STREETCAR PROTOTYPE

RFP NO. 105620
Addendums 1 - 4
Bid Date: October 12, 2006 by 4:00 pm

TECHNICAL PROPOSAL TO:

City of Portland
Bureau of Purchases
1120 SW 5th Avenue, #750
Portland OR 97204

By:
Oregon Iron Works, Inc.
9700 S.E. Lawnfield Road - Clackamas, Oregon 97015
(503) 653-6300 Phone – (503) 653-5870 Fax
www.oregoniron.com

TABLE OF CONTENTS

ATTACHMENTS

Sub - Part A

1.0 BUSINESS AND OWNERSHIP

Oregon Iron Works, Inc. (OIW) is an S Corporation organized under the laws of the State of Oregon. Private stockholders of the Company, as of the date of the proposal are as follows:

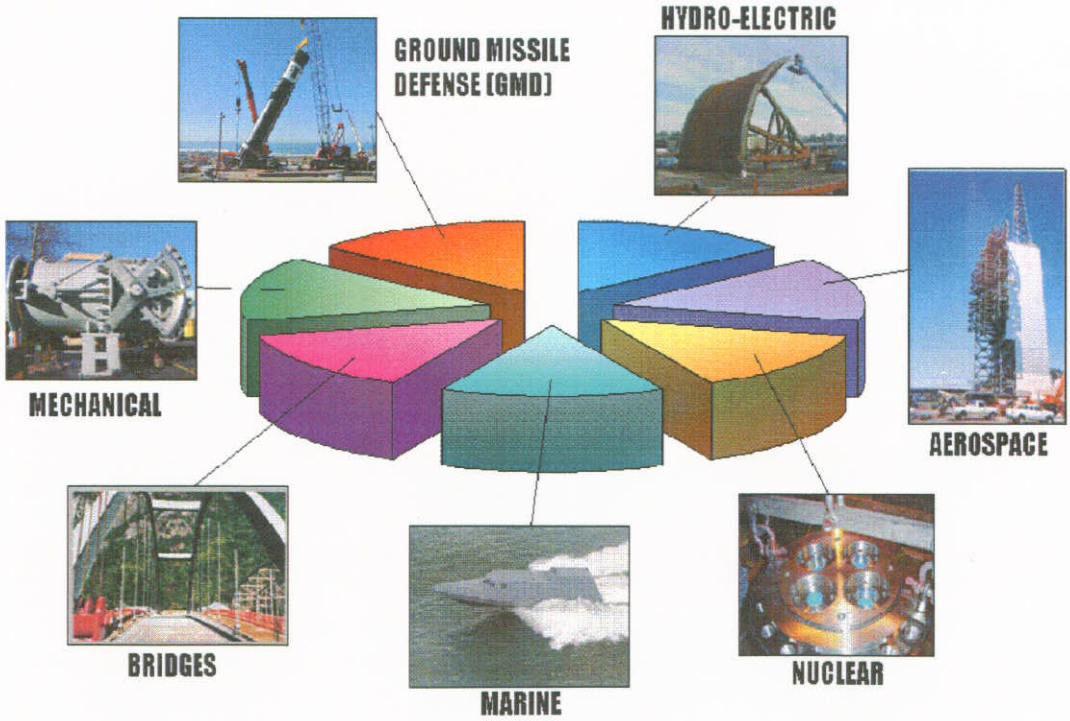
1). Terrance Aarnio
2). Robert Beal
3). Scott Crawford
4). Calvin Craig

All stockholders are U.S. Citizens.

2.0 MANUFACTURING HISTORY AND CAPABILITY

Oregon Iron Works, Inc. is an Oregon, privately held small business founded in 1944 with annual sales in excess of $75 million dollars. The current OIW leadership has resulted in 30 plus years of continuous operations.

OIW's diversity of capabilities and industries provides a source of innovative solutions and producability with direct application to manufacturing Streetcars. A highly skilled workforce numbering in excess of 400 people provides innovative production processes and planning resulting in extraordinary quality and savings as demonstrated over the last 30 years. OIW has had no facility shutdowns or closures in the last 30 years.



2.1 FACILITIES

OIW has state of the art manufacturing and machining facilities with direct water, highway and rail access located in Clackamas, Oregon and Vancouver, Washington.

Clackamas, OR Facility

Vancouver, WA Facility

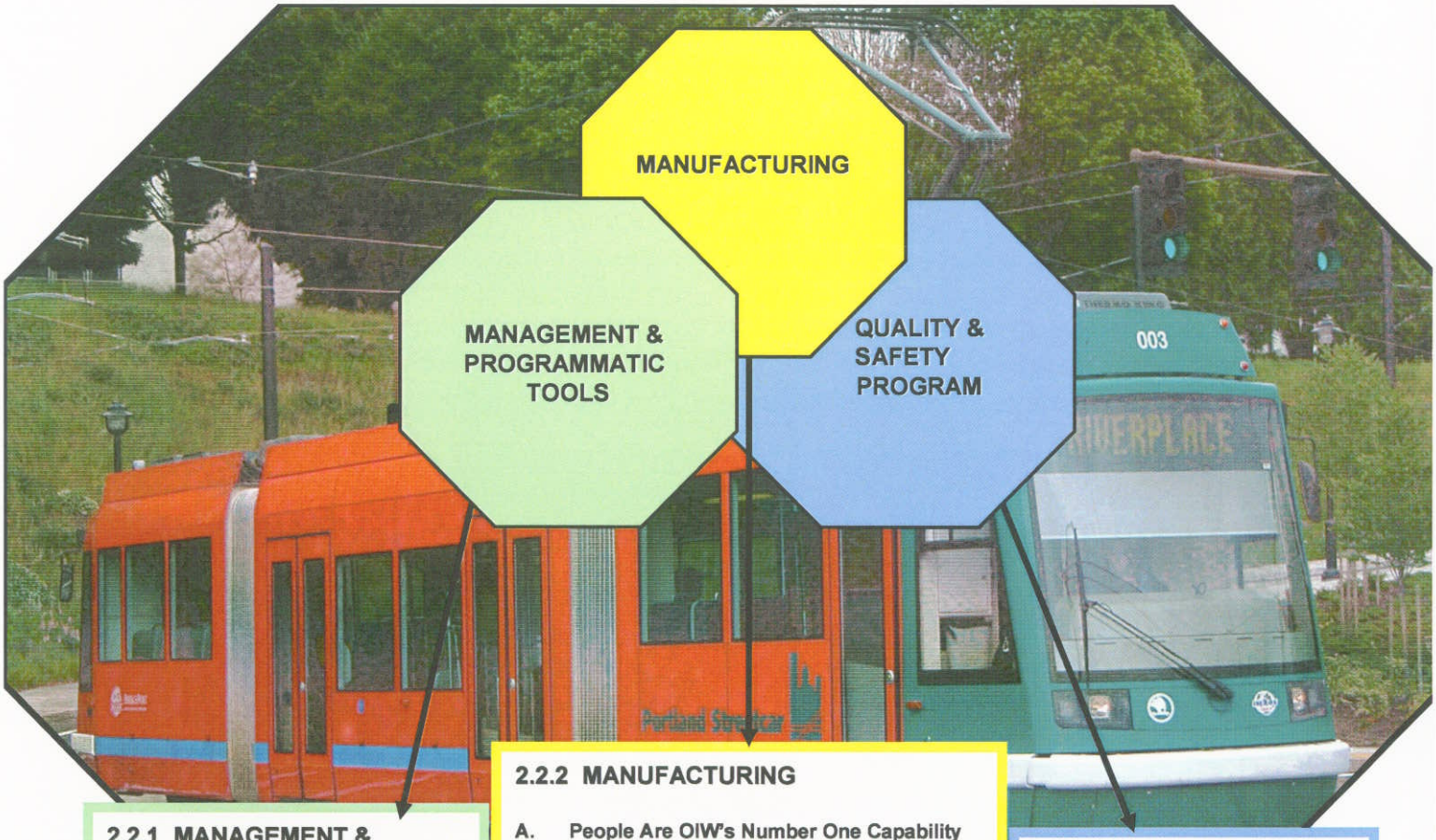
OIW's manufacturing facilities exceed 305,000 square feet under roof on 38 acres with an additional 31,000 square feet of modern offices.

