West Valley Demonstration Project

Doc. Number WVNS-SD-63L

Revision Number 0

Revision Date 02/18/94

Engineering Release #2862

SYSTEM DESCRIPTION

CANISTER WELDING SYSTEM
SYSTEM 63L

PREPARED BY [signature] B. A. Brill
Cognizant Engineer

APPROVED BY [signature] B. A. Brill
Cognizant System Engineer

APPROVED BY [signature] D. C. Burns
Cognizant System Design Manager

West Valley Nuclear Services Co., Inc.

P.O. Box 191

West Valley, NY 14171-0191

SD:0002901.01

RECORD OF REVISION

PROCEDURE

If there are changes to the controlled document, the revision number increases by one. Depending on the document type (per WV-100) changes are indicated by:

- a heavy vertical black line located in the right-hand margin adjacent to the sentence or paragraph which was revised
- an arrow at the beginning of the paragraph which was revised
- identifying as GENERAL REVISION

Example:

The vertical line in the margin indicates a change. |
The arrow in the margin indicates a change. >

Rev. No.	Description of Changes	Revision On Page(s)	Dated
0	Original Issue	All	02/18/94

RECORD OF REVISION (CONTINUATION SHEET)

Rev. No.	Description of Changes	Revision On Page(s)	Dated

TABLE OF CONTENTS

TABLE OF CONTENTS (Cont.)

SUMMARY

The Canister Welding System provides services necessary to contain the vitrified high-level waste within canisters during interim storage. It provides the method for sealing the canisters such that requirements for leak tightness are met. After glass shard samples are taken, a permanent lid is placed on each canister and sealed according to required specifications through an automatic pulsed GTAW welding process which uses remote equipment.

The terms and abbreviations used in this document are defined in Table 1. The units, abbreviations and conversions used in this document are defined in Table 2.

Table 1: Definition of Terms	
Term	*Definition*
ALARA	As Low As Reasonably Achievable, a term used to express the prevailing philosophy of radiation exposure control
CCTV	Closed Circuit Television cameras and monitors.
CWI	Certified Welding Inspector as defined in AWS D1.1, Section 6.1.3 and AWS QC1.
CWS	Canister Welding Station
EDE	Effective Dose Equivalent
GTAW	Gas Tungsten Arc Welding
MSM	Master-Slave Manipulator
Quality Level C	Failure could cause loss of 1-4 weeks operation. (See WVDP-002)
Quality Level N	Failure would cause loss of <1 week operation. (See WVDP-002)
Safety Class N	Generally, risks routinely accepted by workers and the public. Radiologically risks <0.1 mSv (<0.01 Rem) to workers or the public. Chemically risks routinely accepted by workers and the public. Environmentally, no damage risked. (See WVDP-002)
STEL	Short Term Exposure Limit
UBC	Uniform Building Code
VF	Vitrification Facility

Table 2: Definition of Units				
Measure	*SI Unit*	*SI Name*	*English Unit*	*Equalities*
Current	A	Ampere	amp	A = amp
Dose	Gy	Gray	Rad	Gy = 100 Rad
Dose Equivalent	Sv	Sievert	Rem	Sv = 100 Rem
Energy	J	Joule	BTU	kJ = 0.946 BTU
Force	N	Newton	lb_f	N =0.225 lb_f
Length	m	meter	ft	m = 3.28 ft
Mass	g	gram	lb_m	kg = 2.20 lb_m
Potential	V	Volt	v	V = v
Pressure	Pa	Pascal	psi	kPa = 0.145 psi
Temperature	°C K	Celsius Kelvin	°F °R	$t_{(C)} = (5/9)x(t_{(F)} - 32°)$ $T_{(K)} = (5/9)x(T_{(R)})$
Time	s min h	second minute hour	sec min hr	s = sec min = min h = hr
Volume	L m^3	liter cubic meter	gal ft^3	L = 0.264 gal m^3 = 35.3 ft^3
Modifiers				
Millionth	μ	micro-	10^{-6}	
Thousandth	m	milli-	10^{-3}	
Thousand	k	kilo-	10^{+3}	
Million	M	Mega-	10^{+6}	

CANISTER WELDING SYSTEM
SYSTEM 63L

REV. 0

1.0 FUNCTIONS AND DESIGN CRITERIA

1.1 Functions

The Canister Welding System accepts the canisters after they have been filled with vitrified high-level waste. The fill height of glass in the canister is measured. Glass shard samples are taken from each canister and forwarded to the laboratory for testing. A permanent lid is welded to the canister by the remote automatic welding equipment which operates under conditions demonstrated to provide the required leak tightness. Leak tightness is assured by weld process control and visual examination.

1.2 Design Criteria

The Canister Welding System described by this document is designed to meet the criteria set forth by WVNS-DC-011, "General CTS Component Design Criteria," and WVNS-DC-022, "Vitrification of High-Level Wastes."

The Canister Welding System has a design life of 7 years.

1.2.1 Process Requirements

Provide a place to hold two canisters, simultaneously, within site of weld station shield window and within reach of the weld station MSMs. One of these places is for the principle activities of the weld station. The other place is for holding a canister with a grapple engaged with its flange, in the event that grapple cannot be disengaged through normal means.

Provide the means to store canister primary lids prior to use.

Provide a place for extracting glass shard samples from the waste glass in each canister. The glass shard sample system and its operation are described in WVNS-SD-69A.

Provide the means for measuring the level of glass in each filled canister.

Provide the means to (a) verify that the canister is ready to accept a lid, (b) place a lid on the canister, and (c) weld the lid onto the canister.

Provide the means to monitor the weld and the welding parameters while welding the lid to assure that the welding process is progressing as intended.

Provide the means for qualified personnel to visually inspect the welds and determine whether or not they satisfy the acceptance criteria.

Provide the means to repair welds that have not been proven to satisfy the acceptance criteria.

1.2.2 Structural Requirements

All in-cell equipment is designed to endure the following ambient conditions during radioactive waste processing operation.

Temperature	15 to 35° C (60 to 95° F)
Pressure	0 to -1 kPa gage (0 to -4 in. WG)
Relative Humidity	30 to 80%
Nitric Acid Fumes	100 ppm
Radiation Field	50 Gray/h at 300 mm (5,000 Rad/hr at 1 ft) from outside canister surfaces

The fabrication materials are to resist corrosion from the vitrification cell environment.

All system equipment mountings and supports are seismically designed to UBC Zone III, importance factor 1.5, with the addition of a vertical acceleration equal to 2/3 of the horizontal component.

1.2.3 Facility Configuration and Essential Features

A significant facility configuration feature of the Canister Welding System is its physical location at the east wall of the vitrification cell between column lines 3 and 3Z, as illustrated on drawings 900E-3071 and 900E-3072. The shielding gas is piped from two banks of three bottles located on a pad outside the vit building.

The work bench, weld head, and other tools are located in the vit cell near the window and MSMs. The operators controls, and as much of the electrical/electronic equipment as possible, are located outside the cell to protect personnel and equipment from radiation and to provide both operators and maintenance personnel easy access to the equipment during operations.

All welding station operations, aside from loading and unloading canisters, are performed by the operator at the welding station using

A. CWS operators control panel to control the weld station hoist and the flange conditioning tool.

B. CWS Operator's Control Panel to control the weld station hoist and the flange conditioning tool,

C. MSMs to extract glass shards, measure the glass fill height, place lids onto the canister, and perform miscellaneous adjustments.

D. The Astro Arc Model CWS-486 welder control console to control the welder

E. The transfer drawer to deliver replacement torches for the welder, replacement cutters for the flange conditioning tool, etc.

F. The CCTV Control Console to control the remote cameras for monitoring weld station activities and assisting in weld visual examination.

Loading and unloading of canisters at the welding station is done using the process crane and its controls.

1.2.4 Maintenance

The gas supply system located outside the vitrification facility is designed for hands-on maintenance. The welder controls and other auxiliary equipment located inside the vitrification facility but outside the vitrification cell are designed for hands-on calibration and maintenance. Jumpers, tools, and the weld head located inside the vitrification cell are designed for remote maintenance or replacement. Spare parts, duplicate tools and weld head are available for complete system replacement.

1.2.5 Surveillance and In-Service Inspection

Surveillance and in-service inspections are necessarily performed remotely. Surveillance and visual inspection of the welding process are accomplished by observation through a shield window in the cell wall, which provides a direct view of the canister in its compartment and any devices in operation above it. Television cameras mounted above the workbench provide detailed views. In-service inspection is accomplished by carefully monitoring the available instruments, and by reviewing production records (disk files, strip charts, etc.) provided by the system and its operator.

1.2.6 Instrumentation and Control

The Canister Welding System process controls involve the operation of MSMs, a hoist, the flange conditioning tool, and the weld head. A welder console, CCTV monitors/controls, crane and milling equipment console are located at the welding station. Only the CCTV cameras maybe controlled either locally or from the control room. All other weld station operations can only be controlled locally.

1.2.7 Interfacing Systems

The Canister Welding System components physically interface with the following systems.

- The VF Cell Walls & Ex-Cell Arrangement System (63F) provides the shield wall, transfer drawer, and penetrations necessary at the canister welding station.

- The In-Cell Remote Handling, Maintenance, and Viewing Systems (63K) provide for surveillance, routine operation and maintenance of overhead cranes, masterslave manipulators, and ultimately decommissioning support.

- The VF Electrical Power Distribution System (63ED) provides electrical connections to power the weld head, flange conditioning tool, hoist, and instrumentation.

- The VF Instrument Air System (63IA) provides purge air for instrumentation use and, if necessary, to the canister before sealing is complete.

