Developed under NSRP Systems Technology Panel

NSRP Systems Technology Panel Project

Publish ISO Technical Corrigenda for ISO 10303-215, 10303-216 and 10303-227

Final Report

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Product
Data
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Introduction

The STEP Shipbuilding Standards

Over the last 15 years, NSRP, the Navy, DARPA, and the U.S. Shipyards have supported development of U.S. and ISO (International Organization for Standardization) standards for the exchange of Ship Product Model design, simulation, and manufacturing data. These efforts grew out of the realization during the Seawolf and DDG acquisition programs that the development of direct data translation capabilities between the Navy and its various contractors was prohibitively expensive and repetitive as every new acquisition program with different partners and different CAD/CAM tools required complete redevelopment of the software to implement production data exchanges for design and manufacturing. The Navy Industry Digital Data Exchange Standards Committee (NIDDESC) was formed in 1987 as a cooperative effort by the major U.S. Shipyards and the Navy to address the need to share ship design and construction data between co-production partners and with the customer. Similar groups were formed in other industries that were facing the same challenges. In the early 1990's the various industry groups came together to cooperatively develop an integrated group of data sharing standards within ISO.

The STEP (STandard for the Exchange of Product model data) series of standards, published as parts of the ISO 10303 (STEP) and ISO 13584 (Part Libraries) standards, provide standardized data model content and exchange methods for a broad range of manufacturing industries, from printed circuit boards to aircraft, automobiles, and ships. *Figure 1* illustrates the wide range of industrial data supported by the STEP series of standards. Some of these standards are applicable across many or all industries, and some are published as more industry-specific Application Protocols to standardize the requirements for sharing data within a particular industrial sector. *Figure 2* illustrates those portions of the STEP standards developed or used by contributors to the ISO Shipbuilding Committee, many of whom are also members of the NSRP Systems Technology Panel.

The successful sharing of product model data requires that all parties utilize the same underlying data schemas in the development and deployment of translator software. These schemas document the requirements and the technical content of the product model data to be exchanged. The shipbuilding industry has developed and adopted the ISO-standardized STEP Shipbuilding Application Protocols as the standard data schemas for sharing ship product model data. Several of the standards which support ship design and manufacturing, namely 10303-215, 10303-216, 10303-218, and 10303-227 Edition 2 were completed as International Standards in 2003-2005. In parallel, Shipyard, Navy and CAD/CAM Vendor teams working first within the DARPA MariSTEP program and later the NSRP Integrated Shipbuilding Environment (ISE) program developed prototypes of the CAD/CAM translators required to support some of these emerging standards.

As the MariSTEP and ISE programs have developed prototype translator software to implement these standards, some editorial corrections and technical modification of the standards have been identified that will make them more complete and more useful. This Project resolved the technical issues and produced the ISO documentation to incorporate these changes into the International Standards.

