

APPENDIX B

Offshore Fabrication Facilities in Eastern Canada

FABRICATION FACILITIES IN EASTERN CANADA

This Appendix is included to provide a high level indication of fabrication and construction facilities in Eastern Canada that offer specific capabilities and capacity for work associated with the construction phase of the White Rose development. This information was obtained by Husky Oil in response to a written survey distributed to all the respondents in February, 2000.

1.0 FRIEDE GOLDMAN NEWFOUNDLAND LIMITED

1.1 Company Description

Friede Goldman Newfoundland Limited (FGN) is owned and operated by Friede Goldman Halter Incorporated. FGN offer construction, fabrication and engineering services for offshore, heavy industrial fabrication, shipbuilding and repair, with separate offshore fabrication (Cow Head) and shipyard facilities. FGN have experience in offshore module fabrication for the Hibernia and Terra Nova projects, as well as rig conversion projects for the Gulf of Mexico. FGN maintains the highest national structural welding accreditation for steel (to CSA W47.1, Div.1) and expertise in the manufacture of pressure vessels, fittings and piping supported by ASME U-stamp certification.

The normal combined workforce of the Cow Head Fabrication and Marystown Shipyard sites is 997 persons, including management, administration and skilled labour, with a peak work force of 1,200.

FGN's project management system is based on a customized in-house system of integrated software systems using Visual Basic, MS Access, Powerhouse and MS Project. The company's quality assurance/quality control system is compliant with ISO 9002:1994.

In the past five years, FGN has completed:

- fabrication of structural modules for the semi-submersible *Glomar Celtic Sea* for Amfels Inc.;
- fabrication of structural modules for the semi-submersible platforms *Bingo 9000-1* and *9000-2* for FGO East;
- fabrication of structural modules for EVA 4000 conversions of semi-submersibles *Max Smith*, *Jim Thompson*, *Paul Romano* and *Amos Runner* for FGO West; and
- construction, test and trial of two fire fighting, docking and escort tugs for the Newfoundland Transshipment Terminal.

The company's offshore project list also includes:

- three topsides-mounted structures for Hibernia: two drilling modules and one pipe rack;
- mooring pontoons, permanent ballast system, soffit panels, deformation tubes, bailey brackets, access towers and permanent embedment plates for the GBS of Hibernia;
- two offshore support vessels, the *Maersk Norseman* and the *Maersk Nascopie*, for Hibernia;
- refit and upgrade of the *Glomar Grand Banks* and the *Henry Goodrich* semi-submersibles for the Terra Nova project;
- super-duplex pipe spools and pile guide support frame for the Terra Nova Project; and
- refit of the semi-submersible Seco 714 for the White Rose delineation drilling program.

1.2 Facilities Description

1.2.1 Cow Head Offshore Fabrication Facility

This facility, completed in the early 1990s, covers a land area of 8.1 ha and includes a fabrication building of 1.4 ha and an "L" shaped dock of 44 m length along the front face, and 78 m along the inner face. Water depth at the outer dock is 15 m lowest low low tide (LLT). There is also an adjacent load-out wharf built primarily for skidding large assemblies directly onto barges. The wharf face is 30 m long, and the minimum water depth is 6.9 m. The dock is rated at 10 t/m². The facility allows MODUs with a maximum draft of 15 m to be towed directly alongside docking areas so repair and service work can be performed from land.

The offshore fabrication facility consists of several interconnected buildings, the largest of which is the outfitting and assembly building at 3,360 m². This building contains two 50-t and one 20-t, cab-controlled cranes with 17 m under the hook, one computer numerically controlled flame cutting machine, two automated submerged arc welding machines, twenty shielded metal arc welding machines, eight sets of rollers for large diameter pipe, 52 gas metal arc/flux welding machines with 15-m extended push-pull feeders systems and two portable plasma arc cutting machines.

There are separate high alloy pipe and carbon pipe prefabrication areas, each 672 m² in area. These are paired with high alloy pipe and carbon pipe fabrication areas, each 705 m² in area. All are equipped with handling and fabrication equipment, 5 t cranes with 5 m under the hook and 1-t jib cranes. The high alloy pipe fabrication area is air conditioned for proper control of temperature and humidity to facilitate welding of titanium.