- The VF Utility Air System (63UA) provides air to the flange conditioning tool, the lid magazine, and the vacuum generators for the lid lifter and shard sample pick-up assembly.

- The VF Sampling System (69A) is serviced by routine acceptance of glass shard samples. This system also provides the sampling tools for use at the weld station.

- The VF Instrumentation and Control Software System (200B) shall keep a master copy of the disk programs and software user manual, provided by the equipment vendor, used to operate the welder. The maintenance and control that System 200B has over the welder software shall be in accordance with the latest revision of EP-3-013, "Determination of Software Requirements." User copy control and weld parameter changes shall be managed by Engineering.

1.2.8 Quality Assurance

Quality Levels for design, procurement, testing and operation of the various components of the canister welding system are assigned in accordance with QM-2 and QM-3.

The design and procurement of the welder has been treated as a Quality Level N activity. The design and procurement of other components of the canister welding system have been treated as Quality Level C.

Developmental testing is considered a Quality Level C activity, as is preparation of test procedures and reports. Qualification testing of the welder and weld inspection equipment, that is testing to prove suitability for service, is considered a Quality Level B activity.

Calibration and operation of the welder and inspection equipment and preparation of production records is considered a Quality Level B activity.

1.2.9 Code and Standards

The system equipment was designed and fabricated to rigorous quality standards, thereby assuring that the hardware would be safe for the intended applications. The codes and standards listed in Table 1.2 were implemented, as applicable, during design and fabrication.

Table 1.2: Applied Codes and Standards

Codes/Standards	*Title*
ANSI/ASME-NQA-1	Quality Assurance Program Requirements
DOE/RW-0333P	Quality Assurance Requirements Document
ASME B&PV CODE Section V, Article 10	Helium Mass Spectrometer Leak Testing Method
ANSI Y14.5M	Dimensioning & Tolerancing
ASME B/PV Code Sec. II Sec. V Sec. IX	Boiler and Pressure Vessel Code Material Specifications NDE Welding & Brazing Qualifications
ASME SA-276	Alloy Specifications
AWS A.2.4	Symbols for Welding and NDE

1.2.10 Reliability Assurance

The following steps were taken to assure the greatest practical reliability for the system.

- Fabrication materials were selected to provide the maximum resistance to corrosion from the in-cell environment.

- Weld filler material composition conforms to ASME specifications. The canister lids are austenitic stainless steel manufactured to ASTM specifications. These measures ensure that the canister closure material does not have an adverse impact on waste package performance.

- Remote visual inspection using CCTV, review of production records generated by the system, and a verification of input welding parameters will be the quality assurance activities used to accept a canister lid weld made with this system. Visual examinations shall be performed by a Certified Welding Inspector who will follow acceptance criteria based on ASME Code criteria methodology.

- The weld parameters and process variables used are those proven in testing to provide a canister seal which conforms to the necessary leak tightness. Welding will only be performed using these parameters. Actual leak tests will not be performed in-cell during hot operations.

  NOTE: During extensive testing prior to hot operations, effective parameters will be determined and recorded. Weld parameters and process variables to be investigated for their effect on weld quality may include surface preparation, weld area cleanliness, fit-up tolerances, pulse current, background current, pulse times, travel speed, and cover gas flow. For a complete list of variables and more details of this process variation testing, refer to WVNS-TRQ-054, "Canister Lid Welding System Testing," and WVNS-TP-054, "Canister Lid Welding System Process Variation Testing." Other test procedures are described in the series WVNS-TP-054A, B, C, etc.

These parameters must provide a canister lid seal which cannot be breached during canister drop tests, load tests and leak testing. Metallographic examinations, dye penetrant tests, tensile and bend weld zone tests, and helium leak tests will be performed during this developmental testing to determine weld quality. Helium leak tightness measurements will be performed using the Helium Mass Spectrometer Leak Testing Method in accordance with ASME's Boiler and Pressure Vessel Code, Section V, Article 10, 1989 edition including 1990 addenda. Tests will be performed on full-size canisters and on mockups. The specification of parameter values to be used in welding production canisters, along with acceptable tolerances on these values, will be based upon the results of these development tests.

The outermost closure shall be leak tight to $1x10^{-4}$ atm-cc/sec helium in accordance with "Waste Acceptance Product Specifications for Vitrified High-Level Waste Forms (WAPS), "U. S. DOE Office of Environmental Restoration and Waste Management, EM-WAPS, Revision 0. This leakage rate of $1x10^{-4}$ atm-cc/sec or less is based on dry helium at 25°C (77°F) and a pressure differential of 1 atm against a vacuum of 10^{-4} atm or less.

The rationale for the closure specification is as follows. The sealed canister is designed to provide confinement of the waste and protection of the waste form from contact with externally derived liquids and gases until the canister is stored in a repository. The canister itself is not intended to meet a post-closure containment requirement at a final repository. A leak rate of less than $2x10^{-4}$ atm-cc/sec has been established as being sufficient to prevent water from entering the canister. A leak rate of $1x10^{-4}$ atm-cc/sec air has been established as the container failure criterion for repository post-closure service. Thus, a final closure leak rate specification of $1x10^{-4}$ atm-cc/sec helium for canisters of high-level waste glass is considered to be both conservative and demonstrable. (See also WVNS-WCP-001, "Waste Compliance Plan for the West Valley Demonstration Project High-Level Waste Form.")

The effect of the in-cell environment on cover gas flow is another aspect of welding operations to be tested. During cold cell testing, ventilation fans must be run in the cell so that their effect on air currents near the weld head can be determined. These currents may effect the flow of cover gas directed at the molten pool during welding. If cover gas is blown away from the weld pool, oxidation and contamination of the weld may occur. Testing shall determine if actual air currents from in-cell fans have a significant impact on the effectiveness of cover gas flow.

2.0 DESIGN DESCRIPTION

2.1 Summary

The Canister Welding System consists of all the equipment used to hold the canister, place the lid onto the canister and weld it, and inspect the weld. This includes the weld station (a large workbench), the weld station hoist, the weld station controls (ex-cell), the weld head with ex-cell control and data recording, the flange conditioning tool, the lid magazine and the lid lifter, the cover gas supply, and a tool to measure the glass fill height.

Equipment from other vitrification systems will also be used at the welding station, sometimes to support canister lid closure. The MSMs, for example, will be used to place lids onto the canisters and to perform various other "manual" operations. The closed circuit TV (CCTV) system will support inspection of the canister prior to lid placement and, again, after the lid is welded, as well as other operations at the weld station. Additionally, equipment will be stored at the weld station and used to take glass shard samples.

The Operations Performed At The Canister Welding System Are

* receive and hold a glass filled, uncapped canister
* verify the canister's suitability for final closure
* prepare the flange to receive a lid, if necessary
* measure the glass fill height
* extract glass shard samples
* place a primary lid onto the canister
* weld the primary lid
* verify that the lid weld satisfies acceptance criteria

* perform weld repairs or install a secondary lid, if necessary

* store a small supply of primary lids

* store the equipment used in these operations

* maintain the equipment used in these operations

* provision of the means to purge the canister with a clean dry air or inert gas (reference WVDP-185, Section 3.1) may also be considered.

2.2 Detailed System Description

2.2.1 Canister Transport

Filled canisters from either the turntable or the in-cell storage rack will be forwarded to the Canister Welding Station for closure. Those canisters on the storage rack will be covered with temporary lids. An overhead cell crane and grapple are used to pick up one canister and move it to the CWS, and to remove temporary lids.

2.2.2 Glass Shard Sampling

When the filled canister is forwarded to the weld station, scattered glass shards are on and around the top surface of the solid glass within the canister. These shards are taken as samples for archives and chemical testing.

The number of sample vials necessary for each canister varies. The current plan is that three types of shard samples will be taken. First, archive samples from each canister are required for reference. Second, routine samples of every tenth canister are needed for testing of glass components. Third, random samples of 30 canisters out of the 310 produced are required for qualification testing of glass acceptability. The final details of the glass shard sampling plan will be recorded in the system description for the sample system, WVNS-SD-69A.

Removal of glass shard samples is done at the CWS, followed by transfers to the Sampling Station.

2.2.3 Weld Prep Area

The canister neck and flange are to be inspected and, if necessary, conditioned in preparation for welding. Visual inspection is performed using CCTV cameras. Surface conditioning is achieved through the use of milling spindle and wire brush on the flange conditioning tool. This procedure ensures proper shape and surface conditions for welding.

