor has to know in advance the nature and extent of all tests and trials that need to be conducted. Thus the Contractor must be able to ascertain from the contract documents, primarily the Contract Specifications both the nature and the extent of the required tests and trials. The necessity for tests may originate with regulatory agencies, classification organizations, the Purchaser’s additional requirements, or the OFE vendor’s requirements.

Many of the tests and trials will have to be conducted to satisfy the regulatory requirements and the classification rules. If, as is customary, the Contractor is solely responsible for obtaining all regulatory and classification approvals, the Purchaser need not spell out each and every such test that is within that part of the work scope. However, if the Agreement doesn’t already state it, the specifications should clearly state that the Contractor must perform all inspections and tests necessary to obtain all the approvals and certificates from the various regulatory agencies and the classification organization that are listed elsewhere in the contract documents, all at no additional cost to the Purchaser.

The more challenging aspect of this section of the specifications is to address the Purchaser’s additional test requirements and the OFE vendor’s test requirements that are supplementary to the other, already-addressed tests and trials. There is no nearly universal set of tests that falls within this category. Every ship type has differing requirements, and within each ship type, every Purchaser will have differing requirements. The Purchaser’s and OFE vendor’s test and trial requirements are shaped, in part, by their perception of what is needed above and beyond the regulatory and classification tests and trials. It should be noted that the duration or extent of tests and trials is also an important cost factor to the Contractor. If, for example, there is special equipment aboard the ship due to its particular shipowner and mission, some Purchasers may require a full 24-hour heat run, and others may be content with a 4-6 hour test; the Contractor must know the extent of those tests and trials in advance of bidding, perhaps by references to appropriate SNAME, ASTM, or other standards and procedures.

9.3.18 Compartment Closeouts

During the process of ship construction and testing, every component and system will have been tested, all the structural work will have been inspected, and all of the coatings, deck finishes and overhead closures will have been inspected. However, those inspections and tests will have taken place while the shipyard personnel were still active in each space or working on each deck area and while shipyard equipment was still widely distributed throughout the ship. Compartment closeouts are the inspection activity by the representatives of the Purchaser to confirm that the shipyard has cleaned-up and withdrawn from each compartment prior to ship delivery.

For these purposes, a compartment is any of the following: tanks, void spaces, each level of sections of cargo holds between deep web frames or bulkheads, control rooms, equipment rooms, reefer spaces, store rooms, accommodations, heads, galleys, sections of passageways, chart room, interior bridge, bridge wings, steering gear flat paint rooms, chain lockers, shaft alley, each level of each of the machinery spaces, bosun’s locker, each section of the weather deck, and every other type of area that may be appropriate to the individual ship.

This section of the Contract Specifications could require the Contractor to prepare each such compartment for a joint inspection after the shipyard has completed and withdrawn from each compartment. This would include, but not be limited to, removal of scaffolding and ladders, withdrawing of welding leads and gas hoses, removal of temporary lighting and ventilation, paint touch-up where temporary clips have been removed, picking up papers, cans, welding rod stubs and other disposables, clearing out all bilge suction, disposal of all temporary protective materials, and confirmation of the placement of labels on cables and piping, if required by the specifications among other possible aspects of these compartment close-out inspections.

To avoid having the Contractor present all the compartments on a ship for close-out inspection at the same time, the specifications could require the Contractor to present in advance a list of all the compartments and a proposed close-out inspection date within a few weeks prior to vessel delivery, which schedule would be subject to negotiation if needed. Certainly many of the compartments can be closed out prior to sea trials, and the remaining ones closed out in orderly fashion between the conclusion of sea trials and Vessel Delivery.

9.3.19 Disposal of Hazardous and Toxic Materials

The process of ship construction may occasionally create waste materials that are deemed hazardous or toxic ac-

ording to environmental regulations. For example, in some jurisdictions, empty but wet paint cans are hazardous materials. Ordinarily, the Contractor will be solely responsible for the proper transportation and disposal of any toxic or hazardous materials resulting from the construction process.

If the delivery to the shipyard and installation of OFE creates any toxic or hazardous materials, the handling, transportation and disposal of them has to be carefully addressed by the Contract Specifications. First the specifications have to identify them by type, constituents, and quantity. Second, the specifications have to assign to the Contractor the responsibility for containing those materials to prevent contamination of the ship yard or the ship itself. Third, the specifications must call for the Contractor to provide safety and health appliances for employees as may be appropriate and consistent with health and safety regulations. Fourth, the specifications then should address the need to transport those materials over public highways by carriers who are licensed to do so, and fifth to dispose of the materials at landfills, incinerators or by other means at facilities that are licensed to undertake such disposal, all at no additional cost to the Purchaser.

9.3.20 Work Performed by OFE Vendors

When the vendor of OFE sends a technical representative (*tech rep*) to the shipyard to direct or oversee the installation or start-up of OFE, the Contractor may have to provide support services to that tech rep. These services may be limited to the provision of temporary lighting and ventilation or scaffolding and ladders. Sometimes the OFE vendor's tech rep may require the assistance of several of the shipyard's mechanics or other craftsmen for a period of time.