The main fabrication shop for cutting steel is 1,960 m² in area, with a 15 and 10-t crane, each with 5 m under the hook and configured to travel directly into the main outfitting and assembly area. This building features (among a wide range of equipment) a 1,000 mm capacity cold cut saw complete with stockyard, infeed and discharge conveyors and side transfer systems, eight portable flame cutting machines, and a CNC plasma marking/oxyfuel cutting and bevelling machine with a cutting area of 9 m x 19 m.

The facility at Cow Head also includes a 1,200 m² maintenance and electrical shop/administration building, a 17.6 m x 20.5 m shot blast and painting hall, an X-ray bunker designed to Canadian Atomic Energy Authority specifications, and various stores, office, control room, and fabrication related areas.

Recent acquisitions include a 750 t Manitowoc crawler crane with ringer configuration, a 300-t Lima crawler crane, an ESAB Avenger 2 CNC profile cutting machine, 600-t multi-wheel transporters, and open end rolls. Since 1996, increased capacity has been achieved in the fabrication shop and the paint shop has undergone an extension.

1.2.2 FGN Shipyard Facility

The principal fabrication and assembly building is 116 m by 32 m, with 17 m under the crane hook. The crane capacity in the building is 2 x 53 t. There are 15 shops and buildings on the site, including a 22 m x 9 m blasting and paint shop, a 61 m x 24 m joiner's shop, and machine, pipe fitting and sheet metal shops.

The yard also includes a Syncrolift[®] and side transfer system consisting of a platform 76 m in length by 19.6 m wide, with a lift capacity of 3,000 t. There are several docks, the longest of which is 137 m and the minimum water depth alongside is 9 m.

2.0 PCL INDUSTRIAL CONTRACTORS (BULL ARM)

2.1 Company Description

While the Bull Arm Site Corporation is the owner of the asset, the present lease with PCL Industrial is for the duration of the Terra Nova project and expires on December 31, 2000. However, this lease has provision for a six-month extension if required, for the Terra Nova project.

PCL Industrial has a joint venture with Brown & Root and Energy Services and ConPro Group Ltd., called Bull Arm Fabricators. This joint venture operates the Bull Arm site, having negotiated with Bull Arm Site Corporation for its use.

As part of the Terra Nova development, PCL Industrial is responsible for the fabrication of all topsides modules for the FPSO, with the exception of the upper turret. At the inshore hook-up phase, PCL is responsible for the lifting and installation of all topsides modules, including the upper turret, hook-up, and to assist with commissioning at the Bull Arm site. The two process modules for Terra Nova, known as M03 and M05, were fabricated in BARMAC's yard in Ardersier, Scotland. PCL is coordinating the sea transportation to Bull Arm using a piggyback barge arrangement. The utility modules, known as M02 and M04, along with the main generation module, M09, were fabricated at Bull Arm. In addition, the 100-m high flare as well as loose fabricated items at the stern of the vessel and piperack were also fabricated at this site. The total fabricated weight for the Terra Nova project at Bull Arm is approximately 4,800 t.

The Terra Nova Alliance also uses Bull Arm as a staging area for some of its marine operations. This includes the receipt and fit-up of the spider buoy, receipt and preparation for main mooring chains, fabrication of fifteen gravity bases for flowlines, and receipt and final assembly of the main taurus connector for the base of the lower turret. During the fabrication phase of the work, the unionized workforce peaked at approximately 900 people. It is anticipated that the peak during the hook-up phase in July-August, 2000, will be approximately 1,000 people, working two 60-hour/week shifts.

2.2 Facilities Description

As part of the lease arrangement with the Bull Arm Site Corporation, PCL Industrial has control, care and custody of the entire Bull Arm site, which comprises of approximately 2,833 ha of land, as well as the water lot lease contained in the area of Bull Arm. The site is located at the head of Great Mosquito Cove on the west side of Trinity Bay, Newfoundland. This cove is 1.5 km long and has an average width of 500 m. Water depth in the cove's inner section varies from 15 to 35 m, while the water at the outer section is 150 to 180 m deep. The site has a 14-km paved internal roadway.