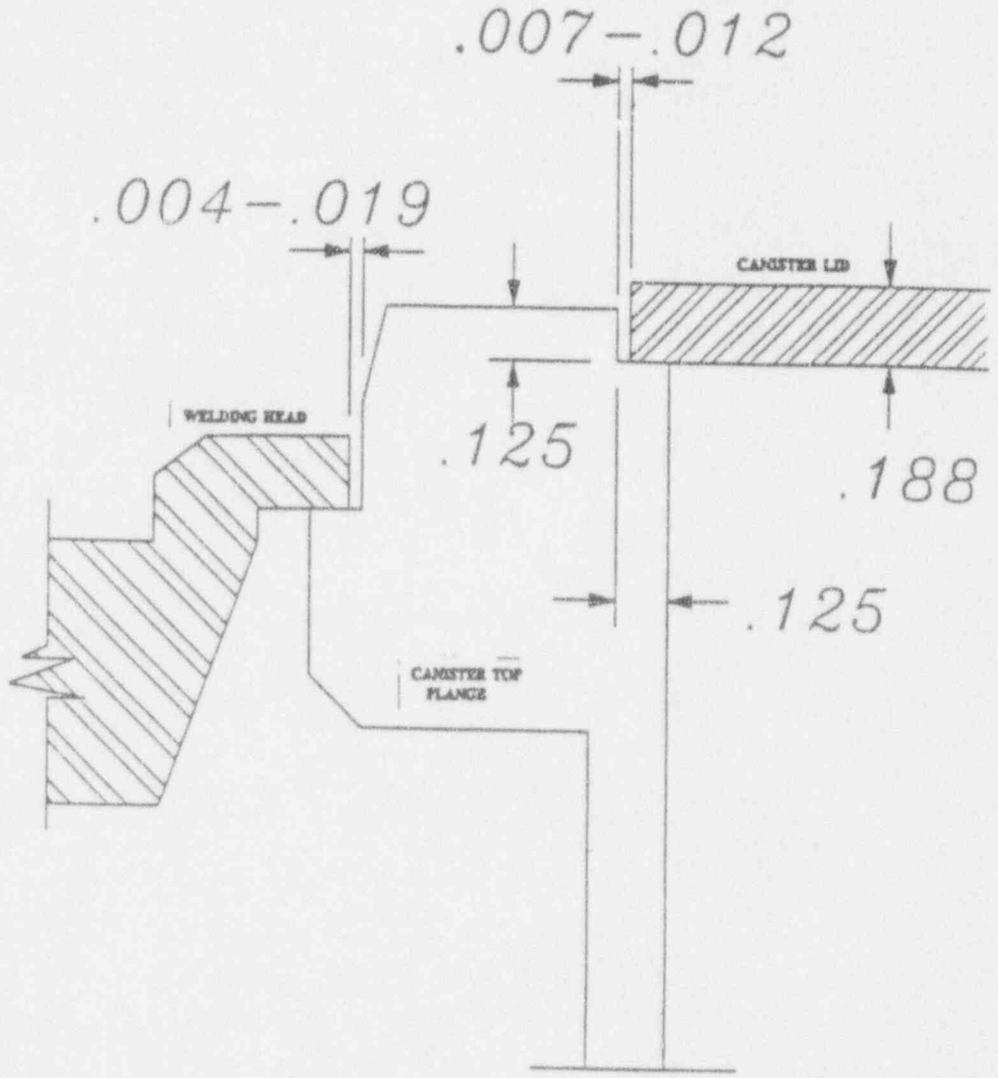


Figure 2.2-1: Canister, Lid and Weld Head Arrangement with Tolerances (All dimensions in inches.)

The diametral clearance between the canister flange and the lid can range from .007 to .012 inches. Figure 2.2.1 illustrates this.

2.2.4 GTAW Welding Process

The Canister Welding System uses autogenous Pulsed Gas Tungsten Arc Welding (GTAW), also known as the pulsed tungsten inert gas (TIG) welding process. This welding process induces coalescence through a localized melting at the joining surface by an arc generated between a nonconsumable tungsten electrode and the base materials. An inert gas, a mixture of helium and argon, is used to protect the molten pool from oxidation and contamination. Once the arc and weld pool are established, the torch is moved along the joint and the arc progressively melts the faying surfaces. A pulsed current is utilized. The pulse current achieves suitable penetration and induces fusion when the weld head is stationary, while the background current maintains the arc when the weld head is traveling and allows the weld area to cool. An additional advantage of pulsed current is that heat input and the possibility of distortion are minimized, for a given depth of penetration.

The weld head is controlled by computer, which runs programs which have been qualified for primary and repair welding. This computer controlled power supply is enhanced via Automatic Voltage Control, which aids in controlling welding parameters. The parameters shall be monitored and recorded.

2.2.5 Weld Parameters

A. Commercial quality welding cover gas composed of 75% Helium and 25% Argon shall be used.

B Weld parameters such as pulse current and dwell time will be the same as those used in cold testing which achieved the required leak tightness. Definition and testing of variations shall demonstrate the effectiveness of the system to produce an acceptable seal weld within the limits of the tested variations. For details on this testing, refer to WVNS-TRQ-054, "Test Request: Canister Lid Welding System Testing", and WVNS-TP-054, "Test Procedure: Canister Lid Welding System Process Variation Testing."

C. See Table 2.3 for Primary and Repair Weld Parameters. Appendix E contains figures and data from the manufacturer about the Canister Lid Welder.

2.2.6 Inspection

A Certified Welding Inspector (CWI) will inspect the weld visually via CCTV. The CWI shall adhere to remote visual inspection acceptance criteria that have been developed using the ASME Code criteria methodology. The criteria are listed in Section 3.7.1 of this document, in WVNS-TRQ-054, and in WVNS-TP-054.

2.2.7 Repairs

If anomalies exist in the primary autogenous weld such that acceptance criteria have not been met, repairs may be made using one or more of the following options.

A. Reweld of primary lid.

B. Local weld repair without filler metal.

C. Local weld repair with filler metal.

D. Mill out defect, then local repair with filler metal.

E. First autogenous weld of secondary lid.

F. Reweld of secondary lid.

G. Local secondary weld repair without filler metal.

H. Local secondary weld repair with filler metal.

I. Mill off secondary and/or primary lid(s).

Secondary lids shall be brought in-cell as needed. The flange conditioning tool is used when milling and/or wire brushing are necessary during repairs. Repair welds shall be inspected by the CWI after completion.

The flowchart in Figure 2.2-2 shows repair weld options and combinations.

CANISTER LID WELD ACCEPTANCE REPAIR OPTIONS

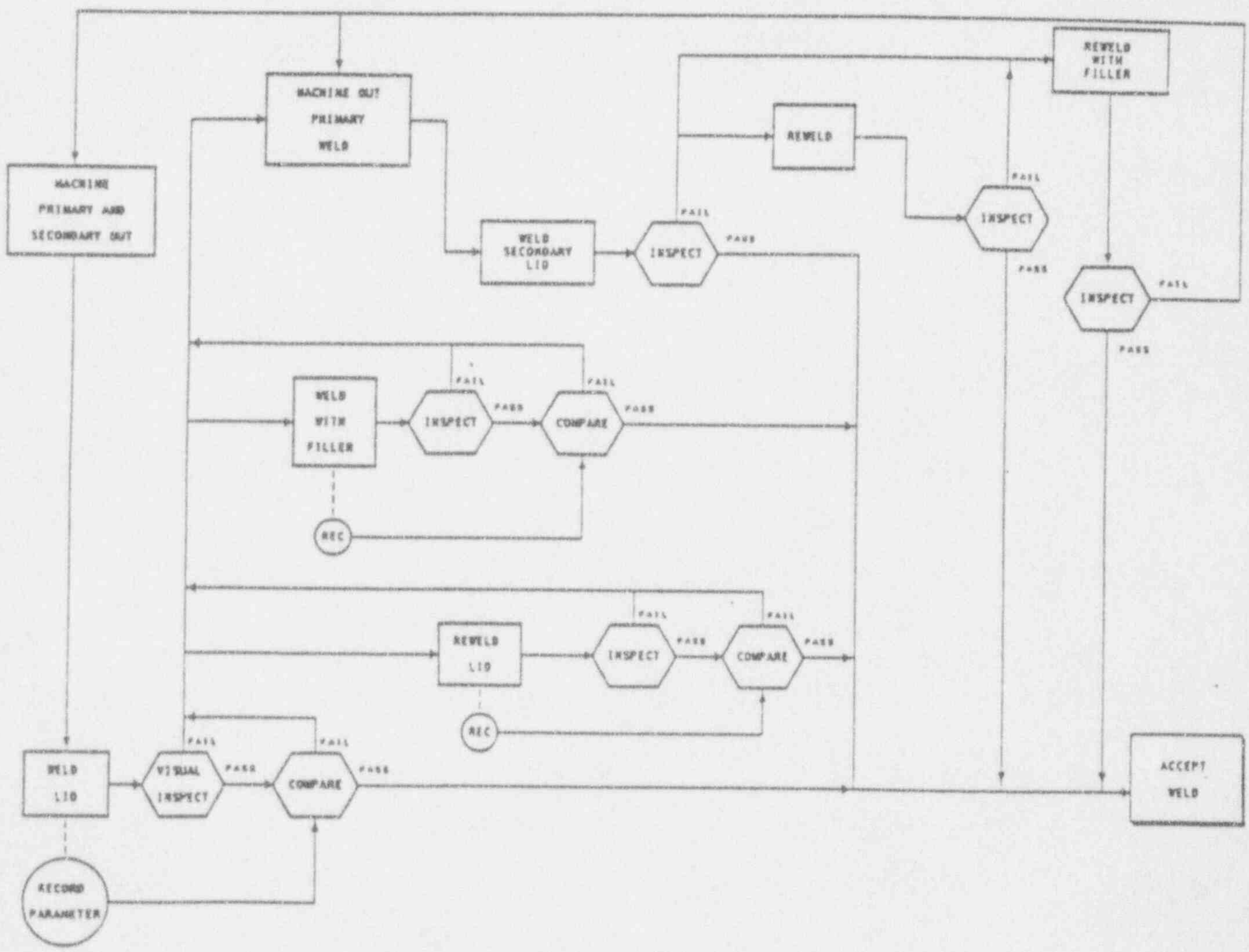


Figure 2.2-2: Canister Lid Weld Acceptance Repair Options

2.3 Equipment Performance Characteristics

Qualified weld head performance characteristics for both primary and repair weld operations are given in Table 2.3.

During test procedures, the welding equipment manufacturer has established this set of weld parameters that produce an acceptable weld for both the primary and repair welds and has qualified the welding procedure in accordance with ASME Boiler and Pressure Vessel Code, Section IX. Essential variables will not be varied beyond the limits set by Section IX of the ASME B&PV Code without further qualification.

