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# **THE NATIONAL SHIPBUILDING RESEARCH PROGRAM**

**Pipe Piece Family Manufacturing**

U.S. DEPARTMENT OF TRANSPORTATION  
Maritime Administration

## FOREWORD

Typically, large numbers of pipe pieces of many varieties in mixed quantities are required for a ship. Competitive shipbuilders have proven that productivity of the overall shipbuilding process increases when pipe pieces, regardless of varieties and quantities, are produced just-in-time to support assembly workers who perform zone outfitting. In other words, a pipe shop's contribution to overall shipbuilding productivity is the only meaningful way to regard its performance.

Pipe-piece Family Manufacturing (PPFM) as described herein, is another form of Group Technology (GT) successfully applied by Ishikawajima-Harima Heavy Industries Co., Ltd. of Japan. The substance was obtained mostly from study of preparations for and operation of the very efficient pipe shop in IHI's Kure Shipyard which is manually operated and out produces automated shops elsewhere.

How well a pipe shop performs is determined by planners. Thus, PPFM necessarily is a discipline for the people who create design details and who perform material definition. PPFM includes material control in procurement and in process until pipe pieces are painted and palletized to anticipate assembly work for specific zones at specific times.

PPFM is a comprehensive methodology which simplifies the manufacture of anything required in mixed varieties and quantities, e.g., vent-duct pieces as well as pipe pieces. The planning and scheduling which has to be done is more complicated than that for traditional, less productive system-oriented methods.

No small reason for the development of PPFM and its effective application by competitive shipbuilders, is the presence of pipe-shop managers, deputy managers and field engineers who have college or equivalent educations and who have experience in other shipbuilding functions. They are, for example, able to apply statistical control for analytically and *constantly* improving pipe-shop methods consistent with the competitive need to constantly improve the entire shipbuilding process.

PPFM is highly organized work. Statistical control is a way to constantly improve design details and work methods. Per Dr. W.E. Deming, known as the father of productivity in Japan, "Gain is accomplished by changes in the system effected by *management helping people to work smarter, not harder.*"

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The book was developed in three stages. M. Kasama, International Division, Ishikawajima-Harima Heavy Industries Co., Ltd. (IHI) of Japan, compiled most of the substance and performed the difficult translation into English. C.S. Jonson, Science Applications, Inc., La Jolla, California, developed the draft, in the context of the IHI submittal and a literature search of Group Technology, which was used to solicit U.S. shipbuilders' comments. The work was next significantly edited and supplemented by L.D. Chirillo assisted by R.D. Chirillo.

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**Appendix A - Problem Area Subdivisions**

- Pipe-piece Family Classifications
- Pipe Pieces by Family for a 60,000 DWT Tanker
- Examples of PPFM Codes
- Decision Logic Table for PPFM Codes

**Appendix B - Pipe-piece Fabrication Flow**

**Appendix C - Work Load Schedules**

**Appendix D - Subcontracting Expense Calculation**

- Operations Control Lists



**EX SCIENTIA EFFICIENS**

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*This book is dedicated to the memory of  
a shipbuilder  
from Vancouver, British Columbia*

*Leslie Coward*

*July 19, 1925 — March 15, 1982*