Essentially, the Bull Arm site infrastructure remains the same as was developed and used for the Hibernia project, with the following exceptions:

- The Bull Arm Site Corporation has dismantled the camp, and all of the accommodations have been sold. Some accommodation units remain on site, but are ready for shipment. Under the sales agreement, the Bull Arm Site Corporation will have these units removed from the site by June 2000.
- The kitchen facility has been completely dismantled by the Bull Arm Site Corporation and remains a shell building not used by PCL. The recreation building, gymnasium and pool are intact and remain unused. The fire hall/medical clinic is intact, however, it is essentially unused with respect to the Terra Nova project.
- The Back Cove area of the site, which was used for access to the deep-water area for Hibernia, again is unused. The portable cabins and locker rooms in this area have been dismantled and removed.

The small wharf facility constructed for the shuttle ferries to and from the GBS remains. The large building in this area used for pre-stress storage is intact and is used by PCL for dead storage.

- The topsides area of the site (formerly known as the PASSB area) has essentially been in full operation for the Terra Nova project. The one exception is the 5,575 m², two-storey administration building that has remained closed for this project. All staff, administrative functions, and engineering functions have been accommodated in the general shops building, second floor area.

Various pieces of portable automated equipment have been purchased by PCL for the Terra Nova project to enhance production of the site. The Terra Nova project required considerably more pipe spooling than was previously required for Hibernia. In fact 5,500 pipe spools have been fabricated for the project. This comprises approximately 65 percent alloys and 35 percent carbon steel.

The topsides pier and quay area have remained intact for the Terra Nova project and are used as the main staging area. The large module supports for the Hibernia project, located on top of the pier, have been removed to facilitate load-outs.

In the drydock area, all of the upper buildings remain intact and are used for dead storage. The major exception in this area is the 18,580 m² rebar building that was converted into a large pipe fabrication facility. This building accommodates up to 150 workers fabricating all types of alloys for the Terra Nova project, including the duplex, super duplex, copper-nickel, titanium and stainless steel. This building was upgraded electrically, and gas distribution systems were added to accommodate this work, along with the installation of automated sub-arc equipment and rotators.

The major investment made by the Terra Nova project at the Bull Arm site was the extension to what was formerly known as the NODECO quay. This quay, approximately 100 m in length, has been extended by an additional 75 m. It is in this location that the Terra Nova FPSO hull will be moored for the installation and hook-up phase of the work. Considerable excavation and rock removal was required in order to maintain a 50-m wide service area to the vessel. The minimum water depth is now 10 m, sufficient to receive an FPSO vessel. This facility is now complete with stair access towers; lifts; and temporary power, both for construction and 10 mva for commissioning power.

During the hook-up and commissioning phase at Bull Arm, the topsides facility will be shut down and all staff will be relocated to the drydock area. The former NODECO office building will house approximately 200 staff members for this phase. The rebar shop will then be further converted into a staging area for hook-up and warehousing.

3.0 ST. JOHN'S DOCKYARD LIMITED (NEWDOCK)

3.1 Company Description

In April 1997, the Canadian Government divested itself from Newfoundland Dockyard Corporation. The new company, St. John's Dockyard Limited (NEWDOCK) assumed operations of the facilities and resources at the former shipyard. NEWDOCK is a member of the Burry and Penney Groups of Companies.

NEWDOCK's Project Management tool for scheduling and progress is Microsoft 98. Labour budgets and tracking of person-hours is with the use of Shopclock (time keeping) and Syspro Impact Encore (budget allocation). Tracking of person-hours for each project and work order is currently done with Access. NEWDOCK is currently developing the user interface between Grand Master Suite (payroll), Impact Encore and Shopclock for allocation and tracking of actual person-hours for each project and work order. Performance measurement is with the aid of Access and Impact Encore downloaded into a spreadsheet format report, providing various levels of performance and efficiencies for each task.

NEWDOCK maintains a quality assurance department responsible for quality assurance and quality control for each individual contract and for liaison activities with customers and representatives of regulatory authorities. Quality control procedures assure in-process and final inspections. Policies and procedures are certified to ISO 9002 and in addition, meets or exceeds the requirements of CSA.Z. 299-3, AQAP-4 and MIL-1-452084. The company also maintains a Provincial Certificate of Authorization for Pressure Piping and is certified by the Canadian Welding Bureau.

Recent offshore projects completed at NEWDOCK include:

- HOST systems (subsea templates and manifolds) for the Terra Nova Development;
- tether connection device, flowline anode fabrication, and intermediate connection collars for Coflexip Stena International;
- offshore service support for both FMC Energy Systems and the Hibernia Management and Development Company; and
- offshore loading system bases and batch plants for Hibernia.