For each instance where the OFE vendor's tech rep will require shipyard support services, the rendering of those services will be a cost to the Contractor. Accordingly, the Contract Specifications could advise the Contractor of the need to provide such support services and indicate the nature and duration of the manpower and equipment needed for such support services. If this matter is not adequately covered by the Contract Specifications the Purchaser may be asked later for a Change Order to cover those costs.

9.3.21 Facilities for Shipowner's Representatives

Most shipyards have rooms in their office buildings set aside for use by the Purchaser's representatives during the design, construction, testing and trials phases of the ship construction project. Some shipowners' organizations require more space than others, and some require particular equip-

ment to be provided within those facilities. Unless the contract documents, usually the Contract Specifications indicate the type, size and furnishing of the facilities, only minimal facilities may be provided, if any.

Thus, this section of the Contract Specifications should indicate the requirements for each of the following:

- total area to be provided,
- number of different rooms within that total area and approximate area of each room,
- the fact that the rooms should be located contiguous to one another,
- the number of desks and chairs to be in each room,
- the capacity of the conference table (if required),
- the size and number of drawing tables,
- the number of telephone lines in each room and number of connection points for each,
- the total number of telephones to be provided,
- the total number of fax machines to be provided,
- the presence of a xerographic copier of a nominated copying rate and document reproduction size,
- other features that will facilitate the obligations and work of the Purchaser's representatives, and
- proximity of the offices to the ship before launching

For reasons of security, if considered appropriate, the specification could require that the phone and fax lines for those offices be run directly from the street and not through the shipyard's centralized phone system. (Cellular phones are not a form of secure communications.) For reasons of convenience, the specification could require the shipyard to temporarily provide a certain number of pagers for use by the Purchaser's representatives.

9.3.22 Development of Contract Plans

Throughout this section on Formation of Contract Specifications and Plans, the emphasis has been on the wording of the Contract Specifications and only occasionally have the Contract Plans been mentioned. This is not to lessen the importance of the Contract Plans, but rather recognizes that the Contract Plans are usually considered to be part of the Contract Specifications or at least to be below the Contract Specifications in the hierarchy discussed in Section 9.2 on Formation of the Agreement.

The purpose of Contract Plans is to convey to the Contractor the spatial relationships, the configurations, the arrangements and the appearances of the various parts of the vessel that are not capable of being conveyed solely by written words. By identifying them as Contract Plans, the intent is that they are non-alterable except by a formal Change Order.

The contract-level design expressed in part by the Con-

tract Plans can vary considerably; some contract-level designs will include only a few drawings and be sparse with details; others will include a large number of drawings, each of which contains considerable details.

From the outset of the project the Purchaser and its naval architects and design engineers have to decide what design configurations pertaining to the ship must be controlled entirely by the Purchaser (these become the Contract Plans), what design configurations can be determined from regulatory and classification requirements and what design configurations can be determined by the Contractor so long as they satisfy all other contractual requirements. The phrase *design configurations* is used here because that is the type of information that is best contained in plans rather than specifications. In other words, development of the list of drawings that will be Contract Plans is the output of a risk-decision analysis. If the configuration of a certain aspect of the ship is not included in a Contract Plan, the final configuration will be determined by the Contractor in its search for a least-cost solution.

If the presence of inclined ladders in a particular area of the ship is important to the Purchaser, for example, when regulations would otherwise permit vertical ladders, that requirement may be best communicated to the Contractor in a Contract Plan. The shape of the hull may be considered too important to be left to the discretion of the Contractor; but if the vessel is a low-speed barge, only general guidance as to the bow and stern configuration may be necessary, thereby allowing the Contractor to design it as a least-cost solution.

Once a decision is made as to what information will be conveyed to the Contractor by the Contract Plans, the Purchaser's naval architects and design engineers must ensure that the Contract Plans are not misleading. For bidding purposes, the Contractor is allowed to rely on information contained within the Contract Plans as being consistent with the nominated regulations and classification rules. If, for example, the Contract Plans include a schematic ventilation plan showing 14 fire dampers the Contractor is allowed to rely on the fact that only 14 fire dampers will satisfy regulatory requirements. If a lesser number is required the Contractor is still obligated to install the indicated 14 fire dampers; but if a greater number is required, the excess above 14 may become the basis of an essential Change Order.

Tolerances that are to be achieved are often implied by reference to a standard, in which case the standard should be reviewed for applicability before citing it. However, if tolerances for certain elements of the ship are of special concern to the Purchaser, they should be expressly stated in the relevant Contract Plans or Contract Specifications. For example, the tolerances within cell guides for container

ships may be different from normal shipbuilding standard tolerances.

9.3.23 Interpretation of Contract Plans

In order to avoid misunderstandings that arise later, it may be advisable for the Purchaser's naval architects and design engineers to seek regulatory and/or classification approvals of the anticipated Contract Plans before the contract is executed. Problems have arisen in the past due to the fact that the Purchaser's naval architects did not interpret the classification requirements in the same manner as the classification organization itself. Pre-contract approval of the Contract Plans, however, does not eliminate the need for further approvals of the more-detailed plans that are to be developed by the Contractor after contract execution.

The Purchaser's naval architects and design engineers should appreciate that many objects shown on Contract Plans are representations only and do not indicate with precision the dimensional proximity of structures or other items of equipment. This means that the Contractor will have a *window* of placement of that item of equipment. If clearances around that item of equipment are important it would be best if the drawing noted that requirement, possibly with reference to an appropriate Contract Specification item.