Inside View of Clackamas, OR Shop

2.2 CAPABILITIES DIRECTLY RELATED TO THE SUCCESSFUL PRODUCTION OF STREETCARS

The Buy America compliant Streetcar does not exist today and will require some degree of development. The long-term success of a development project relies on a broad and diverse range of capabilities. These capabilities go beyond the obvious manufacturing skills of welding and mechanical assembly and look to a complete project. The Buy America streetcar project requires the integration of management, quality, and manufacturing capabilities with a focus on long-term reliability and safety.

Our goal is to build the best quality, most reliable streetcar possible using innovative and cost effective manufacturing with an eye towards the future of Streetcars in America. The prototype car must transition into affordable and reliable production cars for the U.S. Market.



2.2.1 MANAGEMENT & PROGRAMMATIC TOOLS

A. Capability / Experience With A Foreign Partner, License Agreement & Technology Transfer
B. CPM Scheduling
C. Contract Status Report
D. Work & Test Procedures

2.2.2 MANUFACTURING

A. People Are OIW's Number One Capability
B. 3D Modeling & CNC Programming
C. Burning, Forming & Cutting Raw Materials
D. Fitting & Welding Steel Components
E. Precision CNC Machining
F. Coatings: Surface Prep And Applications
G. Electrical: Panel And Controls Installation
H. Mechanical Assembly
I. Testing / Trials Of Passenger Vehicles & Equipment

2.2.3 QUALITY & SAFETY PROGRAM

A. Program
B. Quality Metrics
C. Paint Inspection
D. Weld Inspection
E. Precision Measuring
F. Testing Capabilities

2.2.1 MANAGEMENT & PROGRAMMATIC TOOLS

Management and Programmatic capabilities include tools that are critical to the success of a Streetcar project. Management tools guide day-to-day decisions balancing Quality, Schedule and Cost. OIW's continued success relies on these management tools.

a. Capability / Experience with a Foreign Partner, License Agreement & Technology Transfer:

The successful transfer of foreign technology for a Buy America Streetcar is not as simple as paying a fee and proceeding with business as usual. The working relationship with a foreign partner has pitfalls for the unaware participant. Some of these pitfalls include differences in language, culture, software, work standards and customs. Some of the less obvious pitfalls include establishing trust, managing Intellectual Property issues, and developing a working relationship with all parties motivated for the same successful outcome.

OIW has close to fifteen years of successful experience with a foreign partner, the transfer of foreign technology and U.S. manufacturing of a complex marine passenger vessel. The relationship started with the transfer of a basic design and concept and evolved into a joint development and marketing partnership between OIW and the foreign entity. The administrative and legal hurdles that surround Intellectual Property Rights, Patents, Proprietary information and how to move forward with marketing and future business were all addressed and overcome. The Streetcar project will benefit from the many valuable lessons learned from this successful OIW experience.

The OIW / Skoda (Czech Republic) Streetcar partnership is approaching one (1) year. During this time we have negotiated an exclusive manufacturing and licensing agreement for Streetcars within the United States and transferred and translated several thousand drawings and specifications. Most important is the joint understanding and vision of mutual success. The OIW / Skoda relationship is maturing and is on track for a successful Prototype Streetcar Project.

Foreign Craft

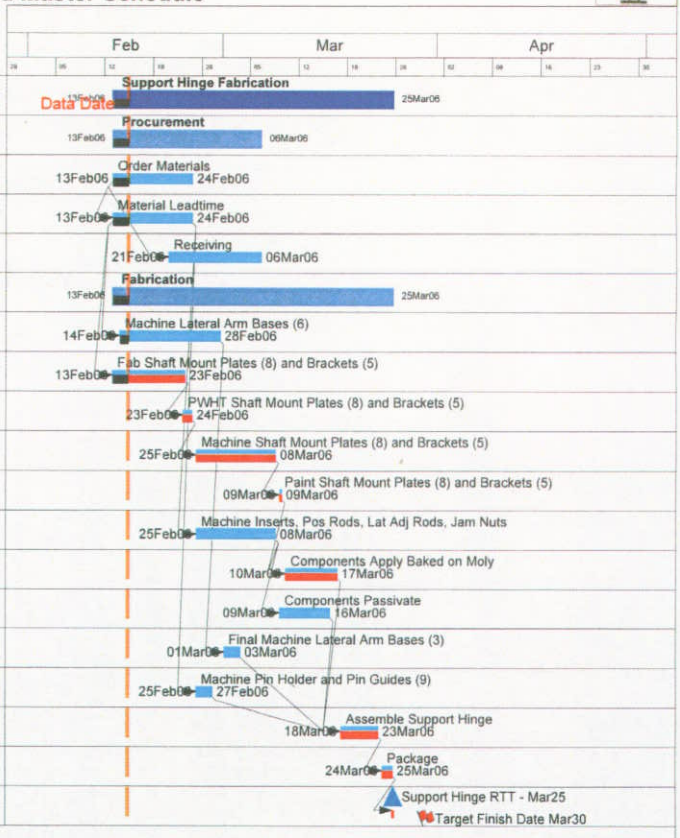
b. Critical Path Method (CPM) Scheduling

Maintaining and meeting a project schedule is the key to a successful project. OIW is proficient in the use of CPM scheduling as a management capability. The CPM schedule provides a view into the future of the project, prioritizing activities and resources for management attention.