3.2 Facilities Description

NEWDOCK occupies 7.5 ha at the west-end of St. John's harbour, including 6,550 m² of interior production space. The current workforce is 280 persons, and the yard capacity is approximately 30 t of steel per week.

A new subsea service hall has recently been erected and occupies a space of 1,010 m². It is serviced by one 60-t and one 13.5-t overhead crane, each with 16 m under the hook. This hall accommodates all major subsea assembly, stacking, integration and test activities.

A prefabrication shop occupies 1,285 m² of area and is serviced by two 5-t overhead cranes. This area furnishes all major fabrication equipment including automatic burning equipment, numerically controlled plasma-arc cutting table, plate rollers (7.925 m in width and 32 mm rolling), power rollers, punch and shears.

A fabrication shop occupies 520 m² of area and is serviced with two 5-t overhead cranes. This building is equipped with minor fabrication equipment such as shears, drills, iron workers, saws, bed jointers and spindle shapers.

A sub-assembly is 340 m² and is serviced by two 5-t overhead cranes. An assembly/machine shop occupies 530 m² of area, and is designed to accommodate all major assembly and machining projects. It is serviced with one 80-t overhead crane and one 15-t overhead crane.

A stainless steel pipe shop is environmentally controlled with an area of 338 m² and serviced by a 2-t overhead crane. A hydraulic/pipe testing shop of 340 m² is used to execute construction, flushing and testing procedures pertaining to hydraulic systems and installations. This shop is also environmentally controlled and serviced with a 2-t overhead crane.

A blast and paint shop of 570 m² in area is serviced with two 5-t cranes. This facility is complete with a blast room enclosure, climate controlled painting areas and designated storage.

A machine shop occupying an area of 335 m² can handle up to 1,500 mm boring and is designed specifically for small machining projects. There are also separate electrical and maintenance shops at 380 m² and 313 m², respectively.

Additional craneage includes 20, 40, 70 and 80-t mobile cranes. Specialized production equipment includes automatic orbital welding machines GTAW (TIG), sub-arc welding machines complete with turning rolls (25-t rolls capacity), CNC controlled Froier floor boring machine, CNC controlled Poreba lathe, digital TOS horizontal boring mill, CNC controlled Ann Yang lathe, CNC controlled Topwell TW 50 milling machine (5-t capacity) and a CNC controlled Topwell TW 60 milling machine (6-t capacity).

NEWDOCK has a 4,000 t capacity Syncrolift[®] marine elevator with a platform of 20 m x 86.5 m and three 100-m repair berths. There is a graving dock with an internal length of 174 m, an entrance depth of 24 m and a depth of 10 m. A north pier is 150 m x 16 m x 9 m draught (LNT) and a south pier is 140 m x 10 m x 9 m draught (LNT). Immediately adjacent to all yard facilities is a 2 ha laydown area, which has been proposed for future development specifically for the offshore.

4.0 SAINT JOHN SHIPBUILDING

4.1 Company Description

Saint John Shipbuilding is a division of Irving Shipbuilding Inc. (ISI), a member of the privately-owned Irving group of companies. ISI owns and operates six fabrication and shipbuilding facilities ranging from small to very large, including Halifax Shipyard, East Isle Shipyard at Cardigan Bay in Prince Edward Island, Dartmouth Marine Slips and Shelbourne Ship repair, both in Nova Scotia.

ISI make widespread use of Primavera (P3) scheduling systems for project management. Both Saint John and Halifax facilities employ a common system for performance measurement based on Workpack, a system that allocates labour budgets and measures performance in terms of actual cost of work performed against budgeted cost of work scheduled and budgeted cost of work performed. ISI can claim valuable recent experience in complex project management derived from its role as Prime Contractor and Program manager for the \$6.2 billion Canadian Patrol Frigate Project.

A quality assurance/quality control program is in effect, administered by Atlantic Quality and Technical Services (AQTS), an affiliate of Irving Shipbuilding Inc. that is registered to ISO 9001 standards by KPMG Quality Registrar. Saint John Shipbuilding is registered to ISO 9001:1994. Other current certifications are ASME Section VIII Division 1, CSA B51, ASME B31.1 and B31.3.

Recent offshore projects completed at Saint John Shipbuilding include:

- major components for *Marine 700* rig for Marine Drilling Companies Inc.; and
- drilling modules for the Hibernia platform.