Both parties have to recognize that the notes contained within a drawing are as much a part of that drawing as are the graphical representations. If the note states that the dimensions and linear weight of a stiffener is *typ.* or typical for a group of stiffeners, the Contractor cannot pretend that the information was lacking. On the other hand, the Purchaser's naval architects need to appreciate that shipyard personnel cannot read the minds of the persons preparing the drawings. Thus, the working rule should be that if there is any doubt as to how someone other than the author of a plan will interpret part of it, then more information is better than less and more notations are better than fewer, even at the risk of making the drawing look too *busy*. If it is necessary to refer to a second Contract Plan to fully understand the first it is best to not assume the Contractor will examine both plans concurrently. Rather, the first plan could reference the second one, and vice-versa, to ensure clarity, without which risks are being created.

A previous sub-section of this section addressed the subjects of composite drawing and the resolution of interferences. Naval architects and design engineers who have not prepared composite drawings prior to the execution of the contract should anticipate that likely there will be interferences arising from a strict interpretation of the contract documents. Accordingly, those persons should be prepared to accept variations from the Contract Specifications and Con

tract Plans that need to be altered to eliminate such interferences. Again, it can be expected that the Contractor will seek to eliminate those interferences in a least-cost manner.

If the Purchaser's naval architects and design engineers are not going to be receptive to Contractor-determined resolution of interferences, which arise from the contract documents, perhaps they may wish to undertake the development of composite drawings prior to contract execution. However, this would be meaningful only for those situations in which the Purchaser wishes to control nearly all of the spatial relationships, configurations, arrangements and appearances through the use of a large number of Contract Plans, which is fairly common for naval combatant vessels and passenger ships.

Contract Plans generally should not include quantities of materials, though they could indicate types of materials in a Bill of Materials at the top of the drawing if the types are not already identified in the Contract Specifications. The presence of exact quantities on Contract Plans may lead to allegations of extras by the Contractor, resulting in an otherwise unnecessary Change Order.

If the Contract Specifications and Contract Plans are available in computerized format, the Purchaser can provide them to bidders as long as a contractually binding hard (*paper*) copy, produced by the original developer of them and not by another party, becomes the official contract document.

9.3.24 Use of Guidance Plans

Some naval architects who develop and/or assemble the technical documents for a shipbuilding contract incorporate into the contract package several *Guidance Plans* in addition to Contract Plans. One possible reason for the differentiation between Guidance Plans and Contract Plans may be that the naval architect has in mind a different degree of required compliance by the Contractor.

Another possible reason for the inclusion of Guidance Plans is to give the Contractor a *starting point* for its own design development responsibilities. A third possible reason for incorporating two different types of plans in the contract package is to encourage the Contractor to seek alternative, lower-cost means which will lead to savings for both Purchaser and Contractor. There are several other possible reasons for including Guidance Plans in a contract package.

The realization that there may be any of several reasons for using Guidance Plans in addition to Contract Plans points out a potential cause of contractual difficulties. Namely, the Contractor may attach a different significance to the Guidance Plans than intended by the Purchaser. The means of avoiding such difficulties or disputes is to either void using Guidance Plans, or to define the use of the word *guidance*.

For example, the phrase *Guidance Plans* can be defined in the Agreement to mean plans from which the Contractor may vary, at no additional cost to the Purchaser, only if approved in advance by the Purchaser.

Another possible definition of *Guidance Plans* could be, for example, plans which must be adhered to in all respects except that the exact dimensions shown or implied therein may result in physical interferences with other components of the ship, which interferences are to be resolved by the Contractor at no additional expense to the Purchaser. There are, of course, many other possible definitions of *Guidance Plans*; but failure to define the term when *Guidance Plans* are included in the contract package may lead to confusion at best, or serious disputes at worst.

9.3.25 Newbuilding, Repair and Conversion

Although this chapter is intended to apply to new ship construction, certain aspects of it also apply to ship conversion and repair. It should be appreciated, however, that this section on Formation of Contract Specifications and Plans is at least applicable to ship repair and a slightly greater portion of it may apply to ship conversion.

For ship repair, the specifications address each repair item individually, although the general section of the Contract Specifications may be somewhat applicable to repair as well as newbuilding. Ship conversion, which involves a significant amount of new steel and/or new arrangements, may appear to be more related to newbuilding than to ship repair. However, ship conversion specifications are even more difficult to write than newbuilding specifications. The reason for that greater difficulty is that in ship construction the specifications and plans must only define the final product, but in ship conversion, the specifications and plans must define both the starting point (the ship before conversion) as well as the end point.

These points about ship repair and ship conversion specifications are included only to caution the reader that those types of projects are quite different from new ship construction. Accordingly, the formation of Contract Specifications for ship repair and the formation of Contract Specifications and Plans for ship conversion will be a measurably different process than discussed above.

9.4. MANAGEMENT OF CONTRACTS DURING PERFORMANCE

9.4.1 Introduction

The purpose of active and responsible contract management is two-fold. First is the necessity of monitoring your own

team's responsibilities and managing them through the use of your own contract management team's resources and through the timely redirection or re-allocation of those resources as appropriate. The second purpose is monitoring the other party's fulfillment of its responsibilities and notifying that party when the potential or actual failure to fulfill its responsibilities arises.