The canister lid welder automatically controls each welding parameter, thereby assuring consistent welds. This automatic control is exercised through a computer program containing the parameters of a prequalified weld process that is loaded into the Astro Arc Model CWS-486 weld control console. The system includes an AVC (Automatic Voltage Control) unit which automatically adjusts the arc gap to maintain the programmed arc voltage.

The CWS-486 weld control console displays the various weld parameters and activates alarm when these parameters exceed preset bounds. It also is capable of sending these parameters, both programmed values and actual test values, to a strip chart recorder, printer, or other recording/display devices.

Table 2.3: Weld H ad Performance	
PRIMARY WELD PARAMETERS *(without filler metal)*	
Parameter	*Expected Performance*
High Current (Dwell)	220 amps
Low Current (Travel)	70 amps
Carriage Speed (Travel)	152 mm/min (6 inch/min)
Wire Feed	NONE
Arc Volts (Dwell)	10 volts
Dwell Time	1.2 sec
Travel Time	0.9 sec
REPAIR WELD PARAMETERS *(filler metal added)*	
Parameter	*Expected Performance*
High Current (Dwell)	220 amps
Low Current (Travel)	80 amps
Carriage Speed	152 mm/min (6 inch/min)
Wire Feed (Dwell)	1524 mm/min (60 inch/min)
Wire Feed (Travel)	0
Arc Voltage (Dwell)	10.5 volts
Dwell Time	1.5 sec
Travel Time	0.8 sec
Filler Metal	Type 308L stainless steel weld filler metal

2.4 Equipment Arrangement

The Canister Welding System arrangement is shown in Figures 2.4-1, 2.4-2 and 2.4-3. For greater detail, see WVNS drawings 900-E-3071 and 900-E-3072.