4.2 Facilities Description

Saint John Shipbuilding occupies 28 ha on the shores of the harbour of Saint John in New Brunswick. The deep water, ice-free approaches of the Bay of Fundy provide year-round access. The average work force at the yard has typically been approximately 1,900 people, including management and administrative staff. The peak labour force at the yard is approximately 3,500. The current work force is 295 persons, owing to the completion of a contract to Container Ships with delivery scheduled for May 2000. As a result, the workforce is depleted. This rundown coincides with a very large refinery upgrade for Irving Oil that has seen the transference of much of the yard's workforce to this project, along with skilled labour from much of eastern Canada.

Ample fabrication shops and layout areas support the modular construction approach employed at the shipyard. Steel is progressively worked and assembled through the steel and outfitting shops, with erection of very large modules being completed either in the Panamax size graving dock or large

laydown areas. At present, modules up to 1,100 t can be transported and erected using Scheurle Transporters in tandem (two at 180 t and two at 350 t) and heavy lift Manitowic Ringer cranes (two at 580 t with 21-m radius). The yard has ample berthage for the offloading and loading of barges or for final outfitting of modules afloat.

There is a total of 41,000 m² of indoor fabrication area. The fabrication capacity is up to 850 t of steel per week.

The fabrication and assembly shop measures 287 m x 63 m and varies in height from 11 m to 26 m. It is divided into four main areas, including panel line, curved assembly, sub-assembly and main assembly. Ahead of the panel line are two CNC burning machines, each with dual plasma underwater cutting heads, one bevelling, capable of cutting 16 m x 3.6 m plates. The panel line is capable of producing flat panels up to 16 m wide x 18 m long. The panel line consists of one-sided welding machines, panel flame planers, automatic stiffener positioners, web fitting gantries, web welding gantries, workstations with ultra heavy lift systems, and a 280-t loadout station. The curved assembly area incorporates mobile pin jigs serviced with stiffener and welding gantries.

The sub-assembly area consists of a semi-automatic line served by two semi-portal 10-t cranes and a 20 t overhead hook crane. The main assembly area, where the smaller sub-assemblies are joined to form shaped units, is served by two 75-t cranes and one 10-t crane. The fabrication and assembly shop also features 1,500-t hydraulic rolls, a 500-t hydraulic press and guillotine shears.

The module hall is 110 m long x 43 m wide x 33 m in height, and is where modules of up to 1,000 t are fabricated under cover, in fully controlled conditions. A 2,013 m² steel shop produces a variety of small steel fabrications such as ladders and gratings, independent tanks, equipment foundations and ventilation trunks, etc. The 1,674 m² machine shop can be employed for large or small machining using a range of lathes, saws, planers and boring mills. The 3,080 m² pipe shop features a KASTO-CNC band saw and sorting machine that handle pipe from 25 to 250 mm in diameter. Two CNC bending machines process pipe up to 150 mm in diameter. A T-drill is capable of extruding tees on pipe up to 250 mm in diameter.

The yard also features an electrical/electronic workshop for the repair, calibration and testing of electrical equipment and for the fabrication of cable and connections.

The main graving dock is 455 m long (gate removed), 38.1 m wide, with a draft over sill of 12.8 m. This is a combination of inner, middle and outer docks with lengths of 146, 133, and 136 m respectively. There is also a tidal graving dock 134 m long, 18.3 m wide with a draft over sill height of 6.7 m.

There are two piers and a Burma wharf at Saint John Shipbuilding. Pier 19 is 100 m x 7.3 m, with a water depth of 7.32 m. Piers 18 and 19 are continuous, and feature a total length of 222 m. The water

depth is 6.09 m. The Burma wharf is 176 x 8.2 m, with a water depth of 8.23 m at LLT and an extension length of 65 m.

5.0 HALIFAX SHIPYARD

5.1 Company Description

Halifax Shipyard is also a division of Irving Shipbuilding Inc. (ISI), a member of the privately owned Irving group of companies. As indicated previously, ISI owns and operates six fabrication and shipbuilding facilities ranging from small to very large, including Saint John Shipbuilding described previously in Section 4.

A quality assurance/quality control program is in effect, administered by Atlantic Quality and Technical Services (AQTS). Halifax Shipyard is registered to ISO 9002:1994.