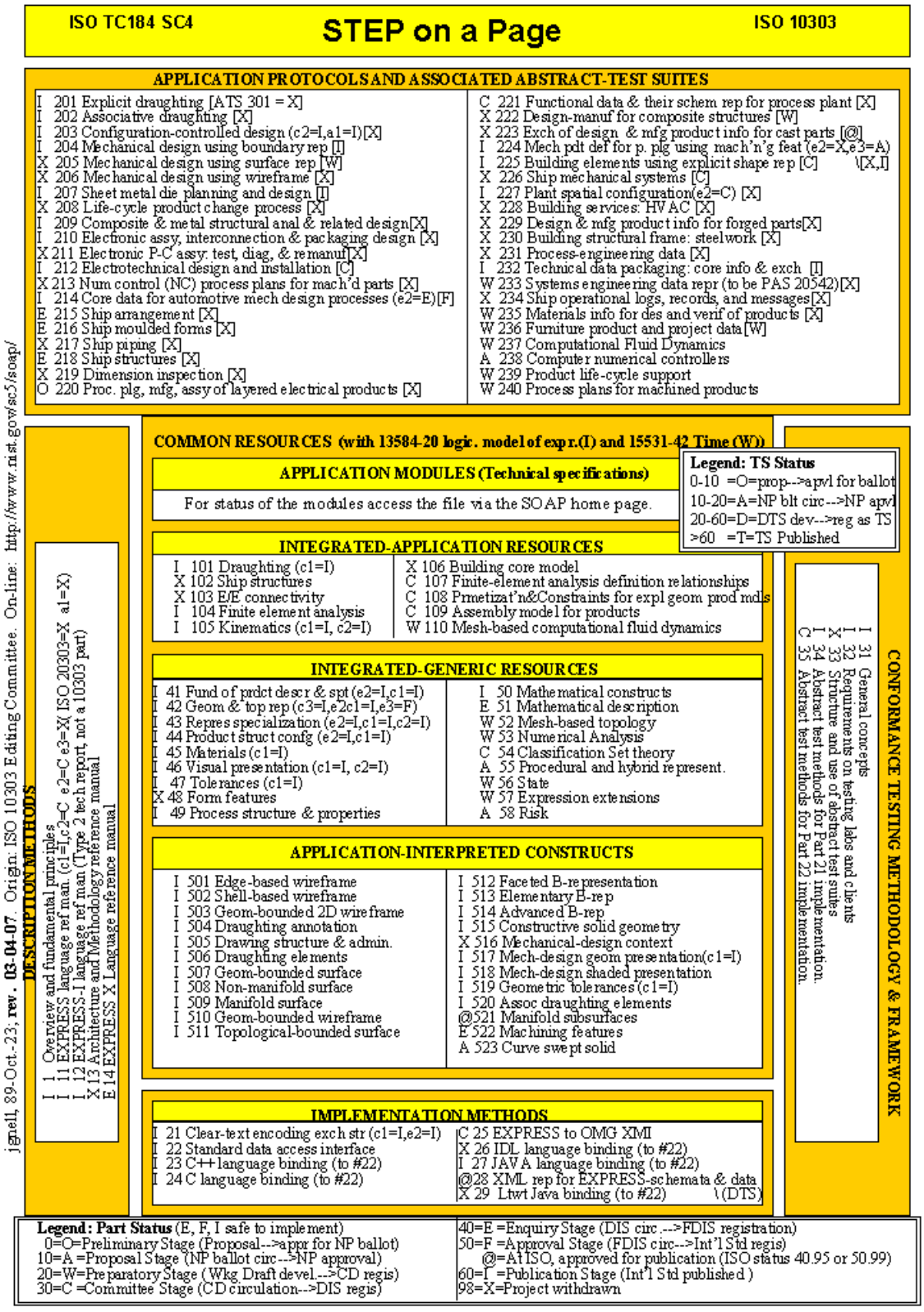

Figure 1 – The ISO STEP Series of Standards

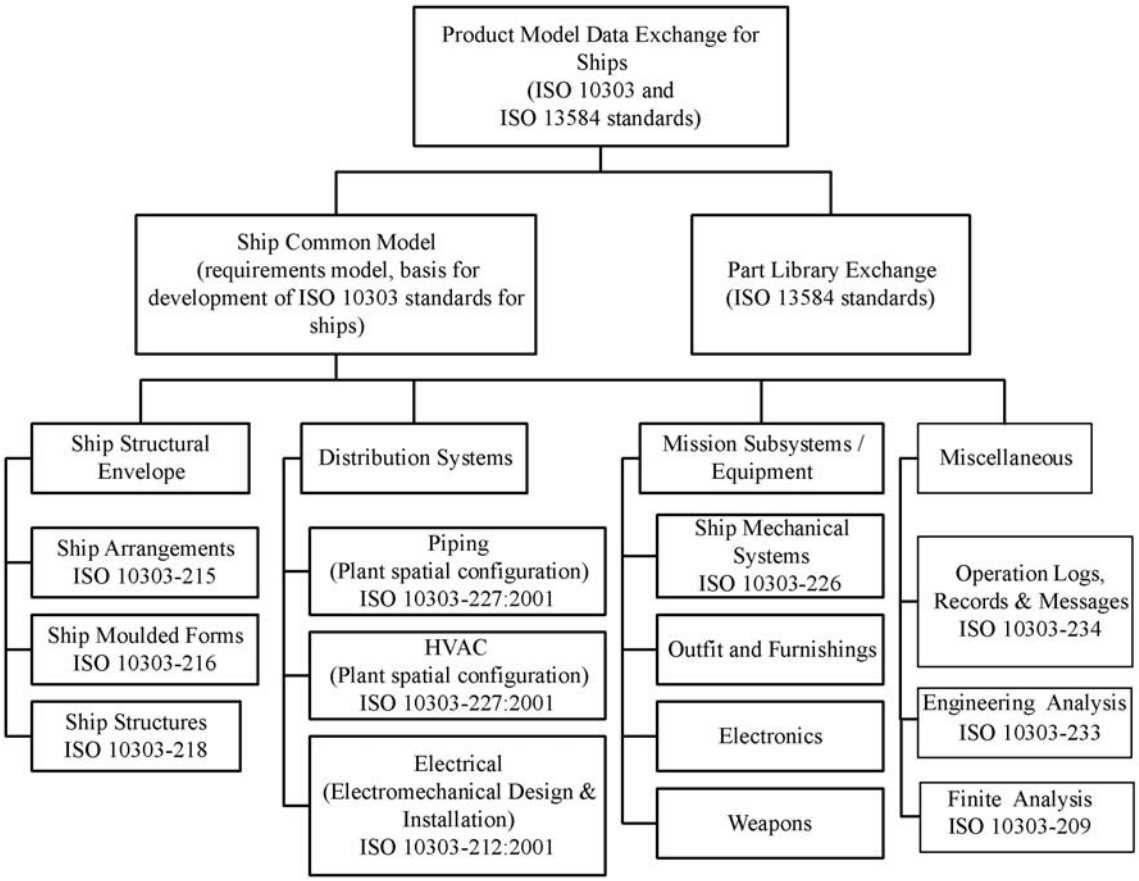

FIGURE 2 – The ISO STEP Shipbuilding Standards

The ISO STEP Application Protocols for the exchange of Ship Moulded Forms (ISO 10303-216:2003), Ship Arrangement (ISO 10303-215:2004) and Plant Spatial Configuration (ISO 10303-227:2005) were developed by members of the NSRP Systems Technology Panel, the NSRP ISE program and the ISO TC184/SC4 T23 (Shipbuilding) group. All were published as International Standards by ISO, with the final editing and publication of the standards accomplished under the previous NSRP Harvest project and NSRP ISE program.

ISO 10303-216 specifies the data content and method of exchange for a Ship's surface geometry and intact stability. *Figure 3* illustrates the data types supported by ISO 10303-216.

ISO 10303-215 specifies the data content and method of exchange for a Ship's compartmentation, weight distribution and damaged stability. *Figure 4* illustrates the data types supported by ISO 10303-215.

ISO 10303-227 specifies the data content and method of exchange for a Ship's Piping, HVAC, Cableway, and Mechanical Systems. *Figures 5 through 8* illustrate the data types supported by ISO 10303-227.