The responsibilities of each party are defined by the contract documents, primarily by the Agreement, the Contract Specifications and the Contract Plans. The preceding sections focused on the development and formation of those documents in a manner that provides a contractually-binding foundation or basis that will ensure the Purchaser gets the product it has bargained for, and the Contractor has to produce no more than it is being paid for.

With that foundation in place, the Contractor expects that it should be able to proceed with its planning, engineering, procurement, production and testing with only minimal interference from the Purchaser. At the same time, the Purchaser believes it has the right to expect that the Contractor will provide all the plans, schedules and documentation supporting the design, construction and testing in a timely manner, and expect that the Contractor will construct and deliver the ship on time.

These two sets of expectations suggest that, aside from engineering and production work, there is not much for either party to do besides watch the ship being designed and built. That perception is not only wrong, but also dangerous. In fact, there are a tremendous number of contract management activities that must be addressed by both parties during contract performance. If one party or the other takes the attitude that it shouldn't have to do much contract management now that the contract has been signed, then that party is likely to pay a severe price for not having actively managed the contract.

In other words, those are theoretical expectations, and are not fully achieved in practice. Sometimes actual practice varies considerably from those theoretical expectations due to either or both parties' mismanagement of the contract during contract performance.

9.4.2 The Origins of Contract Mismanagement

Shipowners' on-site representatives sometimes believe that the Contractor has the attitude that the shipyard will follow the spirit of the Contract Specifications and Plans but will not always meet certain exact requirements as stated therein. This, in the eyes of the shipowners' representatives, undermines the contractual requirements and dilutes the effort that was put into defining the Specifications and Plans. If that situation is developing, shipowners' representatives must man-

age the contract more aggressively to get the Contractor's actions into alignment with its contractual responsibilities.

Similarly, from the shipyards' perspectives, it sometimes appears that shipowners expect the shipyard to modify the Specifications and Plans to suit certain more-costly interpretations of the shipowners' representatives, but without formally changing the Contract Price or performance period. Sometimes Purchasers' engineering staffs try to use the drawing review process to micro-manage the detail design decisions that were ceded to the Contractor. From the shipyards' perspectives, any such behavior by shipowners' representatives undermines the right of the Contractor to select the means of achieving compliance with the Specifications and Plans, all at a fixed price. If that situation is developing, the shipyard must also manage the contractual relationship with the shipowner's representatives more aggressively in order to restrain them from asking for more than they have the contractual right to do.

It is appropriate to recall part of the introduction to this chapter:

... But there is another form of disaster involving ships; namely, contractual disasters, situations in which the shipyard and shipowner are both terribly harmed due to mismanagement of the shipbuilding contract.

It is noted that disasters result from *mismanagement of the shipbuilding contract*. This means that the contractual disasters can originate not only with poorly developed contracts, which development is part of contract management, but that contractual disasters can also evolve from improper or unsuitable management during contract performance.

In other words, situations arise in which one party or the other, Contractor or Purchaser, are not managing the contract, but instead are either expecting to maintain a relationship with the other party while operating contrary to the rules of the contract, or are simply neglecting their responsibility to actively manage their side of the contract. The risks associated with such actions are often translated into an abandonment of the rights of one party or the other in order to avoid litigation, or may result in litigation or arbitration. By developing a clear understanding of each party's contract management responsibilities during contract performance, and then fulfilling those responsibilities both parties are assured of achieving what they bargained for during contract formation and the described adverse risks can be avoided.

9.4.3 The Contract Management Team

The actual management of the contract for each of the Contractor and the Purchaser is usually accomplished by a number of specialists who, collectively, constitute the contract

management team. Depending on the size, complexity, uniqueness and schedule of a shipbuilding project, and possibly depending on other factors, too, the size of the contract management team *after the contract is executed* may be as large as several dozen individuals, as in large navy projects or cruise ships, for example, or as few as one individual occasionally aided by consultants, as in a small pilot boat, for example.

Some shipowners undertake a sufficient number of ship building contracts to warrant having a full-time staff of contract management specialists; and other shipowners use an outside team of specialists or consultants. Usually a shipyard's contract management team consists of its own staff members, but occasionally the ship yard will utilize specialist consultants if the ship type is unique or new to the ship yard, if the shipyard is experiencing a temporary surge of business, or to mitigate risks when contracting with certain shipowners.

Regardless of the type and size of the Purchaser's contract management team, it is important that the remainder of the Purchaser's organization give prompt, effective support to the team whenever such needs arise. If there is any shipowner-furnished equipment, the most important group to provide support will be the shipowner's purchasing department. A lack of expediency and/or accuracy in ordering the OFE can easily result in major contract problems.

Sometimes the additional support from the Purchaser's organization may be the timely need for information from the vessel operations department, or it may be to consent to the temporary use of specialist consultants when dealing with some particular design or construction problem. Another form of support for the contract management team may be the need for approval from senior management of the deferral of changes requested by the operations department until a subsequent drydocking or ship repair period in order to cease requesting change orders from the Contractor near the end of the construction phase.