Project: Sample 1
Printed: 10.11.2006, 11:11AM
Page: 1 of 1

Oregon Iron Works
Integrated Master Schedule (IMS)
Project Manager: John Doe
Client: ABC Company
Sample Integrated Master Schedule

Activity ID	Activity Desc.	Orig Dur WD	Rem Dur WD	Current Dates	TF
1	Support Hinge Fabrication	35d	33d	13Feb06A 25Mar06	0
1.A	Procurement	18d	16d	13Feb06A 06Mar06	1d
1.A.02	Order Materials	10d	8d	13Feb06A 24Feb06	3d
1.A.04	Material Leadtime	10d	8d	13Feb06A 24Feb06	1d
1.A.06	Receiving	10d	10d	21Feb06 06Mar06	14d
1.B	Fabrication	35d	33d	13Feb06A 25Mar06	0
1.B.02	Machine Lateral Arm Bases (6)	9d	11d	14Feb06A 28Feb06	12d
1.B.04	Fab Shaft Mount Plates (8) and Brackets (5)	9d	7d	13Feb06A 23Feb06	0
1.B.06	PWHT Shaft Mount Plates (8) and Brackets (5)	2d	2d	23Feb06 24Feb06	0
1.B.08	Machine Shaft Mount Plates (8) and Brackets (5)	10d	10d	25Feb06 08Mar06	0
1.B.10	Paint Shaft Mount Plates (8) and Brackets (5)	1d	1d	09Mar06 09Mar06	0
1.B.12	Machine Inserts, Pos Rods, Lat Adj Rods, Jam Nuts	10d	10d	25Feb06 08Mar06	1d
1.B.14	Components Apply Baked on Moly	7d	7d	10Mar06 17Mar06	0
1.B.16	Components Passivate	7d	7d	09Mar06 16Mar06	1d
1.B.18	Final Machine Lateral Arm Bases (3)	3d	3d	01Mar06 03Mar06	12d
1.B.20	Machine Pin Holder and Pin Guides (9)	2d	2d	25Feb06 27Feb06	16d
1.B.22	Assemble Support Hinge	5d	5d	18Mar06 23Mar06	0
1.B.24	Package	2d	2d	24Mar06 25Mar06	0
1.B.26	Support Hinge RTT	0	0	25Mar06 25Mar06	0

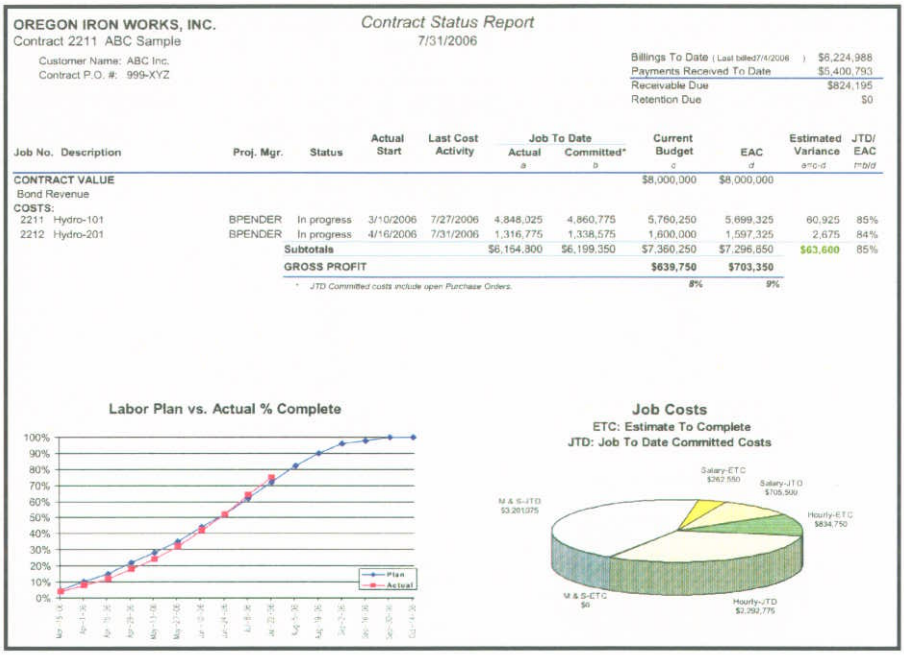


OREGON IRON WORKS, INC.
10.11.2006 Robert Beal

Sample of a CPM Schedule Report

c. Contract Status Report

The Contract Status Report provides specific insight into the three major cost elements of a project; Materials and Services, Hourly Labor and Salary Labor. Each cost element is compared to a baseline budget and is further broken down by the lowest individual cost elements (detailed sheets not shown).



OREGON IRON WORKS, INC.
Contract 2211 ABC Sample
Customer Name: ABC Inc.
Contract P.O. #: 999-XYZ

Contract Status Report
7/31/2006

Billings To Date (Last billed7/4/2006)	$6,224,988
Payments Received To Date	$5,400,793
Receivable Due	$824,195
Retention Due	$0

Job No.	Description	Proj. Mgr.	Status	Actual Start	Last Cost Activity	Job To Date Actual a	Job To Date Committed* b	Current Budget c	EAC d	Estimated Variance e=c-d	JTD/ EAC f=b/d
CONTRACT VALUE								$8,000,000	$8,000,000		
Bond Revenue											
COSTS:											
2211	Hydro-101	BPENDER	In progress	3/10/2006	7/27/2006	4,848,025	4,860,775	5,760,250	5,699,325	60,925	85%
2212	Hydro-201	BPENDER	In progress	4/16/2006	7/31/2006	1,316,775	1,338,575	1,600,000	1,597,325	2,675	84%
		Subtotals				$6,164,800	$6,199,350	$7,360,250	$7,296,650	$63,600	85%
		GROSS PROFIT						$639,750	$703,350		
								8%	9%		

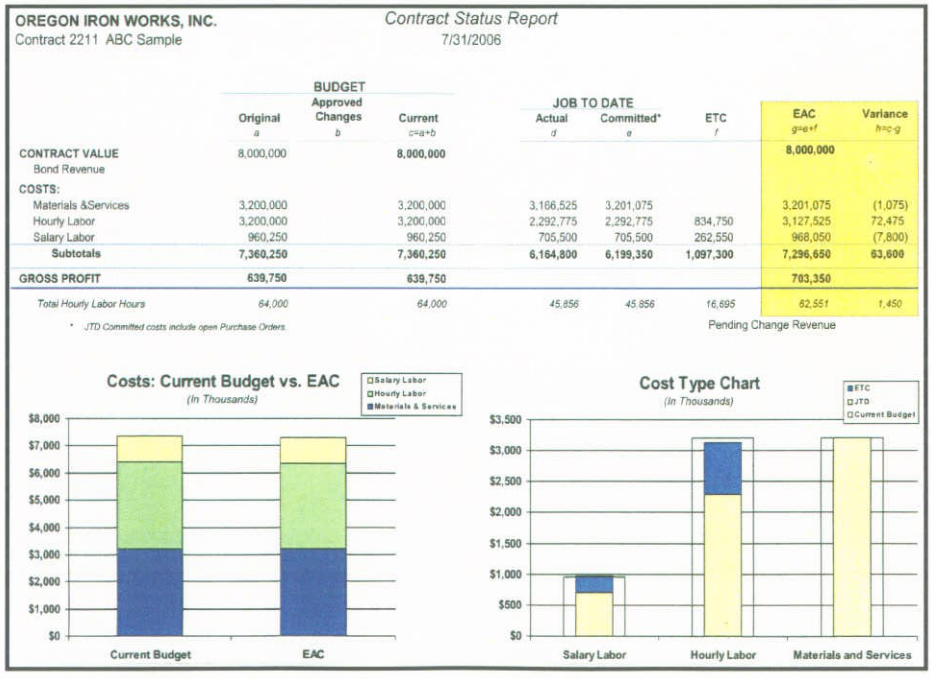
* JTD Committed costs include open Purchase Orders.