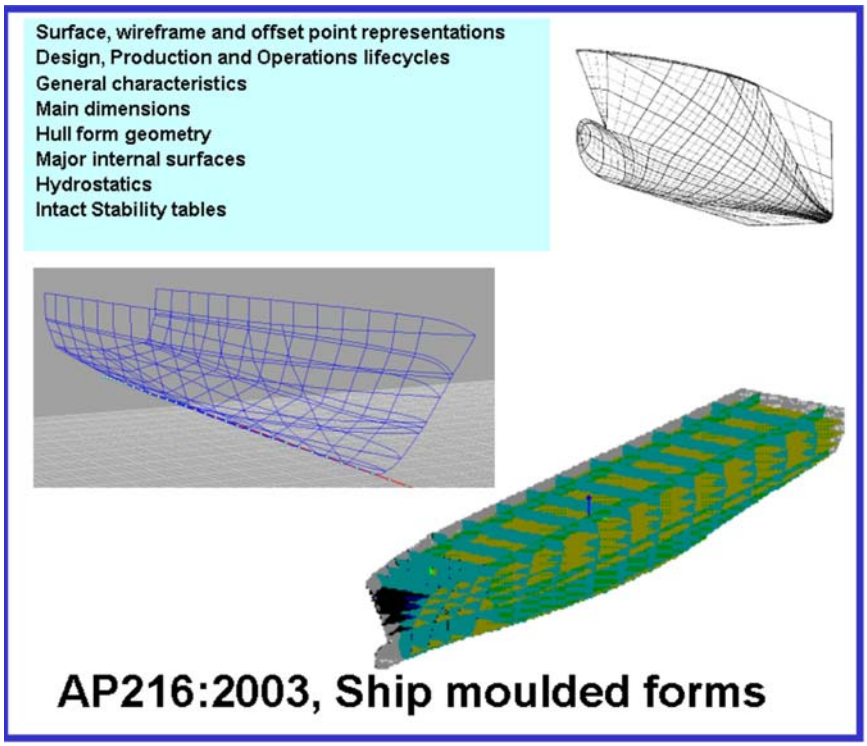

FIGURE 3 – ISO 10303-216 Ship moulded forms

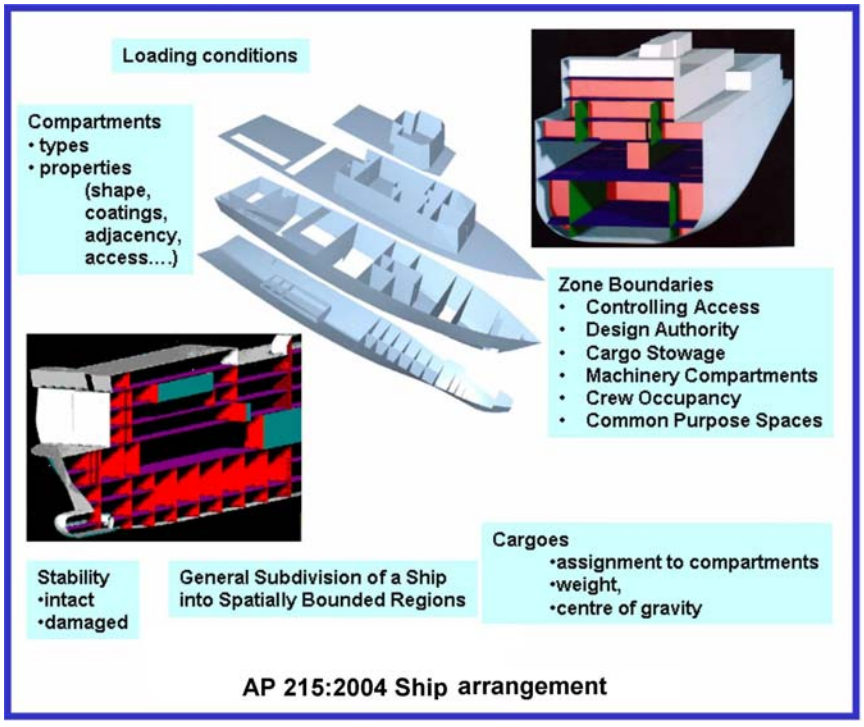

FIGURE 4 – ISO 10303-215 Ship arrangement

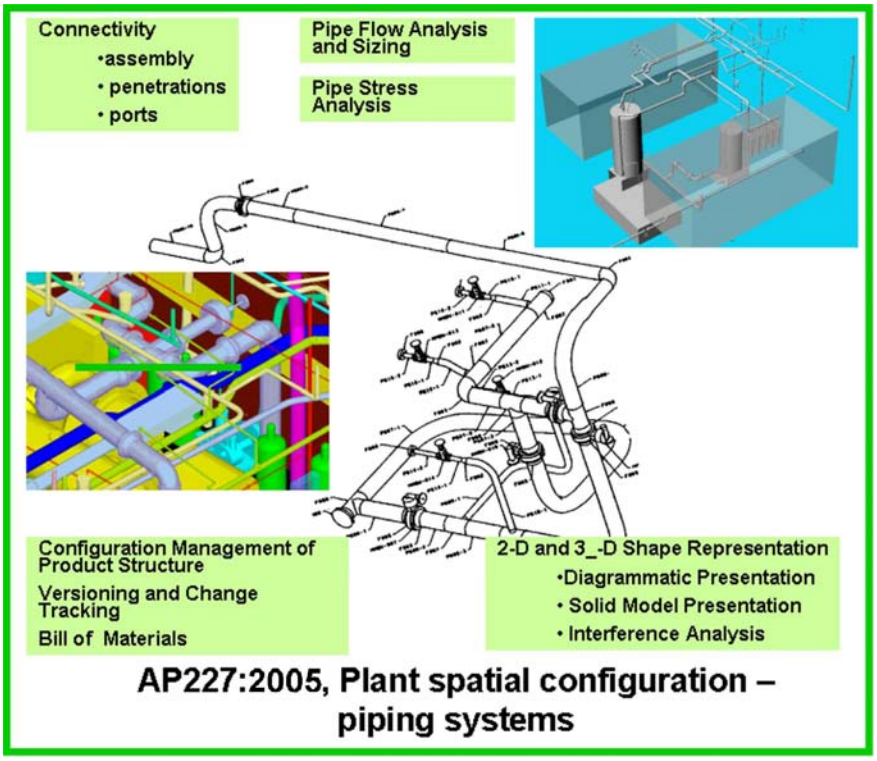

FIGURE 5 – ISO 10303-227 Plant spatial configuration – Piping