Recent offshore projects completed at Halifax Shipyard include:

- caissons for drill rig contract through Marine Drilling Companies Inc.; and
- two AHTS vessels through offshore contract for Atlantic Towing.

5.2 Facilities Description

Halifax Shipyard occupies 18.2 ha of land on the south side of Halifax Harbour in Nova Scotia. There is an outdoor assembly area of 10,200 m², and additional storage and miscellaneous/laydown of 28,000 m². The yard underwent modernization in the early 1990s, which included a substantial extension to the assembly hall to support joining and erection of major pre-outfitted sub-assemblies. The yard's fabrication capacity is up to 250 t of steel per week.

The average work force at the yard has typically been approximately 380 people, including management and administrative staff. The labour force at the yard has peaked in previous years at 1,125.

The sub-assembly/module shop at the shipyard is 162 m x 30 m in plan, and is 22 m in height. It is fully equipped to support shielded metal arc, flux cored arc and submerged arc welding on steel and welding of aluminium, along with cutting, burning, bending, grinding, shaping and pressure welding. The shop adjoins a lifting and turning pad and slipway with a 3,500-t capacity. The entire unit and ship transfer system allows for fabrication of modules of up to 90 m in length in a controlled environment. The module shop features 50 and 44-t gantry crane with 4.8 and 13.4 m under the hook, respectively. There are also two overhead cranes, each with 10-t capacity and one 5-t overhead crane. All feature 6 m under the hook.

There is a 183 m x 23 m x 12 m plate shop with a fully automated panel line system. A burning shop at the rear of the module, and plate shops, is equipped with an N/C underwater plasma burning machine and an N/C optical oxyfuel burning machine. The yard also features project management offices, a central administration building with an attached electrical and maintenance shops, a sheet metal and paint shop, a 1,530 m² machine shop, a 690 m² pipe shop, and a 400 m² joiner shop.

The yard has two floating docks: a 257 m x 38 m Panamax floating drydock (with 9 m draft over keel blocks), capable of lifting up to 36,000 t displacement, and a 183 m x 30.5 m dock with 8 m draft over keel blocks. The Panamax drydock has a gate width of 38 m. Both docks feature 15-t wing wall cranes at either side, combining for a 30-t capacity at the centre.

The yard's graving dock has a 173 m length and a 23.5 m width. There is a 8 m clearance over the sill, and the dock can accommodate vessels up to 25,000 t. The graving dock gate width is 24 m.

There are two fully services piers with a combined length of 388 m and a quayside depth of 7.6 m LLT. In addition, there are 100 m of wharf frontage adjacent to the machine shop, with a 7.6 m depth.

6.0 MM INDUSTRA

6.1 Company Description

MM Industria Ltd. is a Nova Scotia company, wholly owned by American Eco Corporation, a public company traded on both the NASDAQ and Toronto Stock Exchanges, and having its main offices in Houston, Texas and Toronto, Ontario.

Between 350 and 470 persons are employed at MM Industria, with a peak labour force of 650. The company's quality assurance/quality control program is certified ISO 9002. Other current certifications include ASME U, U2, S and H stamps, and CWB 47.1 Div 1 and 2, plus W59.

Recent offshore projects completed at MM Industria include:

- two drilling jackets, 1,500 t, for Sable Offshore Energy Project;
- *North Triumph Platform*, 1,099 t, for Sable Offshore Energy Project;
- production separators for Sable Offshore Energy Project; and
- nine utility shaft module decks for Hibernia.

MM Industria also fabricated two production platforms for Panuke and Cohasset, Canada's first offshore development (1980s).

6.2 Facilities Description

MM Industria is located in Dartmouth on Halifax Harbour. Its facilities consist of a number of fabrication buildings associated, with both its main plant and an offshore assembly plant. The latter plant features a main assembly hall 90.7 m long and 29.9 m wide, with a split ceiling height of 23.8 m and 12.2 m. Fabricating equipment includes press brake, plate rolls, shears, and a CNC plasma burning table. There is a 35 m x 27.4 m marshalling area, blast and paint shops measuring 46.1 m x 18.5 m and various stores. The yard's fabrication capacity is up to 400 t of steel per week.

Craneage consists of two 36.3-t units with 9.8 m under the hook, and five 0.9-t jib cranes, all located in the main assembly shop.

