THE NATIONAL SHIPBUILDING RESEARCH PROGRAM

1985 Ship Production Symposium Volume I
Paper No. 3:
Web Fabrication Line - Results of a Feasibility Study

U.S. DEPARTMENT OF THE NAVY
CARDEROCK DIVISION,
NAVAL SURFACE WARFARE CENTER
# The National Shipbuilding Research Program 1985 Ship Production Symposium Volume 1 Paper No. 3: Web Fabrication Line - Results of a Feasibility Study

## Abstract

Web fabrication lines in shipbuilding will play an ever-increasing role in the fabrication and assembly of structural web plates in the shipbuilding process. This paper describes the results of a feasibility study which evaluated the fabrication and welding methods, which would be required to fabricate and weld the webs for the bow and stern sections of the Assault Craft, Light (AC/L) and the Assault Craft, Mechanized (AC/M) vessels. The study also evaluated the acceptability of various weld configurations and plate thicknesses to the fabricators and shipbuilders.

### Subject Terms
- Welding
- Fabrication
- Structural Integrity
- Shipbuilding

### Security Classification

- **a. Report:** Unclassified
- **b. Abstract:** Unclassified
- **c. This Page:** Unclassified

### Limitation of Abstract

- **SAR**

### Number of Pages

- 8 pages

---

Standard Form 298 (Rev. 8-98)
Prepared by ANSI Std Z39-18
DISCLAIMER

These reports were prepared as an account of government-sponsored work. Neither the United States, nor the United States Navy, nor any person acting on behalf of the United States Navy (A) makes any warranty or representation, expressed or implied, with respect to the accuracy, completeness or usefulness of the information contained in this report/ manual, or that the use of any information, apparatus, method, or process disclosed in this report may not infringe privately owned rights; or (B) assumes any liabilities with respect to the use of or for damages resulting from the use of any information, apparatus, method, or process disclosed in the report. As used in the above, “Persons acting on behalf of the United States Navy” includes any employee, contractor, or subcontractor to the contractor of the United States Navy to the extent that such employee, contractor, or subcontractor to the contractor prepares, handles, or distributes, or provides access to any information pursuant to his employment or contract or subcontract to the contractor with the United States Navy. ANY POSSIBLE IMPLIED WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR PURPOSE ARE SPECIFICALLY DISCLAIMED.
WEB FABRICATION LINE

- RESULTS OF A FEASIBILITY STUDY -

By

Michael Tomzig
Sales Application Engineer
Oxytechnik Systems Engineering

ABSTRACT

In 1974 OXYTECHNIK designed a web fabrication system comprising equipment for mechanized handling and welding stiffeners to plates and a conveying system. This first concept was the basis for a feasibility study to investigate the possibilities of highly mechanized respectively automatic fabrication of webs for building ships. This paper will discuss this feasibility study: the history, requirements, result, description, special features, and conclusion.
1. **HISTORY**

In 1974 OXYTECHNIK designed a web fabrication system comprising equipment for mechanized handling and welding stiffeners to plates and a conveying system. This first concept was the basis for a feasibility study to investigate the possibilities of highly mechanized respectively automatic fabrication of webs for building ships.

2. **REQUIREMENTS**

**Conception:** Manufacturing of webs consisting of pre-cut plates and pre-processed stiffeners, conveying system connecting different stations.

**Automation:** All major processes to be automated respectively highly mechanized as far as economical.

**Dimensions of workpieces:** The line capable of handling webs and frames up to 54' length.
- Max. plate width: 13'
- Thickness: 5/16" to 1"
- Stiffener length: 1' to 13'
- Stiffener height: 18"
- Stiffener type: flat, T, L

**Capacity:** Meeting the demands of AVONDALE Shipyards: 4 bulk carriers per year, 40,000 tons dead weight each.

**Coating of plates and stiffeners:** Ability of handling coated materials respectively consideration of this influence on the welding speed, etc.
3. RESULT

- Flow production on two lanes with integrated processing stations including all activities necessary for a stand alone condition,

  two lanes for transport of webs and web frames,

- main station designed as robot for handling, positioning, and welding of stiffeners to the plate oriented in all directions as required,

- Maintaining exact location of plates after marking and cutting until transport to the welding station. Control of welding robot derived from data of plate marking and cutting process.

4. DESCRIPTION

(see 'layout no. 734.07351 A')

Station I
The pallets consisting of two carriages will be connected and prepared for loading of plates.

Station II
The pallets will be loaded and positioned by crane, marked and labeled. Also bevel cuts are performed here, if required. All information will be transferred to the machine control from the main frame.

Station III
The pallets will be moved automatically to station III for simultaneous cutting on both lanes. All cut parts remain in their original location by leaving tabs.
Station IV
Joining of plates by welding tractors, if required.

Station V
Stiffeners will be removed automatically from a storage magazine attached to the machine, positioned at the correct location on the plate, pressed to the plate, and welded on both sides simultaneously. This robot is able to handle stiffeners of 3' to 12' length. Tacking is avoided.

Station VI
Stiffeners shorter than 3' are handled with a manually controlled positioner. Tacking and welding is done manually.

Station VII and VIII
Unloading and return of pallets. In case of frames the pallets serve as support table for arranging, tacking, and welding face plates. To simplify this work face plate machines are provided, which hold the workpieces in the correct position before manual tacking and welding.

Station IX
Turning over by crane, line heating, adding further stiffeners, welding of bottom sides of face plate and butt joints.

5. SPECIAL FEATURES
- The transporting system can be adapted to several purposes. The normal use is for production of webs and frames as described. By joining pallets sidewise also panels up to 27' x 59' can be processed.
- All machines are arranged on same rails.

- Any handling of single cut plates is avoided reducing labour costs and production time.

- Cutting and marking information is utilized to control the robot.

- All mechanized stations require 7 operators. Manual work like turning over of plates, finishing of longitudinal welds, tacking, and welding of small stiffeners, etc. were not calculated.

- The capacity of the line can be increased by water plasma cutting.

- A material management and shop scheduling system may be developed to ensure a proper connection to the existent beamline, an optimum load, and a reliable availability of parts.

7. **CONCLUSION**

The feasibility study is a proposal based on specific requirements. Modifications easily can be made for individual needs. The robot as the heart of the line also can be used separately as a single station if a stand alone system including plate processing cannot be realized.
Additional copies of this report can be obtained from the National Shipbuilding Research and Documentation Center:

http://www.nsnet.com/docctr/

Documentation Center
The University of Michigan
Transportation Research Institute
Marine Systems Division
2901 Baxter Road
Ann Arbor, MI  48109-2150

Phone: 734-763-2465
Fax: 734-936-1081
E-mail: Doc.Center@umich.edu