Labor Plan vs. Actual % Complete

Job Costs
ETC: Estimate To Complete
JTD: Job To Date Committed Costs

Example of a Contract Status Report – Page 1

Example of a Contract Status Report – Page 2



OREGON IRON WORKS, INC.
Contract 2211 ABC Sample

Contract Status Report
7/31/2006

	BUDGET Original a	Approved Changes b	Current c=a+b	JOB TO DATE Actual d	Committed* e	ETC f	EAC g=e+f	Variance h=c-g
CONTRACT VALUE	8,000,000		8,000,000				8,000,000	
Bond Revenue								
COSTS:								
Materials &Services	3,200,000		3,200,000	3,166,525	3,201,075		3,201,075	(1,075)
Hourly Labor	3,200,000		3,200,000	2,292,775	2,292,775	834,750	3,127,525	72,475
Salary Labor	960,250		960,250	705,500	705,500	262,550	968,050	(7,800)
Subtotals	7,360,250		7,360,250	6,164,800	6,199,350	1,097,300	7,296,650	63,600
GROSS PROFIT	639,750		639,750				703,350	
Total Hourly Labor Hours	*64,000*		*64,000*	*45,856*	*45,856*	*16,695*	*62,551*	*1,450*

* JTD Committed costs include open Purchase Orders.

Pending Change Revenue

Costs: Current Budget vs. EAC
(In Thousands)

Cost Type Chart
(In Thousands)

d. Work and Test Procedures

Detailed work and test procedures provide assurance that manufacturing, quality and management are on the same page of a well thought out comprehensive plan. The procedures allow the early interaction of technical disciplines and customer support.

	Init.	Date
Originator	DG	12/4/2003
Checked	VA	12/4/2003
Job # 7101		

OREGON IRON WORKS
Ground based Midcourse Defense Segment Project
TRAVELER

Work Order	7101-15XX
Traveler No.	71014-TR-01
Page	1 of 1
Revision	0
Weld Data Sheet No.	7101-WD-01

Title: **Fort Greely, CE-2, 2B Top Flange Subassembly**
Unit_____ Approved By_____

Final QA Acceptance _____
Date _____

Operations shown below are not sequential.
Do not pass indicated hold points until accepted by Q.C. / Owner .

Task No.	QC Hold	Owner Hold	Description of Operation	Process Control: Production (Original Initial / Date)	Process Control: QC (Original Initial / Date)	Process Control: Owner (Original Initial / Date)
10			Cut and Prep parts. QC spot check piece dimensions and record any dimensions that exceed plus / minus 1/8".			
20			Transfer HIC# to individual pcs. And record HIC# assigned to each part, initial and date in table below.			
			Fit and weld shell long seam. QC NDE weld and record on Weld Data Sheet.			
30			Layout quarter points on 2P1 mark with low stress stamp. Install spiders top and bottom. QC verify quarter points and NDE of long seam.			
40	X		Fit and weld top flange pcs. 2P2 to make 2C1. **QC perform visual and required NDE before Task 50 fitting is started.**			
50	X		Fit and weld 2C1 to shell. **QC perform visual and required NDE before beginning Task 60.**			
60	X		Fit and weld 2p8 (12 pcs.), 2P21 (2) and 2P22 (2) **QC perform visual and required NDE before beginning Task 70.**			
70	X		Fit and weld 2P23 (8), 2P26 (4) and 2P27 (4). **QC perform visual and required NDE before covering.**			
80			Fit and weld backing bars and covers 2P4, 2P5, 2P6, 2P7, 2P9, 2P11, 2P12, 2P13, 2P15, 2P17, 2P18, 2P19 and 2P20. **Perform welding to minimize distortion.**			
90	X		**QC perform visual and required NDE on welds.**			
100			Fit and weld pcs. 2P30, 2P33, 2P34, 2P35 and 2P36.			
110	X		**QC perform visual and required NDE on all final welds.**			
120			Machine top flange and MSS supports. Document dimensional inspections on Inspection Report Form.			
130			Fit and weld lifting lugs 2P32.			
140			QC perform visual and required NDE on welds.			
150			Load test lifting lugs in accordance with test procedure and instructions.			
160			QC Verify roundness, tolerance +/- 3/8" in Diameter.			
170	X		QC verify all NDE is complete and accepted on traveler. Route completed traveler to QC office.			
180						

COMMENTS: Verify backing strips are made from carbon steel material: QC_____ DATE_____

Example of an OIW Traveler

Work procedures are especially helpful on a development project such as the Buy America Streetcar.

2.2.2 MANUFACTURING

OIW's State of the Art Manufacturing and Machining facilities are supported not only with an extraordinary workforce but also a commitment to cutting edge technologies and continuous improvements.

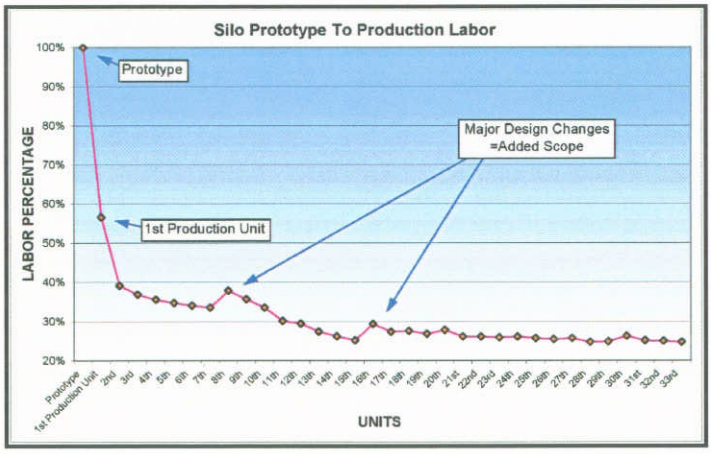
a. People Are OIW's Number One Capability

Streetcar production will require Fitters, Welders, Machinists, Electricians, Painters, Quality Inspectors, Test Engineers and Project Management. The OIW Team includes over 400 personnel with the required skills and capabilities needed for streetcar production.

The diversity, innovation and success of OIW are owed primarily to our number one capability and asset, our people.

The OIW manufacturing approach involves the participation of key representatives from each skill-group focused on success. What is success? Innovative approaches and solutions applied to the project to achieve the best quality, schedule and cost. This sounds simplistic, but it is not. At OIW, for 30 years our success in this area is undeniable.