Office facilities occupy approximately 750 m², and there are approximately 4 ha of open laydown and storage area. A common user dock approximately 230 m long and fronting 1.2 ha adjacent to the plant is used for marine loadout. Water depth at quayside is 12 m at LLT.

7.0 E.S. FOX LIMITED

7.1 Company Description

E.S. Fox Limited, established in 1934, is a privately owned all-Canadian multi-trade company. They are a pressure vessel and custom plate manufacturer, modular constructor, and pipe spool manufacturer, with main fabrication plants at Niagara Falls and Port Robinson, Ontario. The company has experience in working with a wide variety of materials, including copper, aluminium, stainless steel, carbon steel, nickel, chrome-moly steel and exotic alloys such as titanium, inconel and hastelloy, as well as fiberglass pipe and vessels, and lined pipe vessels.

E.S. Fox has developed a computer-based (D.E.C. VAX 3600) project management system that plans, schedules and monitors projects from inception to completion, reporting on schedule, manpower requirements, manpower efficiency analysis, manpower forecast, percentage completion and material costs.

A quality assurance/quality control program is in effect based on Canadian Standards Association Z299.2, 3 and 4 and ISO 9001:1994. Other current certifications include:

- ASME Section I and VIII, U, S and R stamps;
- ASME B31.1 and B31.3; and
- CWB W47.1 and W47.2.

Recent offshore projects completed at E.S. Fox include:

- fabrication/supply of water flood injection system for Chevron's *Cabina* platform off the Coast of Angola, including deaerator module (280-t), chemical injection skid, and water filtration skid; and
- twelve deluge skids for the fire protection system at Hibernia.

The company can also claim considerable relevant experience in providing services and modules to petro-chemical and energy industries, including a pre-packaged chemical plant for Puerto Esperanza Argentina, South America. Marine construction projects include construction of two 125-t marine shunters for the St. Lawrence Seaway Authority, conversion of a 143-m double-hull, tanker barge/tug combination to a cement powder/clinker self unloader for St. Mary's Cement, and fabrication of two tubular, ship unloading booms (43-t) for Kleaven Mek Verkstad A/S, Norway.

7.2 Facilities Description

The E.S. Fox module and pipe fabrication plant is located adjacent to the Welland Canal on a 70 ha industrial business park, and has in excess of 3,700 m² of fabrication floor space. This facility is serviced by rail and highway, and has direct water access to the Welland Canal, allowing movement of loads via barge or ship through the Great Lakes and the St. Lawrence Seaway. E.S. Fox has used its loadout facility at Port Robinson to transport vessels up to 7.6 m in diameter x 25.4 m in length. A heavy barge loading dock extends into the canal turning basin providing 3-m draught and 400-t capacity. There is also a heavy lift RO/RO dock of 800-t capacity, with 145 m of dock face and 7.6 m draught. The dock can accommodate maximum Seaway length vessels.

The fabrication shop is divided into a south bay 106.7 m x 22.8 m in plan and a north bay 64.0 m x 22.8 m. Each bay features a clear inside height of 15.2 m. The average manpower load is 60 persons, but the shop can accommodate a peak labour load of 120. Five 25-t cranes with 5-t auxiliaries are employed, with 20-m spans and 9.7 m under the hook. Equipment includes a high speed cut-off saw with automatic feed, a pipe-cutting/burning table for cutting and bevelling, two wall mounted 1-t jib cranes with 5.4-m span, and 25 welding machines, including a programmable TIG orbital welder.

A 40 m x 9 m storage building is also available on the site, as well as office premises.

The sheet metal and plate fabrication shop located on an 8 ha site in Niagara Falls offers 11,150 m² of indoor fabrication with a predominant height of over 9 m. A grit blasting and paint shop is included in a separate climate-controlled, 930 m² building serviced by bridge cranes. Docking facilities for barge and ocean going vessels are located 5 km from this plant, which is also serviced by road and rail.

8.0 VERRAULT NAVIGATION INC.

8.1 Company Description

Located near the mouth of the St. Lawrence River in Les Méchins, Quebec, Verrault Navigation Inc. is a wholly-owned subsidiary of Groupe Maritime Verreault. The focus of business activities for this division is ship repair and vessel conversion. The total workforce at Les Méchins currently stands at 166 persons, but the facilities have accommodated a peak workforce of 438. The company employs MS-Project and Excel for project management, and maintains a quality assurance/quality control system based on ISO 9002 standards. The company has a valid thickness measurements certificate from Lloyd's Register and two accredited inspectors for CWB 47.1 and 47.2 welding as part of the permanent work crew.