9.4.4 Effective Management

An important question on which to focus at the outset of a shipbuilding project for both shipyards and the shipowners is: how will the success of the contract management effort be measured? Some contract management teams have waited until the project was completed, and then with hindsight considered how much the budget grew during the project and how much later than the original contract Delivery Date the ship was delivered. For some organizations, that may be an acceptable form of measurement, but it does not lend itself to actually managing a contract; rather, the participants having that perspective are essentially observing developments, not managing a contract.

A more appropriate means of measuring a contract management team's performance is to have regular opportunities to alter the emphasis and re-allocate resources being applied to the contract. This is comparable to a ship navigator's course correction at regular intervals. In that situation, the navigator determines the ship's actual position relative to its anticipated position at that time, and then establishes the new, corrected course and speed which should get the vessel to its objective in a timely manner.

Similarly, the contract management team for both the Purchaser and the Contractor establish waypoints in each of the functional areas that are discussed below. Periodically, the actual contract progress in each of those functional areas is compared to the *baseline* or *planned* status that should have been achieved by that time. If appropriate, the team can then reassign resources within those functional areas that appear to be impacting or close to impacting the project. This applies to the contract management teams and resources for both the Contractor and the Purchaser.

9.4.5 Managing the Entire Contract

In this chapter, the importance and the role of technical persons in formation of the Agreement, as well as in the formation of the Contract Specifications and Contract Plans has been discussed and emphasized. Too often, however, the contract management team focuses on management of the Contract Specifications and Contract Plans and leaves aside management of the Agreement. Perhaps this situation arises because the Agreement looks too *legalistic* or has been modified and formatted by attorneys. Nevertheless, the entire contract has to be managed, including the Agreement as well as the technical aspects of the contract documentation. The business managers and lawyers of the two contracting parties are not involved in the daily contract management tasks. Thus, abandoning to or organization's business managers or lawyers the management of the Agreement is equivalent to not managing the Agreement at all. That is, if the contract management team does not manage the Agreement as well as the technical documents, then the Agreement will not have been managed, creating unnecessary risks and likely incurring unnecessary costs.

A maritime industry contract management-training program (3) usually starts in the following manner: "*Read the Contract. Nearly every answer you may need, regardless of how the question is phrased, is found in the Contract.*"

Of course, the Contract includes all of the contract documents, including the Agreement. Many of the answers needed during the project are found in the Agreement but not in the technical documents. Accordingly, members of the contract management team should familiarize them-

selves with the table of contents of the Agreement, so that when questions arise, they can easily refer to and study the relevant sections of the Agreement as easily as they do with the Contract Specifications

9.4.6 Contract Management Phases

There are numerous non-maritime books on contract management, but a reader of them from the maritime industry has to be aware that actual contract management practices vary between industries. Thus, the direct adaptation of the recommendations of generic contract management books may create difficulties within the maritime industry. A directly relevant paper, *An Owner's Management of Ship Construction Contracts* (5), addresses shipbuilding contract management from a shipowner's perspective.

That paper views shipbuilding contract management in five phases:

1. pre-contract management functions,
2. early management functions,
3. continuous Management Functions,
4. intermittent management functions, and
5. later management functions.

As illustrated in Figure 9.4, those phases occur at various times relative to project initiation, contract execution, physical construction, ship delivery, and end of warranty.

Within those five phases of contract management, the cited paper lists a total of 38 managerial activities relevant to many shipbuilding contracts. Although that paper is written from a shipowner's perspective, it is recognized that shipyards have reciprocal or initiating functions associated with each of those shipowner's management activities. A brief description of those 38 management activities is given in the *Appendix* to this chapter.

The progress of nearly all aspects of a shipbuilding project can be tracked by the communications between the Contractor and the other parties, including the Purchaser, regulatory agency and classification organization. Nearly every step of progress is accompanied by a communication from the Contractor, and followed-up by a communication from one of the other parties.

9.4.7 Contract Communications

Equally, if there is any shipowner-furnished information, equipment or materials, the delivery of such items to the shipyard is also accompanied by a communication. Thus, tracking the actual communications will create an understanding of the status of each aspect of the project. Both the Contractor and the Purchaser can employ this fundamental

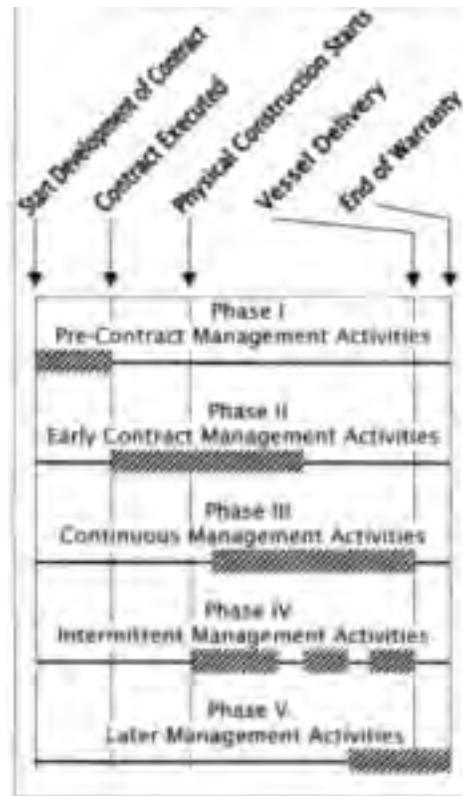


Figure 9.4 Five Phases of Contract Management

mechanism. For example, if the Contractor is producing detail drawings that are to be reviewed by the Purchaser in advance of construction, the transmittal of those drawings is the communication that evidences the status of the Contractor's design development. If the Purchaser then sends comments pertaining to those drawings to the Contractor, the transmittal of those comments is the communication that evidences the Purchaser's review of the design development.