OIW Project Manager Meeting



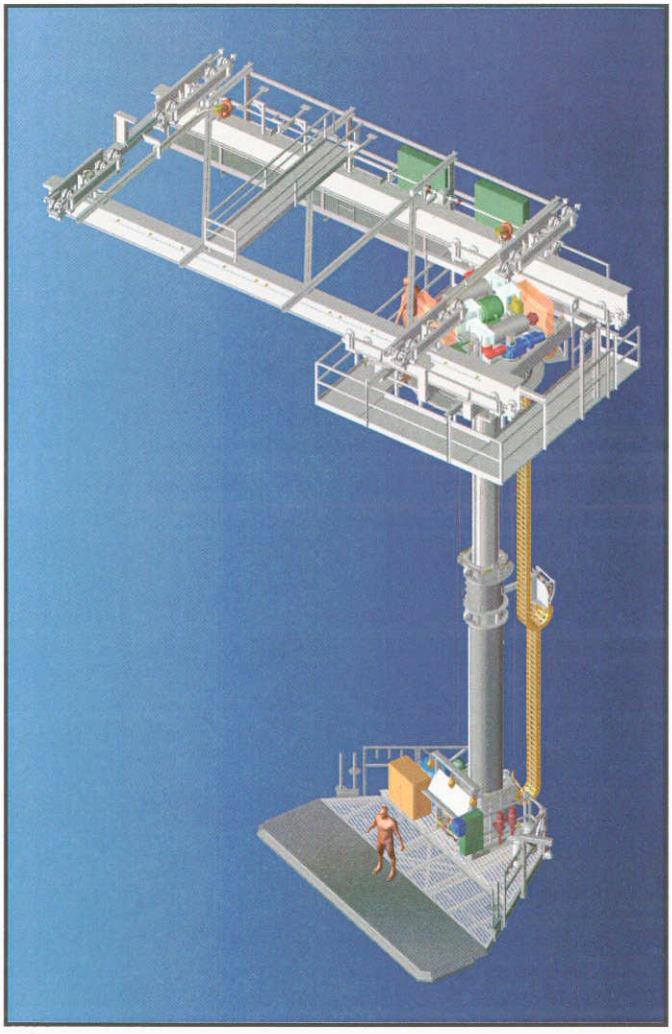
Example of a Labor Performance Chart (Actual Job)
Production Unit = 25% of Prototype

The planned interaction of expert tradesmen such as machinists, welders and electricians with project engineers combines the practical and theoretical with millions of man-hours of diverse experience resulting in extraordinary performance and quality.

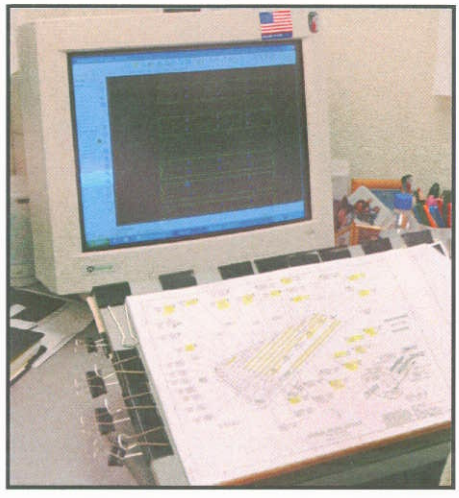
OIW is not limited to solutions or approaches from a single industry such as Streetcars, because we work in the Hydroelectric, Marine, Nuclear, Aerospace and Machinery industries, all of which brings innovation and creativity to a project.

b. 3-D Modeling and CNC Programming

3-D solid modeling and Computer Numeric Control (CNC) programming are at the front end of every OIW Project. The streetcar will live in a virtual digital world of manufacturing prior to the first cutting of steel. The upfront digital effort pays huge dividends in quality and performance of the manufacturing processes.



3D Stacker Crane Model



CNC Programming

Streetcar configuration management technical support, spare parts, and maintenance will benefit from the digital effort with increased quality.

c. Burning, Forming and Cutting Raw Materials

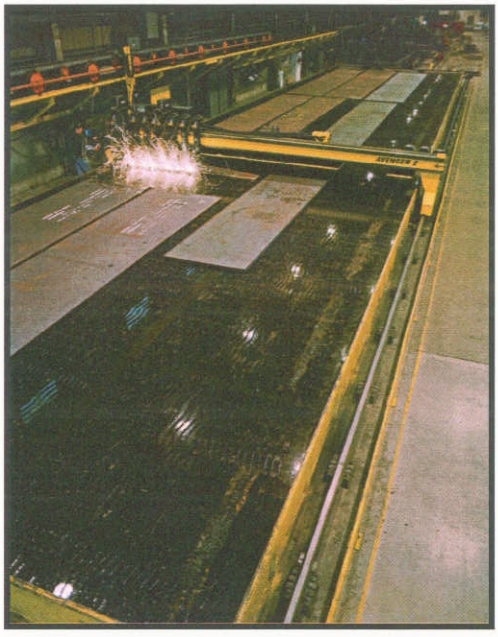
The manufacturing of Streetcars will start with the processing of bulk raw materials. This process is called pre-fabrication.

Bulk raw materials are delivered to OIW and are burned, cut and formed into specific small parts using CNC equipment. Quality and cost competitive manufacturing relies on precision parts.

The Burn Table is 120ft x 20ft and can cut steel plate up to 12 inches thick. Streetcar parts will be processed using high-definition plasma at speeds approaching 100 inches per minute.

OIW Employee working on the Press Brake

The 500-ton Press Brake bends and forms metal with computer accuracies.



Vertical Burn Table Cutting Plate

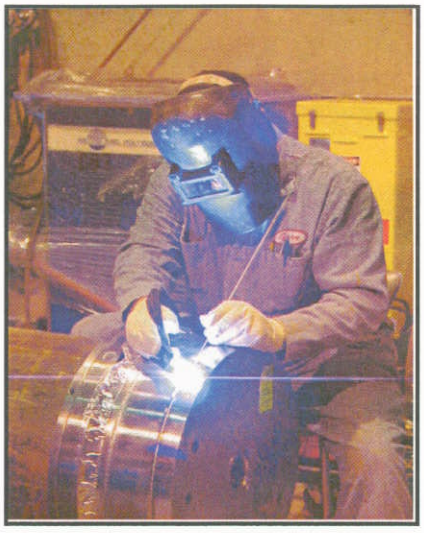
The CNC Beam-Line saws, punches holes, and burns steel shapes. The raw materials will enter the Beam-Line as standard 20ft or 40ft lengths and will come out the other end as precision parts ready for assembly.

CNC Beam Line in Clackamas, OR Shop

d. Fitting & Welding Steel Components

The fitting and welding capabilities of Oregon Iron Works are unique in their depth and diversity.

OIW capabilities include compliance with a variety of industry welding codes spanning nuclear containment, Fracture Critical Bridges, ASME pressure vessels, aerospace, marine and transportation industries. In addition to a diverse industry portfolio, OIW is experienced in numerous types of materials including multiple grades of; carbon steels, stainless steels, aircraft and marine grade aluminum, titanium, nickel aluminum bronzes and many more.



OIW Certified Welder

Welding on Nuclear Part

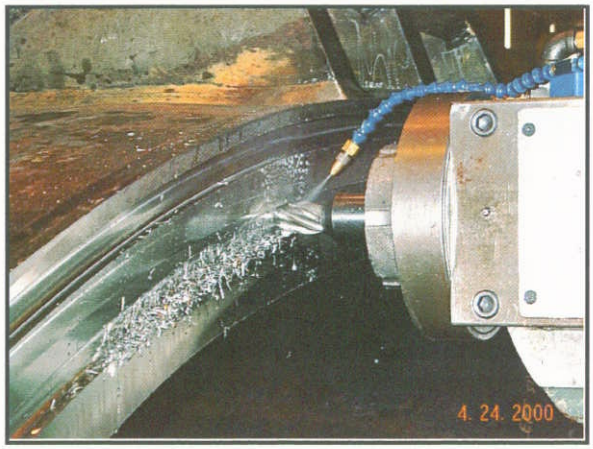
The fabrication, fitting, welding, and inspection of streetcars are well within the current capabilities and experiences of Oregon Iron Works.