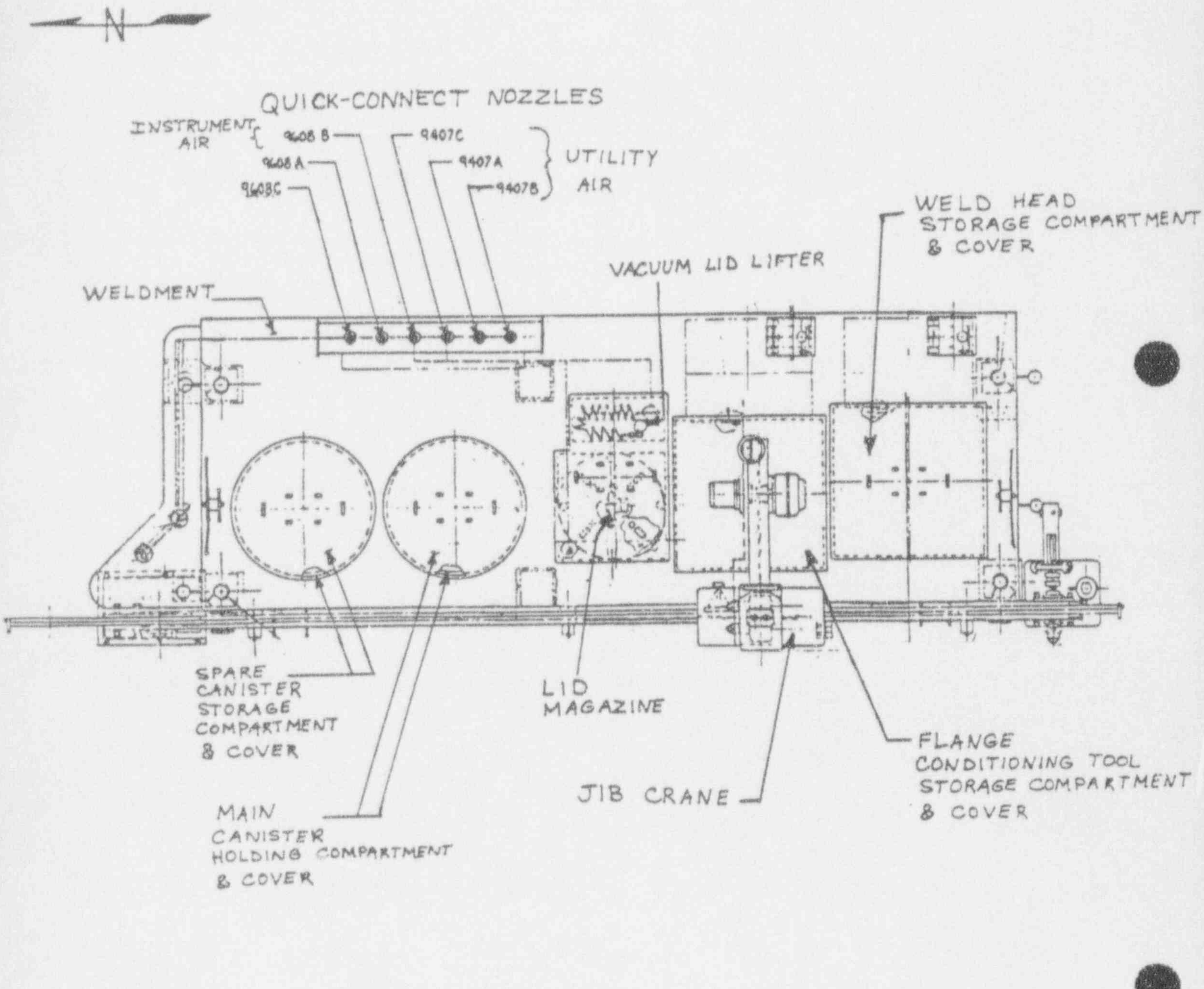


Figure 2.4-1: Weld Station Enlarged Plan View

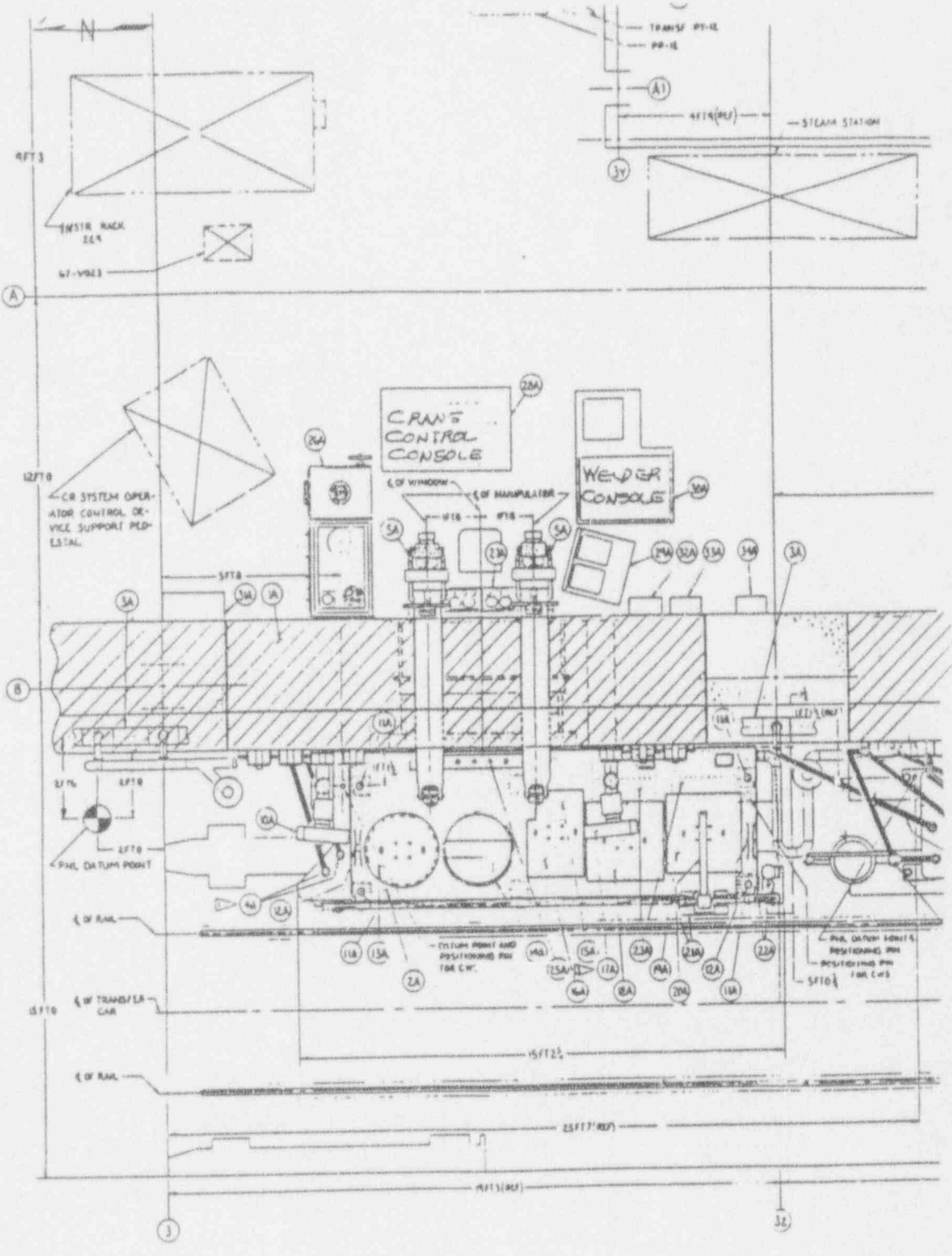


Figure 2.4-2: Weld Station Plan View

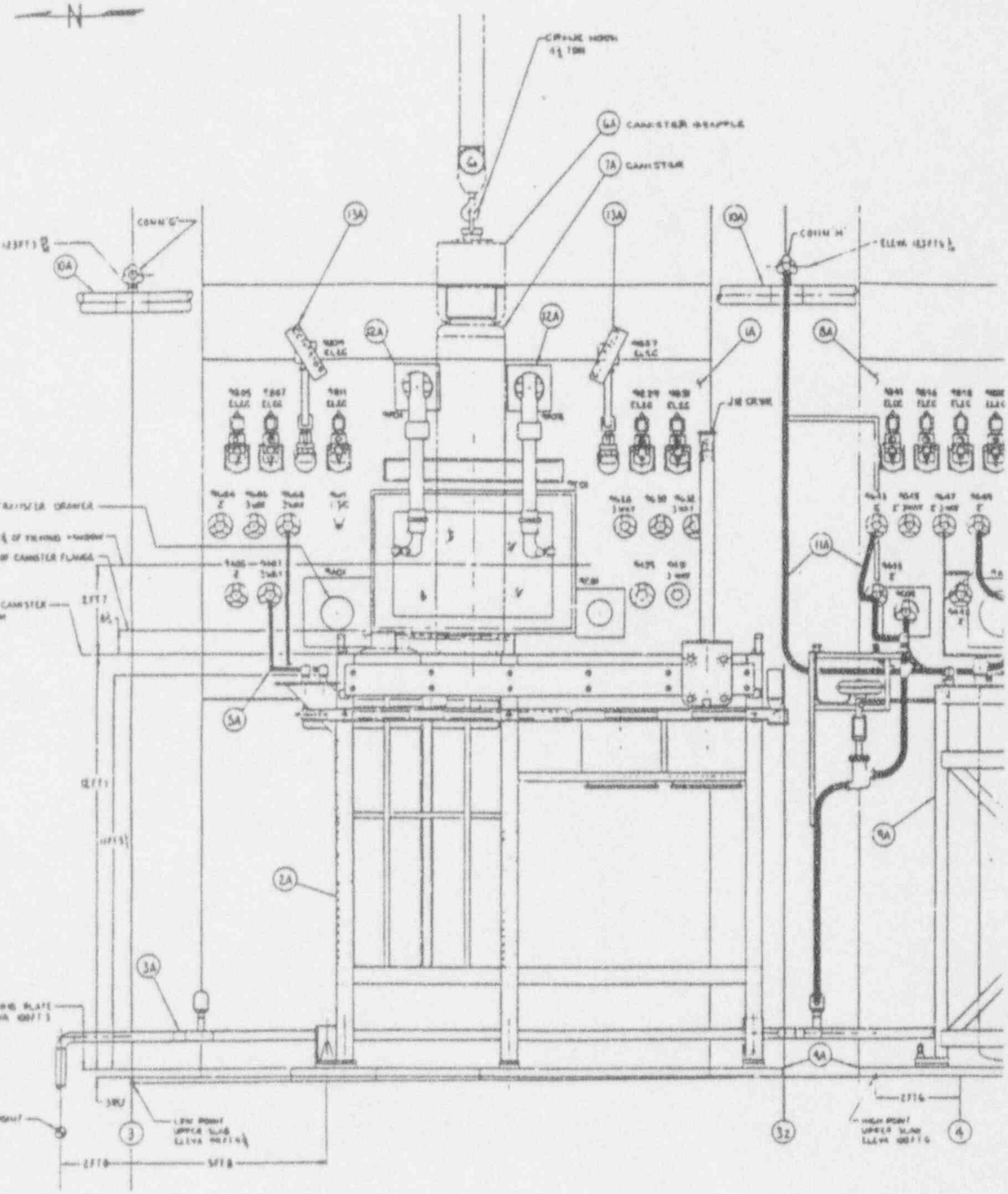


Figure 2.4-3: Weld Station Elevation View, Looking East

2.5 Component Design Descriptions

2.5.1 Workbench Structure

The welding station support structure is fabricated from stainless steel. It was designed to facilitate remote removal and replacement of the workbench, which rests on separate base plates and has lifting lugs on either end of the top surface. The station structure and main assembly are detailed in WVNS drawings 900-E-4228 and 900-D-4229, and installation drawings 900-E-3071 and 900-E-3072.

The workbench, 63-V-049, measures approximately 4.0 m (13.0 ft) long, 1.2 m (4.0 ft) wide, and 3.7 m (12.0 ft) high. The dead weight of the entire steel frame is about 3410 kg (7500 lb). The unit weight of the entire workbench, including storage compartments, lid holder and lids, jib crane, and flange conditioning tool, is about 4825 kg (10,615 lb).

The welding station workbench includes two canister holding compartments, each measuring about 2.8 m (9.0 ft) deep. One is used for welding procedures and the other can be used for canister storage during off-normal situations (i.e. backup at decon station, removal/repair of a grapple "stuck" on a canister). During normal operations, however, the glass shard sampling tools and tray are stored in the spare canister compartment. Storage compartments for the weld head, flange conditioning tool, and vacuum lid lifter are sub-assemblies within the workbench structure. All compartments remain covered when the equipment stored inside is not in use.

Primary lids are held in the lid magazine sub-assembly within the workbench. Fifteen lids at a time can be stored in this rack. Four alignment guides hold lids properly, while four lid holder rods and four lifting brackets support lids underneath. The lid magazine with 15 lids @ 5.8 kg (12.7 lb) each, weighs about 90 kg (196 lb). Lid magazine details are shown in WVNS drawing 900-D-4347.

Secondary lids will not be stored at the workbench. They will be required only when it is decided that repair of the primary lid weld is not feasible. A secondary lid will only be sent into the cell at that time.

On top of the workbench are six nozzle couplers for hose quick-connects. These are routed to the instrument air and utility air service lines. The nozzles are used when quick, temporary connection to IA, UA, or argon gas is needed for milling, glass shard sampling, canister air purge, or other jobs as necessary. All nozzles remain covered when not in use. These nozzles are shown on the workbench in Figure 2.4-1, and with a hose assembly attached in Figure 2.5-4. Also refer to WVNS drawings 900-E-4228, Sheet 1, 900-D-4341, and 900-D-5310.

2.5.2 Hoist

The weld station hoist, or jib crane (63-V-115) is mounted to the front of the workbench, 63-V-049, and has three components: carriage, hoist, and trolley. Jib crane total weight is approximately 320 kg (700 lb). There are three motors on the weld station hoist which must be controlled from the operator control panel at the east cell window between columns 3 and 3Z. Speed potentiometer on the operator panel allow power and direction adjustments to be made.

The carriage runs north-south on a 5 m (16 ft) long track along the workbench, allowing full access to the entire weld station. The carriage drive is connected at the input shaft to a chain drive with gearhead motor. This 9/32 HP motor is variable speed, reversible, open loop, with no feedback signals required. Running torque is 9.0 N-m (6.7 ft-lb), with a normal running speed of 28.57 rpm. This provides a normal carriage speed of 8 m/min (25 ft/min). Minimum running speed provides carriage incremental moves of 12.7 mm (0.5") or less. Operating range for the carriage drive is 0 to 35.3 rpm.

The trolley moves east-west across the workbench, with a total travel of less than 610 mm (24"). The reversible trolley drive uses electromotive impulse S and adjustable frequency motor control of a 1/2 HP motor. Trolley speed is adjustable from 0.4 to 12.2 m/min (1.3 to 40.0 ft/min), with a normal running speed of about 1.3 m/min (4.3 ft/min). Minimum running speed provides trolley incremental moves of 12.7 mm (0.5") or less.

The hoist can be lowered down to the workbench and into tool storage compartments to engage lifting bails. The hoist drive uses electromotive impulse G and adjustable frequency motor control. The 2 HP motor is variable speed, reversible, open loop, with no feedback signals required. Hoist speed is adjustable from 0.2 to 8.0 m/min (0.4 to 26.0 ft/min), with a normal running speed of about 3.7 m/min (12.0 ft/min). Minimum running speed provides easy set-down of equipment on the canister.

The carriage drive is connected to electrical penetration #9807 for power. The hoist and trolley motors are connected to electrical penetrations #9829 and #9831, respectively, through two power cables shrink-wrapped together. This provides protection and ease of manufacturing and replacement.

Maximum jib crane load limit is 230 kg (500 lbs). The jib crane sub-assembly is detailed in WVNS drawing 900-D-5195.