As another example, if there will be some shipowner-furnished equipment (OFE) as part of the project's arrival at the shipyard will result in a delivery receipt and possibly an inspection report upon opening of the crate. Since both parties, Contractor and Purchaser, will get copies of both the receipt and the inspection report, those communications serve to evidence the arrival of the OFE and its condition upon arrival.

9.4.8 Functional Areas of Contract Management

In order to create an orderliness out of the hundreds or thousands of communications that will be created during a ship-

building project, the communications can be divided into functional areas, as illustrated in Table 9.VIII. The status of each of those functional areas generally can be determined with adequate accuracy by tracking the communications between the parties pertaining to each of those functions.

9.4.9 Contract Management Procedures

The tracking of communications to monitor the status of each functional area is the first step in active contract management during contract performance. Recall the analogy, above, to the ship navigator's course corrections. The first step is to determine the position and current course of the ship.

Similarly, the status of the contract work, in each functional area, including both the Contractor's and Purchaser's roles, can be reasonably determined from the communications being tracked.

The second step in the previously stated navigator's analogy is to determine where the ship should have been at the time of measuring its actual location and course. In contract management, a review of the project's schedule and the anticipated status of each functional area relative to that schedule serve to establish the progress that should have been made since the last *course correction*. This assumes that the project schedule has sufficient detail is a valid representation of all activities in the project (engineering, purchasing, production and testing), and is not merely a *showpiece* prepared to satisfy a contractual requirement.

In the analogy, as the final step the navigator would then determine how the ship's course and speed should be adjusted in order to assure timely arrival at the intended destination, if possible. Similarly, the contract management team considers the difference between the actual status in each functional area and the intended status at that same time, and then evaluates what reallocation of resources are appropriate to correct any untoward variations.

Of course, even without reference to communications, the Contractor tracks the actual physical progress of the ship construction relative to the planned and updated schedule. Whenever a discrepancy arises between actual and the latest-planned schedules, the Contractor must evaluate whether that schedule slippage will have any subsequent impact on ship delivery or the availability of resources that may be in short supply such as, having a limited number of workers in a particular craft available for the project. The Contractor may then redirect the use of its resources to avoid the developing impacts.

This process of *course correction* is equally applicable to both the Contractor and the Purchaser. For example, relating to the Contractor, if it is determined that electrical installations are falling behind schedule, the shipyard would

consider how to temporarily increase the rate of electrical installations by assigning more electricians or by the judicious use of overtime, among other possibilities. The Purchaser may have similar responsibilities. For example, if the review of detail drawings by the Purchaser's engineering consultants or staff is not keeping pace with the shipyard's submittal of them, in order to not lose the right to timely comment on the drawings, the Purchaser would consider a temporary increase of the drawing review staff.

9.4.10 Functional Spreadsheets

The generally described contract management procedures rely on both the Contractor and the Purchaser having an expected status or target against which to measure the actual status in each functional area identified in Table 9.VIII. Many of those targets can be developed in both form and content in advance, and the form of others can be developed in advance but completed as to content during contract performance. For example, an advance drawing schedule identifies each of the drawings, and the target date for completion of each, that the shipyard will develop to suit its needs. Also, the shipyard will have a detailed planned schedule developed in advance for construction and testing.

TABLE 9.VIII Functional Areas of Contract Management

Drawings
Equipment Purchase Orders
Engineering Analyses and Reports
Weight Control
Schedules
Classification
Regulatory Authority
Owner Furnished Information
Owner Furnished Equipment (or Materials)
Secondary Contracts
Change Orders
Inspection by Shipowner
Inspection Deficiency Reports
Test and Trials
Invoices and Progress Payments
Spare Parts and Hardware Deliveries
Paper/Computerized Deliverables
Warranty Items

The content of some functional areas cannot be defined in advance. For example, the number and subject of inspection deficiency reports cannot be anticipated, but the means of communicating about such deficiencies can be planned in advance.

The anticipated and the routine contract management procedures for ship construction are achieved with the aid of spreadsheets in each of the functional areas that pertain to the particular project. Some contract management teams use checklists, but it is recognized that a checklist is a limited form of spreadsheet, not suitable for easy updating and the addition of other information. A spreadsheet, on the other hand, whether manual or computerized, allows for multiple data entries for each line item.

As an example, the column headings for a spreadsheet for inspection deficiency reports (I.D.R.'s) are listed in Table 9.IX. Upon inspection, if the shipowner's representatives identify a deficiency relative to the Contract Specification or Contract Plans, an I.D.R. is sent to the Contractor.

The Contractor may acknowledge that it constitutes a deficiency and correct it then or at some other time; the Contractor may dispute that it is a deficiency; or the Contractor may offer a credit if correction of it is waived by the Purchaser.

The spreadsheet has to be capable of addressing each possible outcome, as well as have as its final column the date of closeout, when the issue was resolved between Contractor and Purchaser due to either correction or waiver-with-credit. Any special retainages associated with the deficiency are noted in the same spreadsheet.