OIW Employee Working on a Fixture

OIW Employee Welding Inside Structure

e. Precision CNC Machining

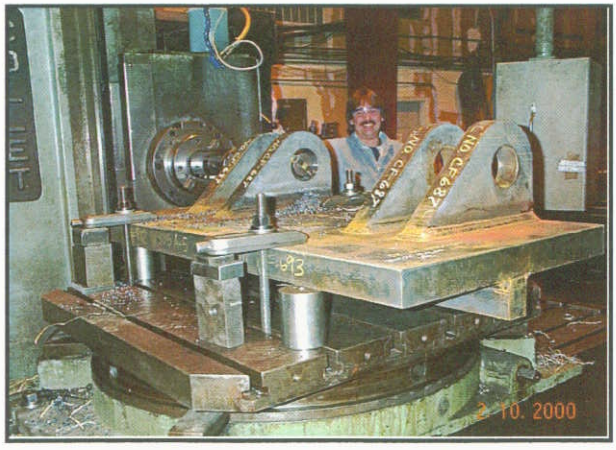
Oregon Iron Works invests heavily in state of the art CNC machinery. The investment in new technology provides a competitive advantage and entry into more sophisticated markets including streetcars. With the advancement of CNC technology, processes that were costly and almost impossible to complete are now routine and affordable.



CNC Machine at Work

Verification of CNC Work

Streetcars require precision machining for wheels, trucks, and car-to-car interfaces. The CNC machining capabilities of OIW far exceed traditional streetcar manufacturing and open the possibility of innovative and cost saving approaches with an increase in the traditional streetcar quality.



OIW Employee Machining Hinges

OIW Employee Completing CNC Inspection

f. Coatings: Surface Prep and Applications

Streetcars are subjected to a harsh environment and corrosion control is vital to the longevity and useful life of a streetcar. Streetcars rely on specialty coatings for protection from harsh weather and the proper application of these coatings is critical to the Streetcar's survival and longevity.

Almost without exception the industries served by OIW, to include Streetcars, require the application of corrosion resistant coatings. Corrosion protection for critical bridges, marine products and aerospace machinery is of special importance to the customer and ultimate end user. In 1987 OIW installed a totally enclosed, environmentally controlled coatings building within the Vancouver shop that includes isolation of sandblasting for surface preparation. Since 1987 this paint facility has undergone multiple upgrades and enhancements.

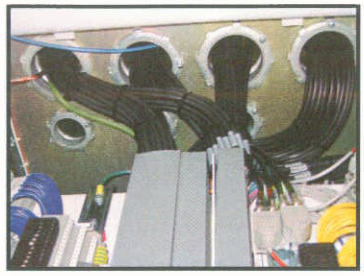
Paint Booth at Vancouver

Inside Look at Paint Booth

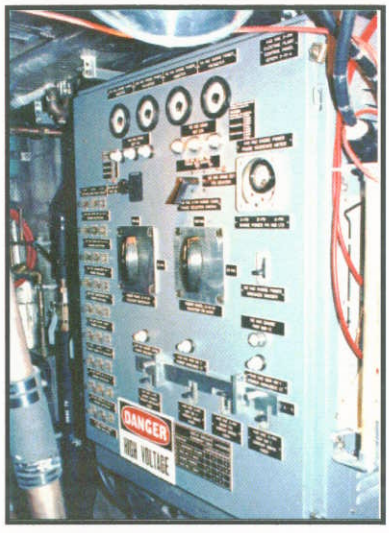
The totally enclosed paint building is 130ft long x 20ft wide x 18ft high with the capability to accurately control temperature, humidity and clean airflow. The application of modern coatings requires strict adherence to surface preparation, temperature and humidity during application and curing. This facility will lend itself well to the application of coatings required for the prototype streetcar and is large enough to support production quantities of streetcars in the future.

g. Electrical: Panel and Controls Installation

The modern streetcar is electrically driven and controlled. The manufacture, assembly and testing of a streetcar requires extensive electrical experience and capabilities. OIW has the electrical and control experience to manufacture and test Streetcars.



Power and Control Wire



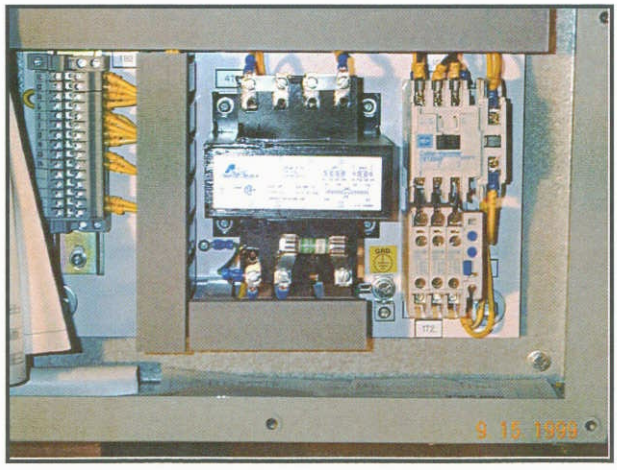
Control Panel

OIW capabilities encompass 30 years of integrating electrical power and controls for the diverse industries OIW serves.

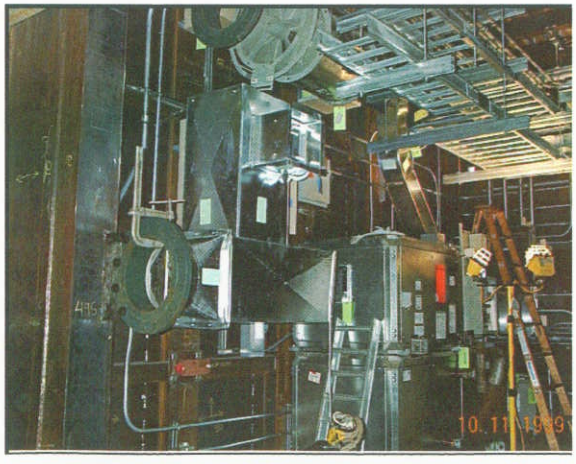
High voltage AC and DC power, solid state motor controls, variable frequency drives, digital controls, fiber-optics, conduits and cabling are a sampling of OIW experience and capabilities.

Current relevant experiences include, power wiring and digital controls for over 30 National Missile Defense interface vaults referred to as a (SIV). The SIV contains multiple high voltage AC power and distribution systems as well as digital drives and controls for environmental and launch functions.

The level of complexity for SIV installation and testing is equal to or exceeds that required for a streetcar. Other relevant experience includes Marine vessels and Space Launch machinery all utilizing digital controls. The electrical group within OIW numbers in excess of 30, all with direct skills applicable to streetcars.



Motor Control Panel



Silo Interface Vault SIV with Electrical Systems

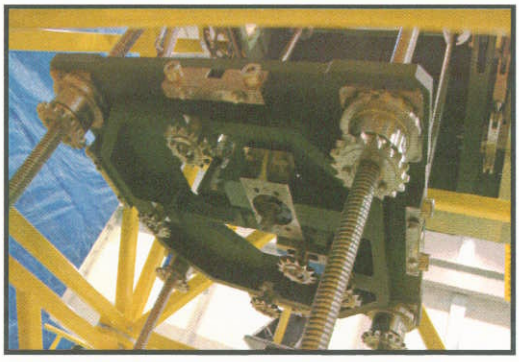
h. Mechanical Assembly

The mechanical assembly of the streetcar requires diverse skills. The electrical, mechanical, propulsion and machinery assembly is common and familiar to OIW. However, the interior finish, seats and joinery are new to OIW.