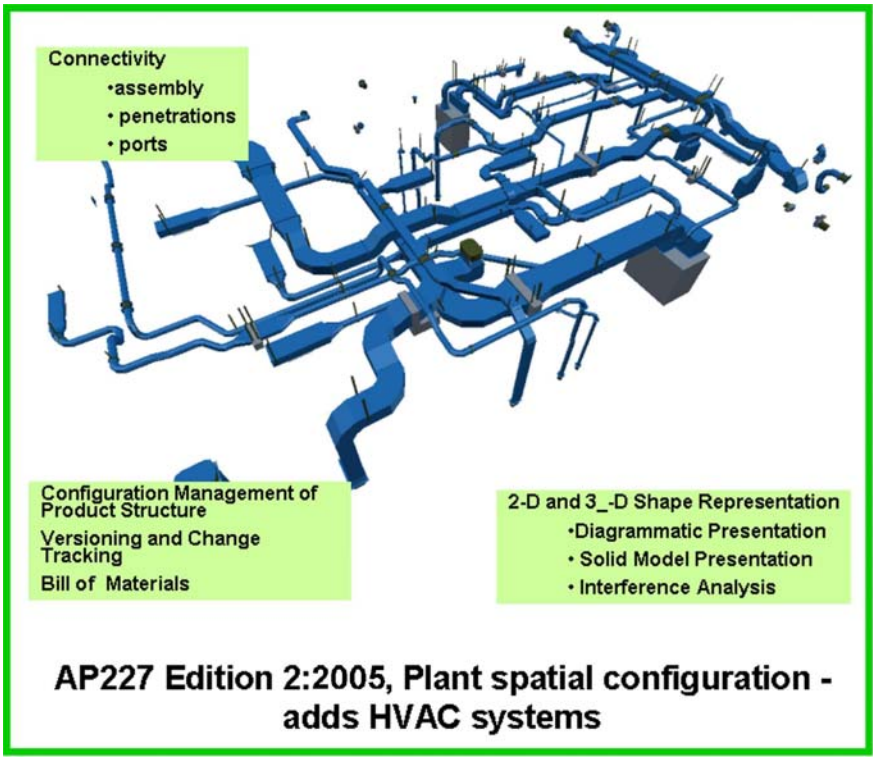

FIGURE 6 – ISO 10303-227 Plant spatial configuration - HVAC

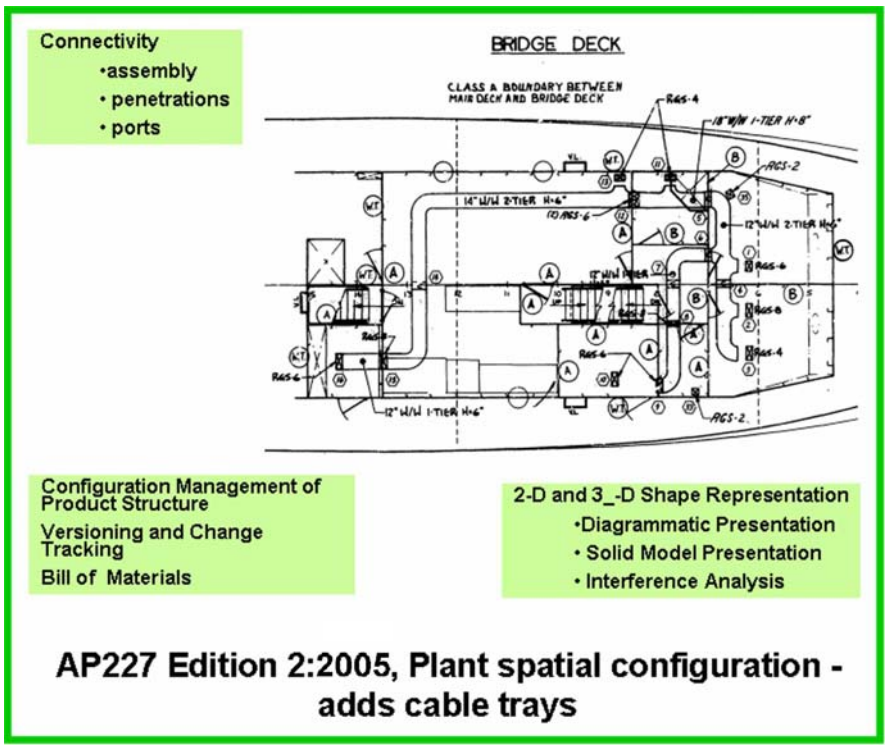

FIGURE 7 – ISO 10303-227 Plant spatial configuration – Cable trays

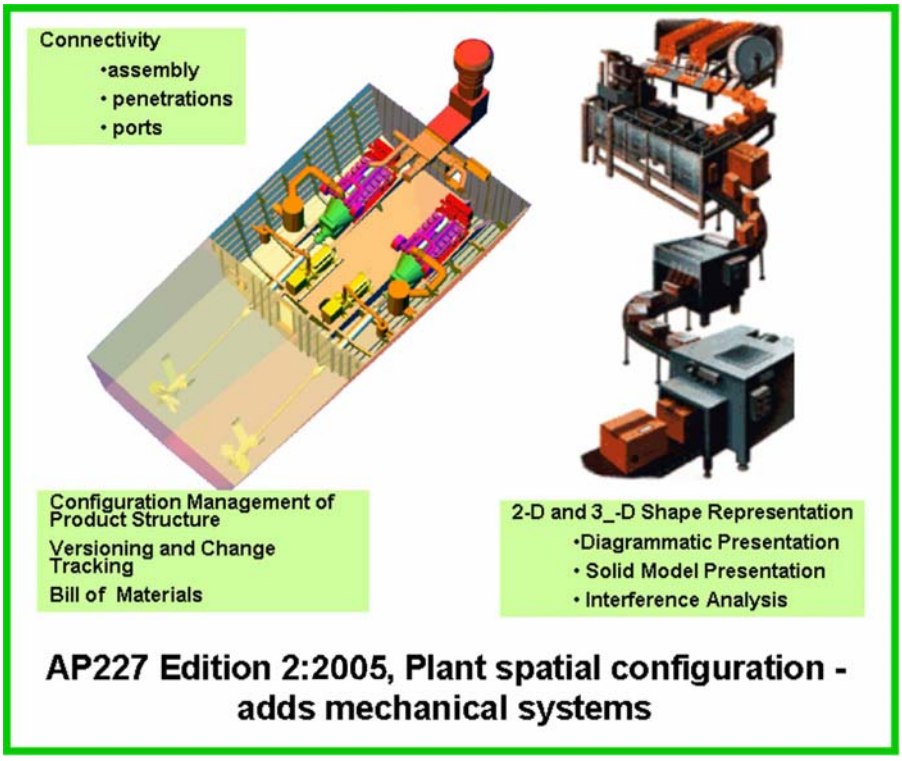

FIGURE 8 – ISO 10303-227 Plant spatial configuration - Mechanical

ISO 10303-218 specifies the data content and method of exchange for a Ship's Structural Systems and parts. Though not addressed in the current project, it is included here for completeness. *Figure 9* illustrates the data types supported by ISO 10303-218.