The company has not been involved with oil and gas projects but its recent (since 1997) marine works history includes:

- conversion of a stripped out Russian ship (*Burin Sea*) into a supply vessel;
- conversion of six ISO 6-m containers into scientific labs for the Canadian Coast Guard;
- conversion of the *Len Speer* submarine maintenance ship into an optic fibre laying ship for C.S. Agile;
- conversion of 32 ISO containers into offices, workshops, lodging, school, kitchen, freezer, generators, electric distribution, sanitariums, etc. for Cirque de Soleil; and
- conversion of the ferry *John Hamilton Gray* into a luxury casino cruise ship for Contessa.

8.2 Facilities Description

Verrault Navigation maintain 1,486 m² of fabrication shop area recently equipped (1999) with a 500-t Pacific press brake, a 50 mm x 19 mm Cincinnati shear, and an eight point flame cutting machine with 3 m x 6 m capacity. There are four overhead cranes, two with 25-t capacity and two with 10-t capacity. The site also has a 32 m x 24 m paint shop with 12 m height, and a 37 m x 15 m mechanical and machine shop with 7.5 m height, completely outfitted for a full range of shipbuilding operations. A new 410 m² office building is also located on the site.

The total yard area is 12,567 m², with a drydock measuring 252 m x 27.4 m and a draught of 6.7 m. The gate width is 27.4 m. A semi-submersible drydock is also available that is 36.6 m x 12.8 m, with a lifting capacity of 500 t. The yard is serviced by a 50-t Whirley crane on rails and a mobile PH crane with 90-t capacity. Total berthage at quayside is 335 m, with a water depth of 6.7 m LLT.

9.0 ATLANTIC SEABOARD INDUSTRIES LIMITED

Atlantic Seaboard Industries Limited (ASIL) is a subsidiary of Engineering Power Systems Limited in Toronto. Engineering Power Systems did not respond to the Fabrication Capability and Capacity Survey that formed the basis for this assessment. It was subsequently learned that the ASIL fabrication facilities at Port aux Basques, Newfoundland have been shut down, with all employees laid off, and all equipment either sold or removed by other EPS subsidiaries. The property is not strictly up for sale, but the understanding is that EPS would entertain offers to that affect.

10.0 MIL DAVIE INC.

MIL Davie Inc. is located in Levis, Quebec, but closed its gates late in 1998. At that time, it was a subsidiary of Dominion Bridge. Dominion Bridge filed for bankruptcy in October of 1998. As recently as September of 1999, Syntek Technologies and Transnational Capital Ventures were in a due diligence period to purchase Davie Industries. This company is out of Arlington Texas and claim to be vigorously pursuing new work for the yard. The Syntek buyout was completed based on an improved proposal to Davie creditors. Groupe Ocean of Quebec City were a minor partner in this deal.

11.0 PORT WELLER DRYDOCKS

This facility, located in St. Catherine's, Ontario, is a division of Canadian Shipbuilding and Engineering Limited. The following is an excerpt from their website (www.pwdd.com) regarding their facilities:

"Our extensive machine shop is equipped with modern CNC controlled machinery, including a CNC vertical machining centre, CNC lathe, and a variety of conventional machine shop equipment including lathes to 84" diameter by 40 ft. between centres, milling machines to 75" by 16" table. 175,000 sq.ft. of undercover fabrication and manufacturing facilities.

- *Large material handling complex, 3 storage yards with truck and water loading/unloading capabilities.*
- *Automated shot blasting and prime painting building.*
- *Large assembly halls for construction of modules.*
- *1,200 ft. long shipping wharf with one 120 ton and one 55 ton travelling jib crane at a maximum outreach of 150 ft.*
- *Assorted mobile cranes of up to 200 tons.*

Our steel stock yard, mechanical blasting/priming equipment, NC plasma and oxy-propane plate cutting machines, plate forming equipment, welding and assembly shops are fully integrated and capable of producing 400 tons of custom steel fabrication weekly. Our large cranaage capacity and strategic location on the Welland Canal section of the St. Lawrence Seaway provides easy access for the shipment of construction modules too large for land transportation.”

However, Port Weller Drydocks declined to respond to the Fabrication Capability and Capacity Survey that formed the basis for this assessment.