The interior finish capabilities and skills will be developed under the guidance of Skoda personnel working onsite with OIW personnel.

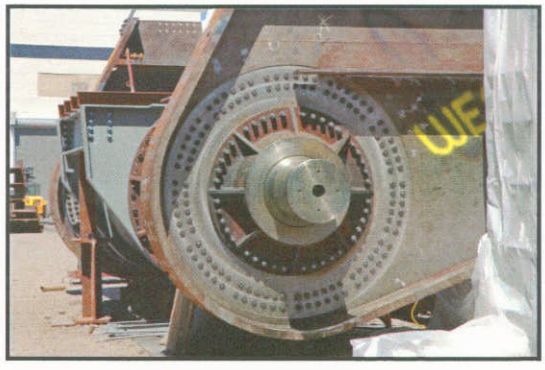
Montgomery Point Lock and Dam

Arrangements with Skoda will bring key engineering and production support to OIW throughout the manufacture, assembly and testing of the prototype car. After the prototype car is complete, these capabilities will be part of OIW's Team Expertise.



Mechanical Assembly

The assembly of the mechanical propulsion system, car body and non-interior finish is consistent with OIW experience and capabilities.



Bascule Bridge

Arrowrock Dam Clamshell Gates

For 30 years OIW has been building and testing machinery requiring precision alignments, shaft and wheel assembly, gearbox and mechanical interfaces and often the projects include electric and hydraulic systems. These skills are inherent within the diversity of industries including hydroelectric machinery, bridge machinery, space launch equipment, and specialty marine craft with diesel engines, complex hydraulic systems and digital electric controls.

The capabilities and experience of the OIW / Skoda team are more than sufficient for the assembly of Streetcars.

i. Testing / Trials of Passenger Vehicles and Equipment

OIW possesses the in house capability to perform functional and physical acceptance testing of a streetcar. Admittedly, OIW has never built or tested a streetcar, as was once the case for National Missile Defense equipment, complex boats for the military, or space launch complex movable platforms. Each of these successful and complex programs was new to OIW, but with a systems approach to management, manufacturing, quality and testing each project was completed successfully, on time and on budget.

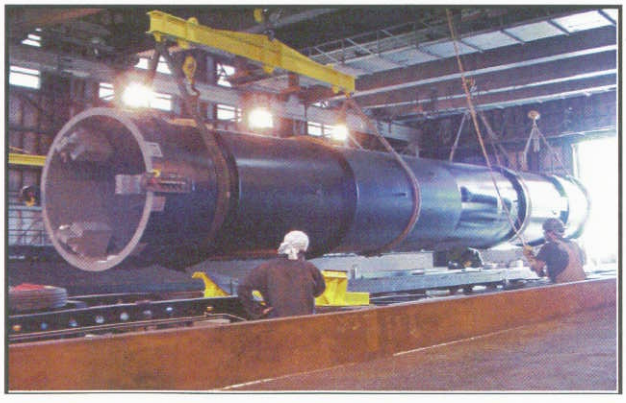
Test Trials of New Craft

Electrical Components Testing

The testing of the prototype streetcar will benefit from Skoda's experience with European Streetcar projects and the original City of Portland vehicles. OIW will utilize Skoda for testing protocol and acceptance criteria.

OIW's Indoor Testing Pool

Space Launch Complex Six (SLC-6) Platform Testing



Ground Based Missile Defense (GMD) Testing

2.2.3 QUALITY & SAFETY PROGRAM

a. Program

Quality Assurance and Quality Control capabilities are integral to a successful project and equally important to a successful business. OIW places great importance on quality. The OIW culture combines Quality with daily production from the beginning of each project. Our motto is: "You cannot inspect quality into a product…quality must be planned for and executed from the outset because after it is built it is too late".

OIW will use an ISO 9002 compliant program for Streetcar production. The program is currently supported with 26 certified Quality Control inspectors. The inspectors are certified in NDE (Non Destructive Examination) weld examination, paint and coatings inspections, dimensional inspections and CMM (coordinate measuring machine).


Defense Contract Management Seattle

Quality Systems Qualification

Based on a quality systems evaluation,

OREGON IRON WORKS, INC.
CLACKAMAS, OR

is hereby declared compliant with

ISO 9002

ISO 9002 Certificate

b. Quality Metrics

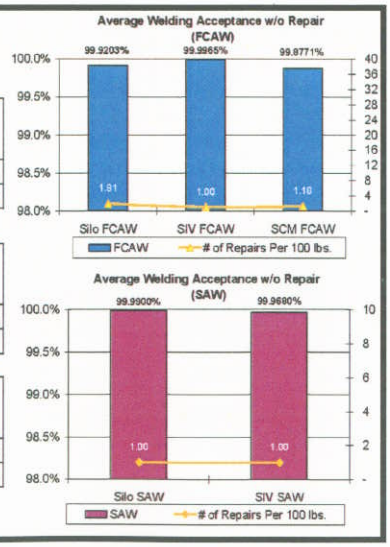
Real-time measurement of Quality is key to the identification of positive or negative trends in the manufacturing environment. OIW will use objective metrics for the Streetcar Project to track quality and its associated processes thus providing meaningful input into the manufacturing process. As an example, the "Weld Metrics" shown are taken from an ongoing program and track three physical components: Silo, SCM and SIV, and two weld processes for each component. The Metrics show that for over 2.5 million inches of deposited weld metal ~99.99% was defect free, exceeding a Sigma 5+ quality standard. Such extraordinary performance is guided by the active measurement of quality.

WELD METRICS

Silo Welding *Cumulative*	Repairs Required	Total Weld Dep. (LBS)	Repairs Per 100 LBS	Total Weld Inches	Accepted w/o Defect Inches	Repaired Inches	Accepted w/o Repairs
Weld data to date: FCAW	433	23,894	2	701,796	701,237	559	99.9203%
Weld data to date: SAW	29	28,177	1	531,829	531,776	53	99.9900%

SCM Welding *Cumulative*	Repairs Required	Total Weld Dep. (LBS)	Repairs Per 100 LBS	Total Weld Inches	Accepted w/o Defect Inches	Repaired Inches	Accepted w/o Repairs
Weld data to date: FCAW	111	9,416	1	169,592	169,384	209	99.8771%
Weld data to date: SAW	-	-	-	-	-	-	0.0000%

SIV Welding *Cumulative*	Repairs Required	Total Weld Dep. (LBS)	Repairs Per 100 LBS	Total Weld Inches	Accepted w/o Defect Inches	Repaired Inches	Accepted w/o Repairs
Weld data to date: FCAW	37	21,528	1	1,132,536	1,132,497	39	99.9965%
Weld data to date: SAW	10	1,824	1	50,376	50,360	16	99.9680%



c. Paint Inspection

The American Institute of Steel Constructors (AISC) has certified OIW for Sophisticated Paint and Coatings. Typical inspections include surface substrate, wet film thicknesses, dry film thicknesses and final coatings acceptance.