2.5.3 Glass Shard Sampling Tools

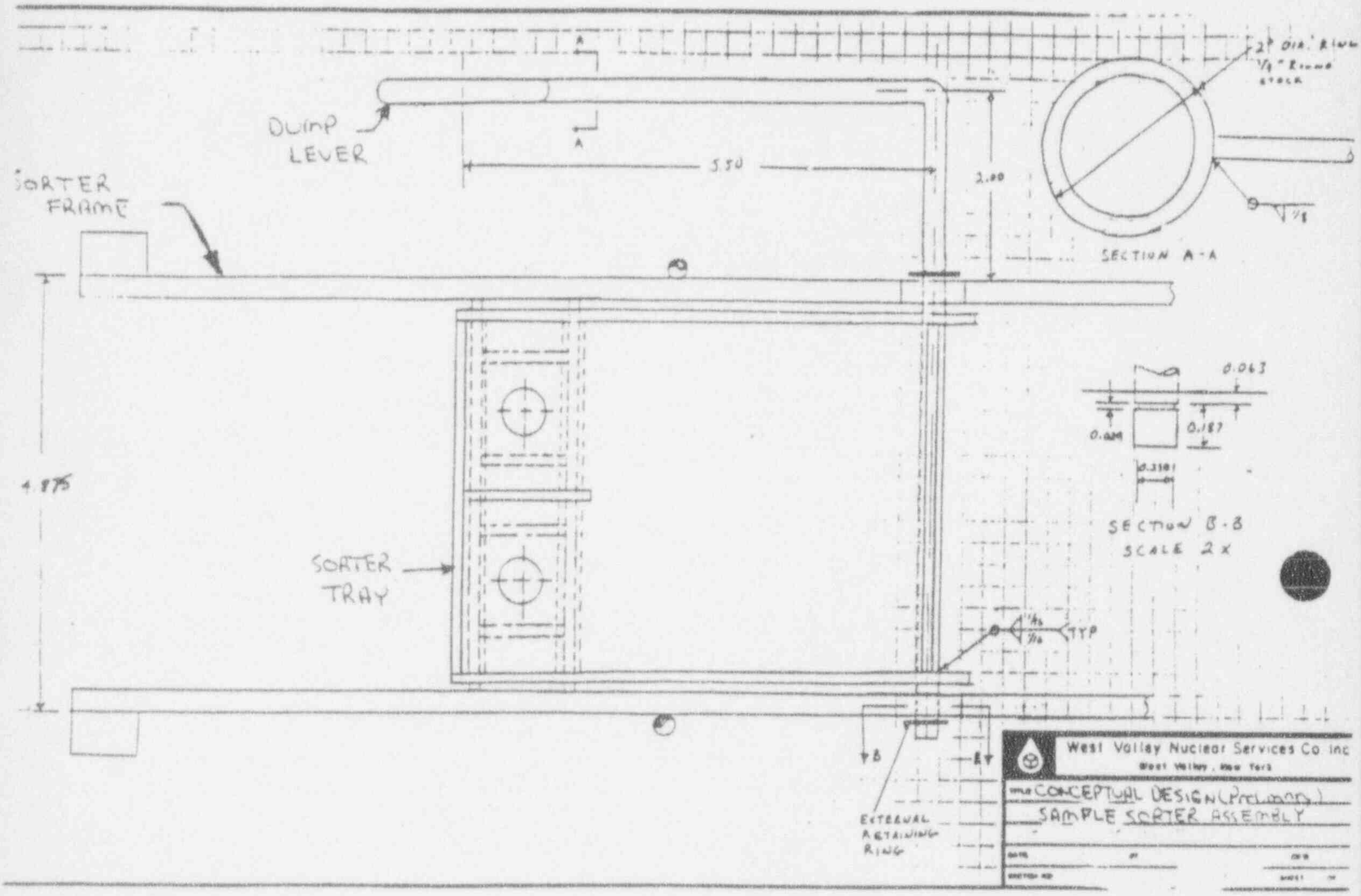
All equipment used to obtain glass shards from the canister prior to installing the lid is considered part of the Sampling System, System 69A. These tools are stored and used at the welding station, however, so they will be briefly mentioned here.

The Glass Shard Sampler consists of the Glass Shard Sampler Sorter Assembly (900D-5649), the Vial Rack (900D-5652), the Pickup Assembly (900D-5653), the Pickup & Tool Bracket (900D-5654), and the Sorting Tool (900D-5655). A general arrangement of these parts at the Weld Station is shown on 900D-5648 and Figure 2.5.1.

The Sorter and the Vial Rack are stored in the northernmost canister receptacle during normal operations. The Pickup & Tool Bracket is mounted to the Weld Station Hoist and supports the Pickup and the Sorting Tool when they are not in use.

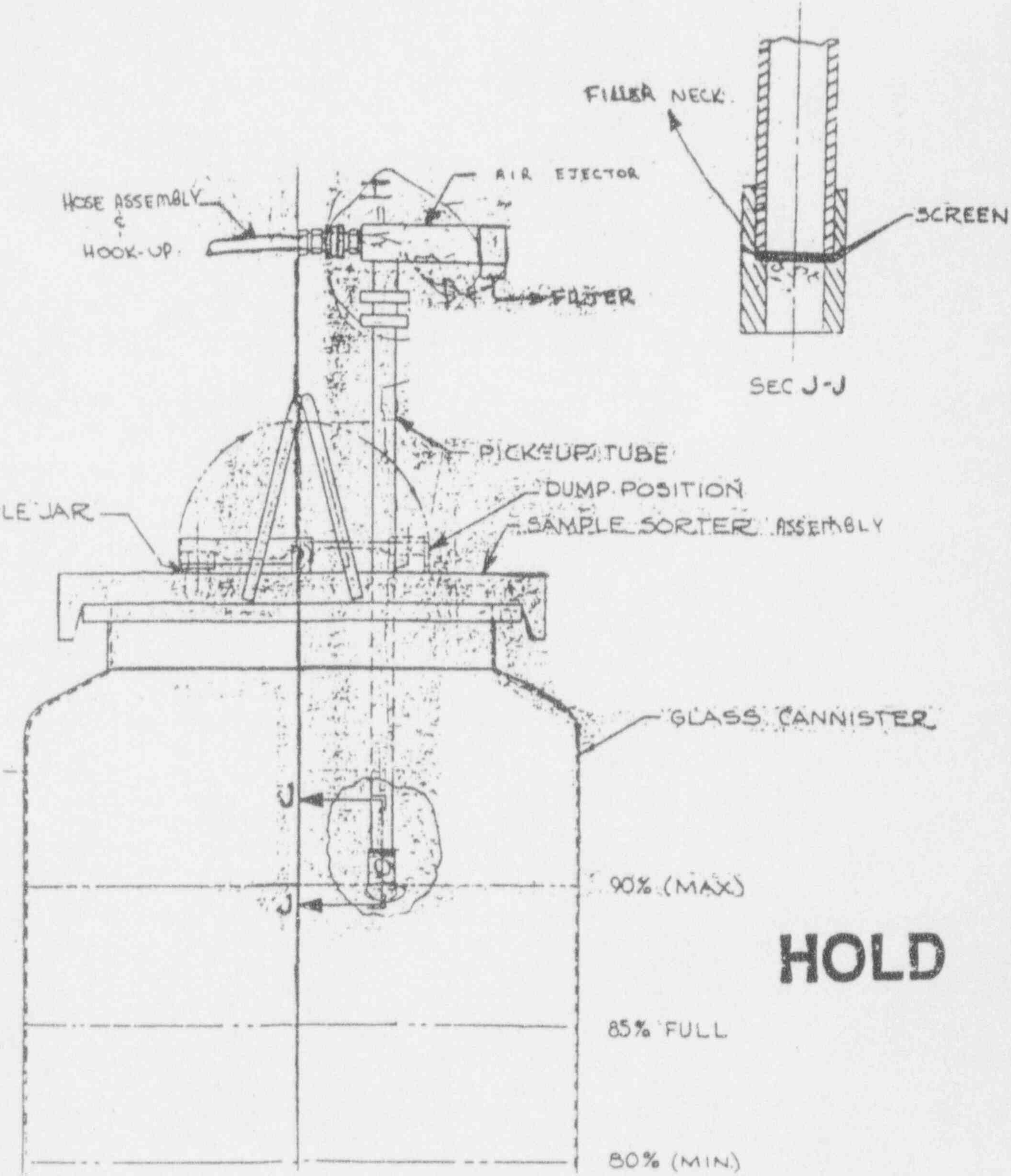
When it is desired to extract glass shards from a canister, the Sorter and Vial rack are placed on the canister flange using the MSMs. The Pickup is then used with the MSM to retrieve glass shards and place them on the Sorter. The Sorting Tool is used with the MSM to separate glass shards of the desired size and push them into the sample vials.

A more detailed description of the operation of the Glass Shard Sampling process is given in the VF Sampling System Description, WVNS-SD-69A.



HOLD

Figure 2.5-1: Sample Sorter Assembly (Conceptual Design)



HOLD

Figure 2.5-2: Sample Sorter Assembly and Vacuum Pick-Up Assembly on a Canister (Conceptual Design)

2.5.4 Flange Conditioning Tool

The flange conditioning tool, 63-V-114, weighs 160 kg (350 lb) and must be moved by the jib crane from its storage compartment onto the canister. The flange conditioning tool consists of the following components: turntable, drive, mill, mill indicator, three motors, wire brush, vacuum sealed receptacle, carrier yoke, and lifting bail.

The milling spindle cutters are center cutting, right hand, cobalt high speed steel, ground for milling a shallow groove in type 304L stainless steel. Cutter penetration depth into the flange is 1.575 ±0.127 mm (0.062 ±0.005") or 3.175 ±0.127 mm (0.125 ±0.005") depending upon which quill stop is employed. Mill radial position is adjustable from 211.07 mm (8.31") to 238.25 mm (9.38") with an accuracy of ±0.127 mm (±0.005"). The 1 HP milling head motor is variable speed but not reversible. The cutter is automatically fed along a circular path, concentric with the canister flange, at a remotely controlled feed rate in either a clockwise or counterclockwise direction.

The turntable drive, at the input to a wormgear reducer, is reversible with a running torque of 1.26 N-m (0.93 ft-lb). The turntable is driven by a 9/64 HP motor. Normal running speed is between 21.53 and 28.74 rpm, with an operating range of 0 to 35.6 rpm.

When in use the flange conditioning tool is mounted to and centered on the canister flange, whether there is no lid, a primary lid, or a secondary lid on the canister. The conditioning tool assembly is clamped to the canister flange such that it remains fixed while milling or wire brushing.

A chip vacuum is provided to collect chips that are created when the end mill is cutting. This is done to minimize the spread of debris around the welding station where such debris has the potential for compromising weld quality.

All needed hoses and cables are supported such that they are not dragged during operation. Connectors on electrical cables and hoses enable them to be remotely handled, plugged in, and unplugged from electrical receptacles and service line connections using the MSMs. Power for the flange conditioning tool is supplied by connection to electrical penetration #9811. Utility air supply hose from quick-connect nozzle #9407-B, line UA-1/2-4908, is connected to the centerline of the drive assembly, which runs the carrier yoke assembly. This temporary connection is only made when the wire brush is to be used. The UA hose may be stored with the tool in its storage compartment.