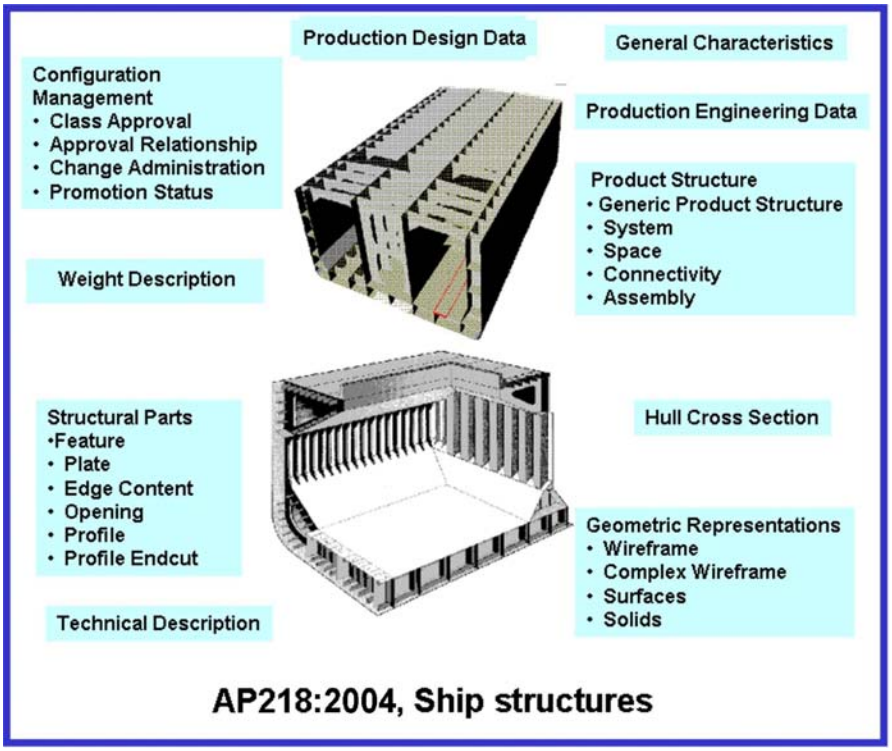

FIGURE 9 – ISO 10303-218 Ship structures

Maintenance of the ISO STEP Shipbuilding standards

As noted above, during the several phases of NSRP ISE program, several shipyards, the Navy, and their CAD vendors have developed software implementations to exchange ship design product model data in compliance with these standards. One of the tasks of the ISE program was to validate and recommend corrections and modifications to the ISO standards where necessary to assure successful future exchange of data among the shipyards and the Navy. The editorial and technical issues identified by the ISE Team as well as other reviewers and users of the Shipbuilding standards were documented as ISO Standard Enhancement and Discrepancy System (SEDS) reports for necessary corrections or recommended modifications to the standards.

This NSRP Panel Project has completed the technical issue resolution and has developed the ISO amendment documents for ISO 10303-215, ISO 10303-216 and ISO 10303-227 to incorporate the corrections and modifications identified by the ISE Team and others into the Shipbuilding standards. The appropriate documents have been prepared for publication by the ISO Central Secretariat as Technical Corrigenda to the International Standards.

The technical work consisted of a review of the outstanding STEP Standard Enhancement and Discrepancy System (SEDS) issues that had been submitted against the three International Standards, and resolution and documentation of the technical solutions to these issues as an ISO Technical Corrigendum document. Outstanding issues and proposed solutions were discussed with members of the ISO TC184/SC4 T23 (Shipbuilding) Team on several conference calls and at meetings of the NSRP ISE-6 project and the NSRP Systems Technology Panel.

Deliverable 1 of this project, the Technical Corrigendum for ISO 10303-216 (Application Protocol for Ship moulded forms) has been published by ISO and is publicly available from the STEP website (http://www.tc184-sc4.org). Deliverable 2, the Technical Corrigendum for ISO 10303-215 (Application Protocol for Ship arrangement) was submitted to ISO in July, 2007, and is expected to be published by ISO shortly. Deliverable 3, the Technical Corrigendum for ISO 10303-227 (Application Protocol for Plant spatial configuration) was submitted to ISO at the end of the project, and is expected to be published by ISO before the end of 2007.

Benefits of maintaining the Standards

Most of the modifications made to the ISO Shipbuilding standards were to correct errors and omissions identified during development of the NSRP ISE STEP translators. The recommended corrections were made in the ISE software as it was developed, with these lessons learned fed back for maintenance correction in the standards in this Panel Project. Revising the published ISO documentation to match that used for recent ISE software development assures that future translators developed by non-ISE participants will interoperate with the ISE versions of the product model schemas.

In addition, NAVSEA Instruction 9040.3 recommends contractor delivery of data in accordance with the ISO STEP Application Protocols. Revising the ISO standards to include the corrections, changes, and lessons learned from the NSRP ISE program brings the existing ISE translator software into compliance with the NAVSEA Instruction for potential use on current and future ship programs.