Thus, at a glance, the contract management team for either Purchaser or Contractor will know the status of all the identified I.D.R.'s. This forms a status report that both parties

can use for continuing or concluding the management of that functional area.

As another example, nearly all of the inspections to be performed by the shipowner's representatives can be listed in an inspection spreadsheet long before actual construction commences. The approximate target date of such inspections can be inferred from the Contractor's detailed schedule. The spreadsheet then performs two functions: 1. it ensures that the shipowner's representatives do not overlook any intended inspections, and 2. it tracks the timeliness of the Contractor's preparations for inspections.

Similar use is made of all the other spreadsheets developed for each of the other functional areas listed in Table 9.VIII as well as any other functional areas appropriate to the specific project.

9.4.11 Active versus Passive Contract Management

The theme of this section on the Management of Contracts During Performance is captured by a principle of contract management stated in (3):

“Both parties to a contract must be active participants during performance; passive contract management is taxed, active contract management is rewarded.”

It was noted above that passive contract managers are no more than observers of the project's events, having no influence on any adjustment in how the responsibilities of each party are being fulfilled. However, once a decision is made instead to be active contract managers, mechanisms have to be developed to measure the success of that active contract management. As discussed in the prior section, the use of spreadsheets, either manual or computerized, associated with each applicable functional area has been found to be an effective means of monitoring the effectiveness of such management.

The initially developed spreadsheets constitute the targets for performance by both the Contractor and the Purchaser. The updating of the spreadsheets establishes the actual point of progress in each functional area. Noting the difference between target and actual progress, the relevant party can redeploy or reallocate its available resources, or supplement those resources if appropriate, to get the project back on course to the extent needed.

It should not be forgotten however, as quoted earlier from (3), that *“Contract management should commence the moment a contract is contemplated, not after it is signed.”* As discussed in the prior subchapters on formation of the key components of the contract, that stage of contract management is the most important, as it creates the contractually-binding foundation for all subsequent participation by both parties.

TABLE 9.IX Spreadsheet Column Headings for Inspection Deficiency Reports

I.D.R. Number
Date of Inspection
Specification Item Number
Date Acknowledged by the Shipbuilder
Intended Correction date by Shipbuilder
Date of First Reinspection if Not Final
Date of Second Reinspection if Not Final
Date Disputed by Shipbuilder
Amount of Credit for Waiver
Amount of Special Retainage
Date of Closeout

9.5 REFERENCES

1. Clarke, M. A., *Shipbuilding Contracts*, Comité Maritime International, Lloyd's of London Press, London, UK, 1982.
2. Fisher, K. W., "Responsibilities Pertaining to Drawing Approvals During Ship Construction and Modification" SNAME *Marine Technology*, Vol. 28, No. 6, November 1991.
3. Training Program Notebook: *Fundamentals of Contract and Change Management for Ship Construction, Repair and Design*, Fisher Maritime Transportation Counselors, Inc., Florham Park, New Jersey, USA, Revised January 2000.
4. Daidola, J. and Llorca, M. R., "The Legal Ramifications of Margins of Error," Transactions, SNAME, 1999.
5. Fisher, K. W., "An Shipowner's Management of Ship Construction Contracts," *Proceedings of the Newbuild 2000 Conference*, Royal Institution of Naval Architects, London, UK, October 1995.

9.A APPENDIX

9.A.1 Shipowner's Contract Management Activities

The following constitutes a brief description, from a shipowner's perspective, of each of the activities of contract management, divided into the five phases of contract management identified in Section 4. These descriptions are adapted from *An Shipowner's Management of Ship Construction Contracts* (5). The activities described below start with the draft Agreement, draft Contract Specifications and draft Contract Plans. The corresponding shipyard's contract management activities, in addition to engineering, purchasing, production and testing, usually are either parallel activities or mirror images of the shipowner's activities. They are not separately discussed below.

In these descriptions, OFI indicates Shipowner-Furnished Information and OFE indicates Shipowner-Furnished Equipment, or Materials. The phrase *secondary contract* refers to a contract let by the shipowner to an organization other than the Contractor, but which is meant to support or supply the Contractor.

9.A.2 Phase I—Pre-Contract Management Activities

Organization—Development and structuring of Shipowner's contract management organization, including functional and reporting relationships pertaining to prime and all secondary contracts associated with the project (contractor, engineering, regulatory, classification suppliers, vendors, services, etc.). A *secondary contract* is one between the Purchaser and a vendor or service-provider other than the prime Contractor, which secondary contract supports the project of the prime contract. Generally, the Pur-

chaser has responsibility for the performance of the secondary contractors, and the Contractor has responsibility for the performance of the subcontractors.

Specifications—General: Review of specifications to maximize Shipowner's and Contractor's mutuality of interpretation of each party's technical responsibilities and to identify ambiguous or incomplete aspects of specification which may require clarifications

Specifications—Schedule: Development of specification to supplement the Naval Architect's specifications with section or sub-section pertaining to the Contractor's schedule development and schedule-reporting commitments.

Specifications—Tests and Trials: Development or modification of proposed specification pertaining to tests & trials as necessary to maximize pre-delivery verification of all systems and components modified by the shipyard.

Specifications—Downward Review: Coordination between specifications and contract plans to maximize consistency between those components of the contract.