The weld milling station operator panel, 63-WMS-01 and 02, provides controls for power and speed of the milling spindle and turntable, with meters indicating both spindle speed and turntable speed. The control station is located at the east cell window between columns 3 and 3Z.

The flange conditioning tool is shown in Figure 2.5-3. Further details are shown in WVNS drawing 900-D-4312. The hose assembly attached to the nozzle is shown in Figure 2.5-4. Refer to WVNS drawing 900-D-5310 for details.

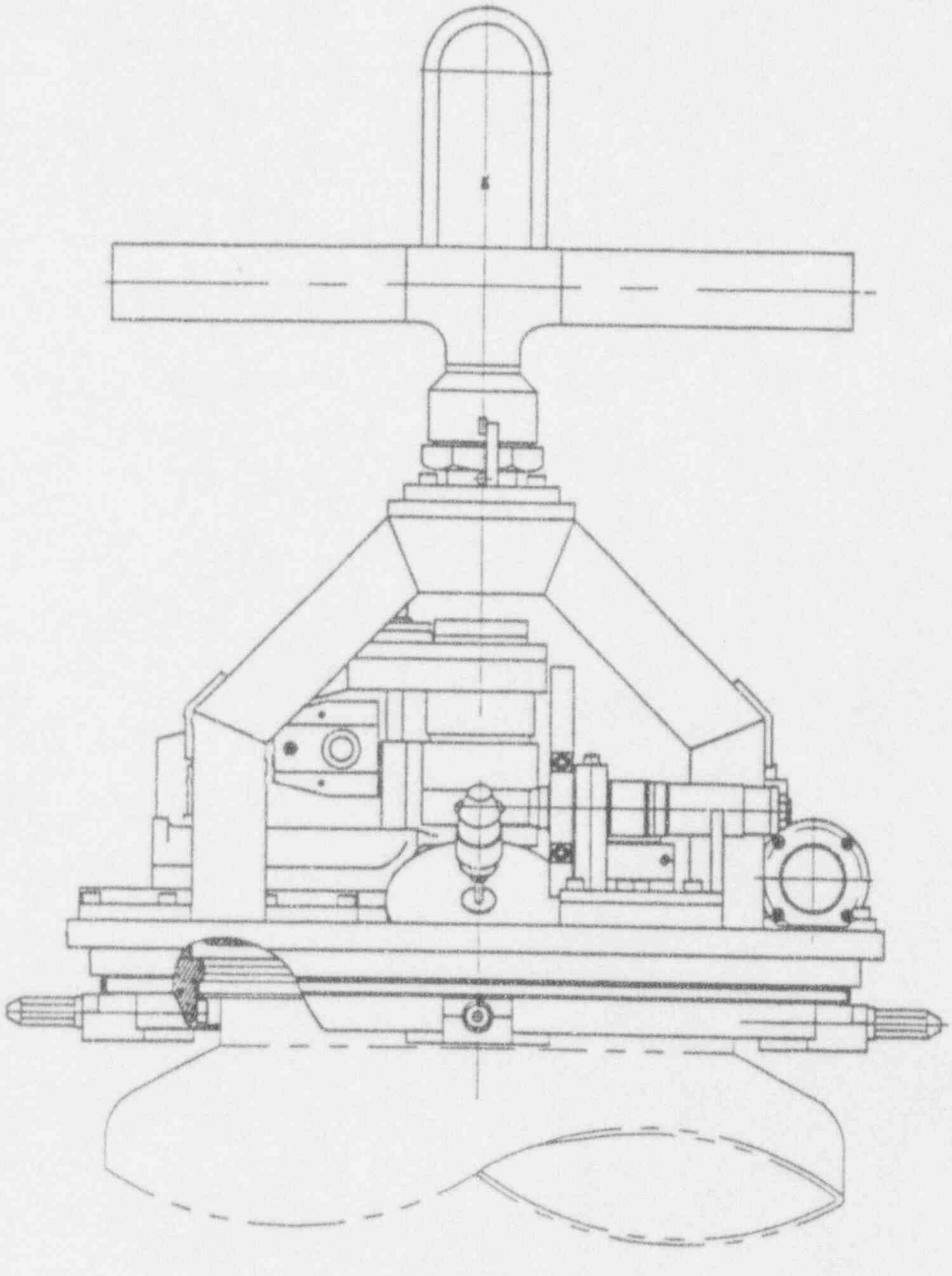


Figure 2.5-3: Flange Conditioning Tool on a Canister, Elevation View

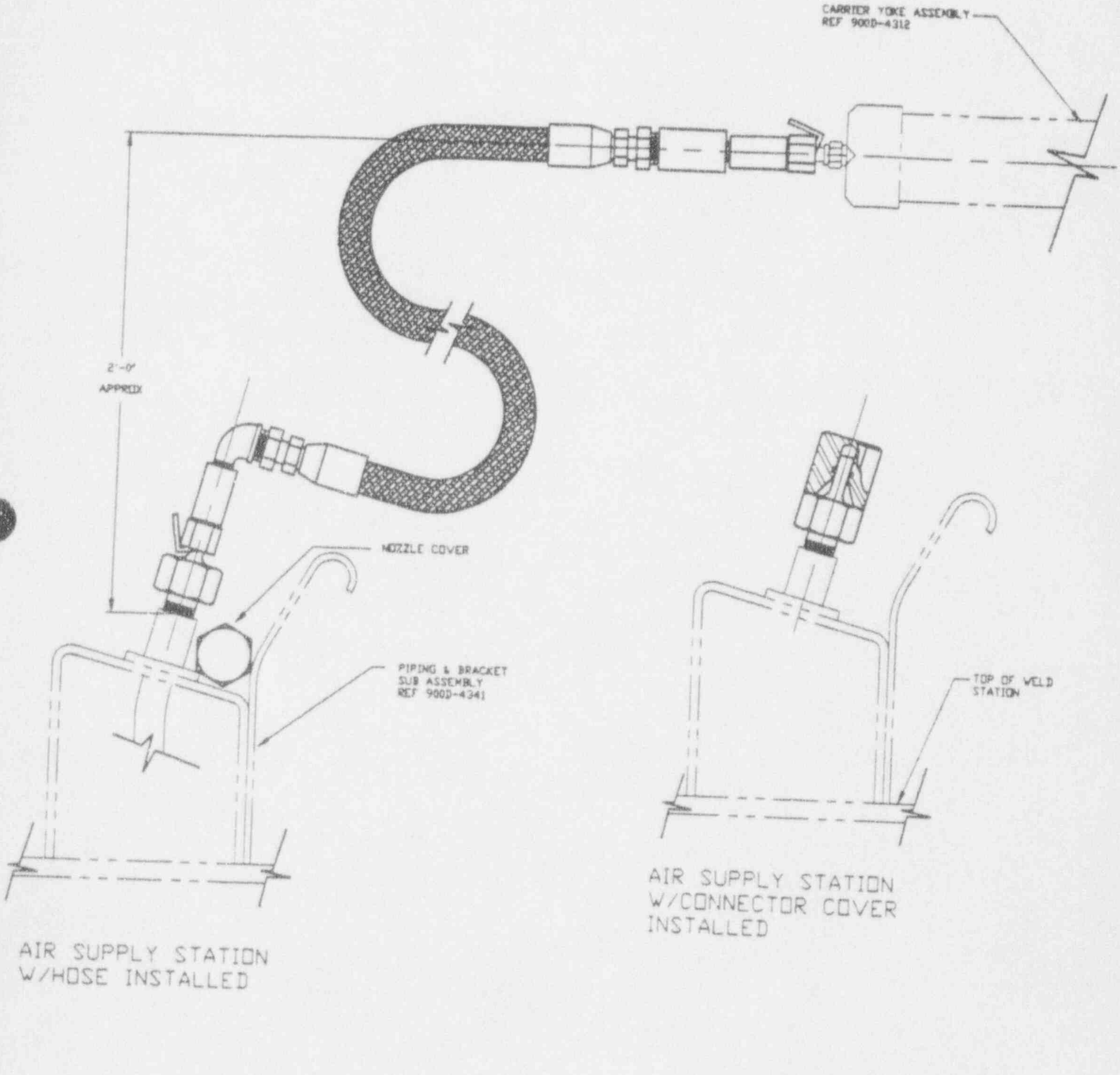


Figure 2.5-4: Hose Assembly Attached to a Quick-Connect Nozzle

2.5.5 Vacuum Lid Lifter

The vacuum lid lifter device, also referred to as the lid pick-and-place tool, is considered part of the weld station workbench, 63-V-049. This tool, fabricated from stainless steel, is used to pick up one lid from the lid magazine and place it on top of the canister. The vacuum lid lifter is retrieved and operated through the MSMs.

The lid lifter device consists of a vacuum generator connected to a pickup assembly by a polyurethane recoil hose assembly, 9.5 mm (3/8") inner diameter. The pickup assembly has a polyurethane o-ring on its end which makes secure contact with a lid. The vacuum generator produces enough suction to lift one 5.8 kg (12.7 lb) lid and hold it for positioning. The lid lifter vacuum generator is connected to utility air penetration #9407-C by line UA-1/2-4909. The lid lifter device is shown in Figure 2.5-5. Further details are shown in WVNS drawing 900-D-4288.