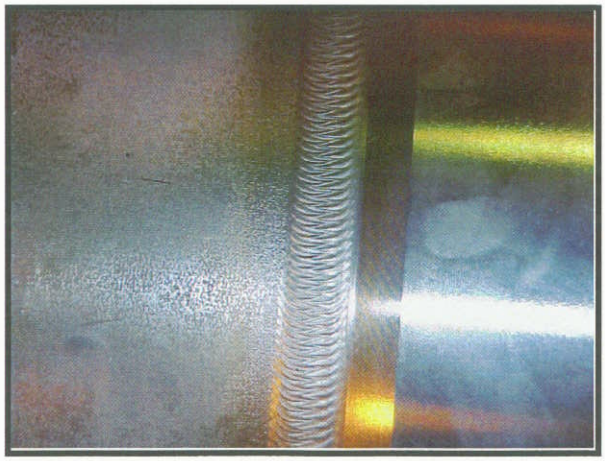
AISC Certificates

With Endorsement for:
Sophisticated Paint – Enclosed Fracture Critical

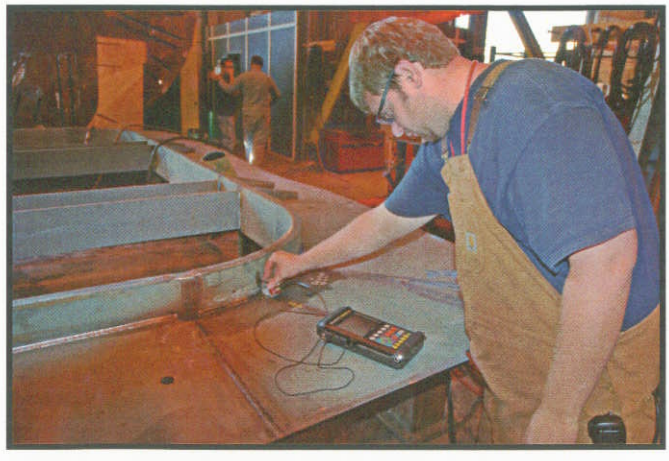
Paint Inspection with Dry Film Gauge

d. Weld Inspection

Non-Destructive Examination (NDE) of Streetcar components and welds will include Ultra-sonic (UT), Mag-particle (MT), Dye-Penetrate (PT), Radiographic (X-Ray) and visual examination. OIW inspectors are certified in all aspects of NDE.



Visual Weld Inspection

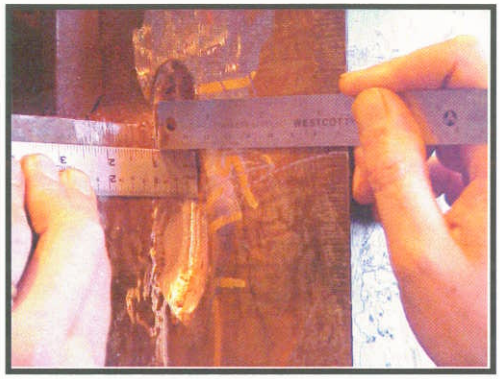


UT Weld Inspection

e. Precision Measuring

Precision measurement techniques will be used for validation that Streetcar assemblies and components are manufactured per the Skoda design.

OIW inspection capabilities for physical dimensions are extraordinary for a metal fabrication and machine shop. The capabilities range from conventional tools such as standard scale rules and large micrometers.



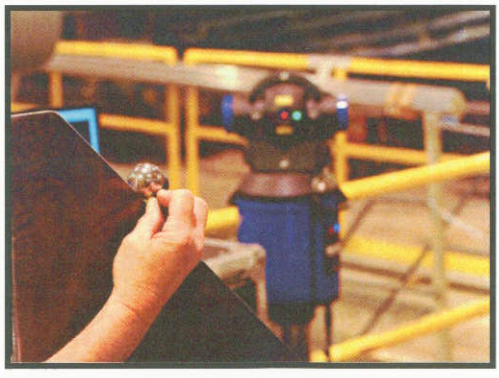
Standard Dimensional Inspection

Large Micrometer Inspection of Diameter to +/- .001"

In addition to conventional measurement tools OIW inspection capabilities utilize Laser Trackers. The Laser Trackers and their associated 3-D software can measure and digitize extremely large physical objects, many times larger than a streetcar, with computer accuracies exceeding one-thousandth of an inch.

For dimensional measurements that require extraordinary precision, to the ten-thousandths of an inch, OIW uses a Coordinate Measuring Machine (CMM), a Laser Tracker with a 4ft x 8ft precision ground granite table. The CMM is integrated with 3-D software that supports a level of precision that was previously impossible.

CMC w/Granite Table = .0001" Accuracy



FARO Laser Tracker

CMM is used to inspect supplier parts as well as critical OIW manufactured components.

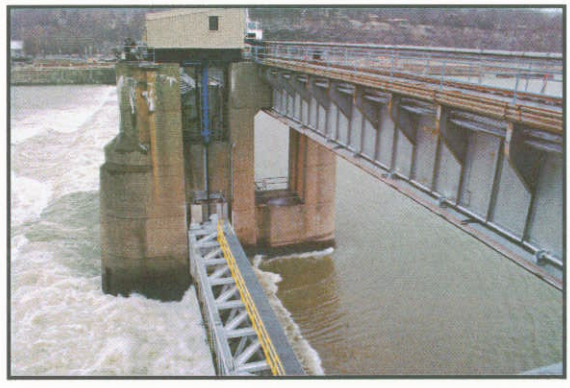
The FARO Laser Tracker measures objects with computer accuracies.

f. Testing Capabilities

The testing of a complex system such as a Streetcar is an involved and detailed process. Testing typically focuses on Physical and Functional testing and is supported with detailed planning and test procedures.

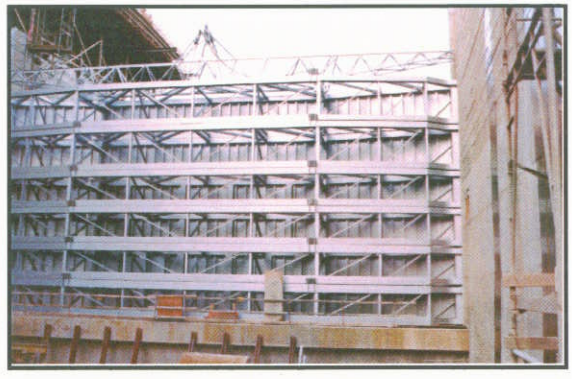
OIW's current experience with such testing is in conformance with the U.S. Navy, Aerospace, U.S. Corps of Engineers, Bureau of Reclamation and Nuclear Industries each of which represents complex mechanical systems that transport people or involve substantial safety issues.

U.S. Coast Guard (Guardian) Craft



Emsworth Lock and Dam

McCook Reservoir Slide Gates



Bonneville Lock and Dam

OIW will benefit from Skoda's Streetcar testing experience. Skoda testing procedures and personnel will be directly involved with OIW and the prototype Streetcar.

g. Conclusion

Oregon Iron Works, Inc. (OIW) brings exceptional Management, Manufacturing and Quality Capabilities to the Prototype Streetcar Project. With the addition of Skoda to the OIW Streetcar Team, together they provide state of the art facilities, experience, innovative solutions and a rich history of successful streetcar projects in Europe and the U.S.A. For the Buy America Streetcar to be a success story it must be high quality, reliable and competitively priced and if it meets these standards, streetcar production will move back to the U.S.A.