Specifications—Upward Review: Coordination between agreement and specifications to maximize consistency between those components of the contract.

Communications: Review of specifications to identify all contractually anticipated communications evidencing compliance with contractual obligations by both Shipowner and Contractor. (see *Deliverables*)

Deliverables Control Spreadsheets: Development of computer-based, revisable, detailed lists and related information for each party's communications, approvals, reports, other software and hardware deliverables in hard-copy and electronically.

9.A.3 Phase II—Early Management Activities

Project Kick-Off Meeting—Meet with Contractor's contract management team to develop mutual interpretations where ambiguities exist and to discuss other administrative and procedural matters, which may be relevant to a smooth-running contractual relationship. Some of the other matters, as identified in reference 2 are:

- Avenues for exchanges of documentation and information,
- Clarify contract specifications & plans
- Clarify precedences, inclusions, exclusions,
- Identify OFI that is needed early to get project started,
- Identify what is not already included in price & work scope,
- Identify unit prices for labor, services, lay days, material mark-up,
- Identify crafts and services that will be directly charged in change orders,

- Procedures to control shipowner property (if applicable),
- Billing and payment practices,
- Reporting requirements (weights, stability, vibration, noise, EMI, others),
- Change order procedures, including distributed, limited authority,
- Number of change order hours that automatically gives one day extension,
- Quality control, testing, inspections, compartment close-outs,
- Identify standards that will apply to key inspections,
- Turn-around times for condition reports and change proposals,
- Disposal of hazardous and/or toxic materials,
- Spare-parts requirements,
- Subcontract, or prime contract) issues,
- Where shipowner will inspect the subcontractor's work,
- Up dating & release of scheduling information,
- Special retainages for outstanding deficiencies and
- Fire watch, fire response pressurized fire main

Schedule: Review of Contractor's proposed critical path network to ensure all elements of the work scope are properly included, such as completion of design, engineering, procurement, production, subcontracts, tests & trials.

CFE Procurement: Monitoring of Contractor-furnished equipment (CFE) having long-lead time procurement windows. Failure by the Contractor to allow realistic, that is, long lead times for major or specially-manufactured equipment is a too-frequent problem leading to costly repercussions in ship construction projects. For that reason, the Purchaser should consider monitoring the Contractor's ordering process and its schedule.

OFI Procurement: Procurement of Shipowner Furnished Design Information as required by contract.

OFI Schedule: Coordination with contractor for timely delivery of Shipowner-Furnished Information.

OFE Procurement: Procurement of Shipowner Furnished Materials & Equipment and associated technical information.

OFE Schedule: Coordination with contractor for timely delivery of Shipowner-Furnished Materials & Equipment.

Secondary Contracts: Management of Shipowner's secondary contracts for design, support services and any OFE or OFI.

Drawings: Receipt and review of Contractor's detail drawings, including bills of material, and preparation of comments as appropriate.

9.A.4 Phase III—Continuous Management Activities

Critical Path Network: Review of Contractor's updates of the critical path network to ensure that schedule updates reflect actual project conditions and events (start, percent complete, finish)

Progress Meetings: Leadership at regular progress meetings with Contractor and follow-up to ensure all obligations by both parties arising there from are timely satisfied

Progress Monitoring: On-site identification of when critical path activities have started and finished to monitor Contractor's performance vis-à-vis its own planned schedule.

Progress Payments: Review of Contractor's progress invoices to ensure that all invoiced amounts have been earned.

Classification: Oversight and review of Contractor's communications with classification organization.

Regulatory: Oversight and review of Contractor's communications with appropriate regulatory authorities.

9.A.5 Phase IV—Intermittent Management Activities

Contract: Maintenance of up-dated contract including changes to price, technical specifications contract drawings and delivery date.

Change Specifications: Development or review of technical aspects of proposed changes and Shipowner's estimate of cost of changes.

Change Negotiation: Negotiation of proposed changes after review and acceptance by technical staff.

Delays: Review of Contractor's requests for *force majeure* delays and oversight of other potential causes of delay

Extensions: Review of contract extensions requested by Contractor in association with potential changes.

Rework: Identification and documentation of types areas and timing of Contractor's own rework necessitated by its own errors.

9.A.6 Phase V—Later Management Activities

Inspections: Identification of work in progress and completed items to be inspected and accepted.

Deficiencies: Development of inspection deficiency reports for transmittal to ship yard and follow-up to ensure correction of cited deficiencies

Tests & Trials: Review of draft agendas for tests and trials, oversight of tests and trials, review of final reports on tests & trials.

Acceptances: Preparation of notices of acceptance of inspections, tests and trials, and conveyance of the acceptance to Contractor.

Compartment Closeouts: Final closeout inspection of each compartment upon presentation by Contractor (includes

each tank and void space as well as working spaces), and conveyance of the acceptance or deficiencies to Contractor.

Manuals: Review of draft manuals, including signs and placards, preparation of comments to Contractor review of final manuals

Spare Parts: Development of approved spares lists and communications with Contractor to ensure timely arrival of spares.

Delivery: Development of draft vessel delivery documentation and inventorying and filming of status of ship at time of delivery.

Warranty: Accumulation of warranty items identified by operational staff, transmittal of reports to shipyard and follow-up to ensure correction of cited warranty items.