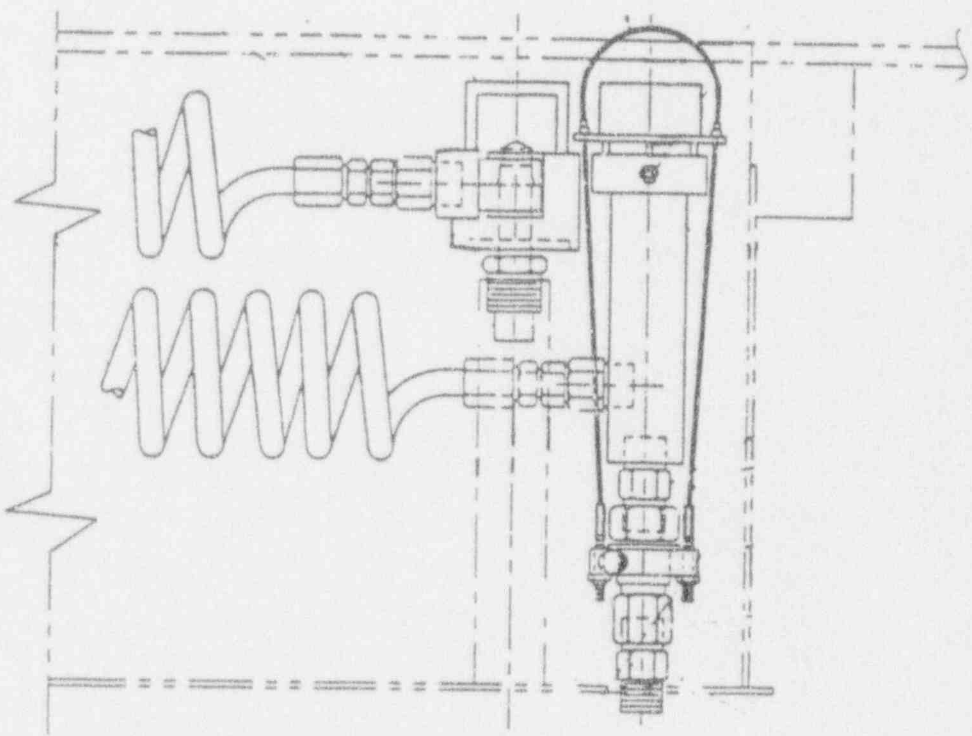


Figure 2.5-5: Vacuum Lid Lifter Device

2.5.6 Weld Head and Console

The portable canister lid welder, also referred to as the weld head, 63-V-061, is fabricated from stainless steel. This assembly consists of a guide track and support ring, carriage drive unit, torch, and cable assembly. A wire feeder system is mounted only when required for local repairs.

The weld head guide rail and support ring, about 686 mm (27") in diameter, are connected to a lifting bail which facilitates movement by jib crane. MSMs are used to guide the assembly when mounting on the outer diameter of the canister flange. Three steel lips on the support ring rest on the canister flange, assuring proper placement and fit.

The carriage drive unit supports the automatic voltage control head, vertical and cross-seam positioning slides, and cable connection block. When necessary for repairs, the carriage drive unit also supports the wire feed unit and filler wire spool. The carriage is gear driven by a miniature high-torque DC gear motor with tachometer generator for feedback signals. Normal carriage travel speed is 152 mm/min (6 inch/min). During the primary lid GTAW procedure, the carriage moves the torch with a travel time of 0.9 sec, and a dwell time of 1.2 sec as it pauses for a high current pulse.

The gas tungsten arc torch is air cooled. Power output is regulated based on workpiece, duty cycle, and travel speed. The standard 3.175 mm (0.125") diameter electrode is one of nonconsumable tungsten. The torch block with tungsten holder is removable from the welding head by means of a twist lock arrangement. Torch tilt angle and lateral position are adjusted by knobs on the slider bracket above the torch block. Adjustments can be made by MSM and positions read off the scales next to the knobs.

The wire feed assembly consists of a wire spool, guide nozzle, wire straightener, and motor. The wire feeder accepts size 0.889 mm (0.035") diameter wire on a standard 102 mm (4") dia. spool. A swivel arrangement allows radial and axial adjustment of the wire guide nozzle, and travels with the torch assembly. This system employs a miniature high-torque DC motor with tachometer generator feedback, and a drive with two opposed spring-loaded gear wheels. Wire feed speed range is 127 to 2515 mm/min (5 to 99 inch/min), with a normal speed of 1524 mm/min (60 inch/min) during repair welding.

The standard cable assembly consists of an electrode power cable, a ground cable, one gas hose, and a multi-conductor shielded control cable. All cables and hoses connect to the welding head and console by means of quick-disconnect couplings for ease of maintenance.

The weld head is shown in Figure 2.5-6. Details are shown in the manufacturer's set of drawings #4472501, and the reference manual, Operating and Maintenance Manual for Computerized Welding System Model CWS-486 & Canister Lid Welder Model WVN, Astro Arc Company, Sun Valley, California.

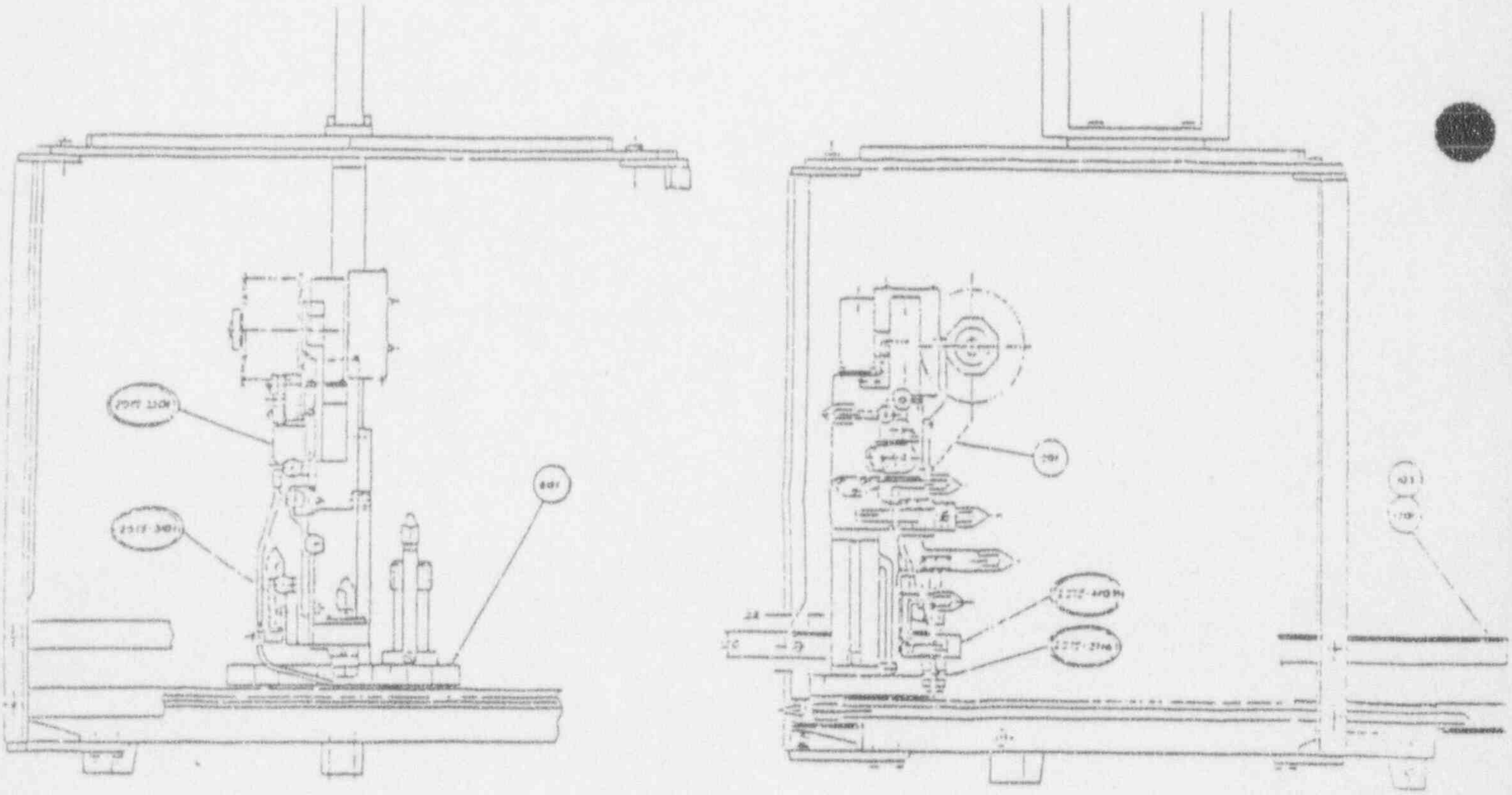


Figure 2.5-6: Canister Lid Welder

All weld head controls are handled by the welder control console, 63-V-060, which is located Ex-Cell at the CWS operators control panel. This controller workstation consists of a computer with a 486 processor, 3½" disk drive, color monitor, keypad, power system, and cover gas supply control system. All electrical cables and cover gas hoses for the weld head are connected to the console. A flowmeter within the cover gas connection monitors gas flow to the weld head in cubic feet per hour (CFH). This flow rate is displayed on the computer screen during welding. A standard printer and 4-channel strip chart recorder are available to record data for each canister weld. The strip chart recorder continuously records several weld parameters, while the printer is used for summary output after each weld.

Nine welding parameters are displayed on the screen: high and low current, high and low arc voltage, carriage speed, dwell and travel time, wire feed rate, and cover gas flow rate. These parameters are controlled to within 1% of the input values by the servo, which is run through the welding software provided by the equipment vendor. The software and weld parameters shall be qualified during testing at WVNS. The screen is refreshed every 10 milliseconds to display updated parameters. Readings are taken by the servo in less than 1 millisecond. The main console is shown in Figure 2.5-7.

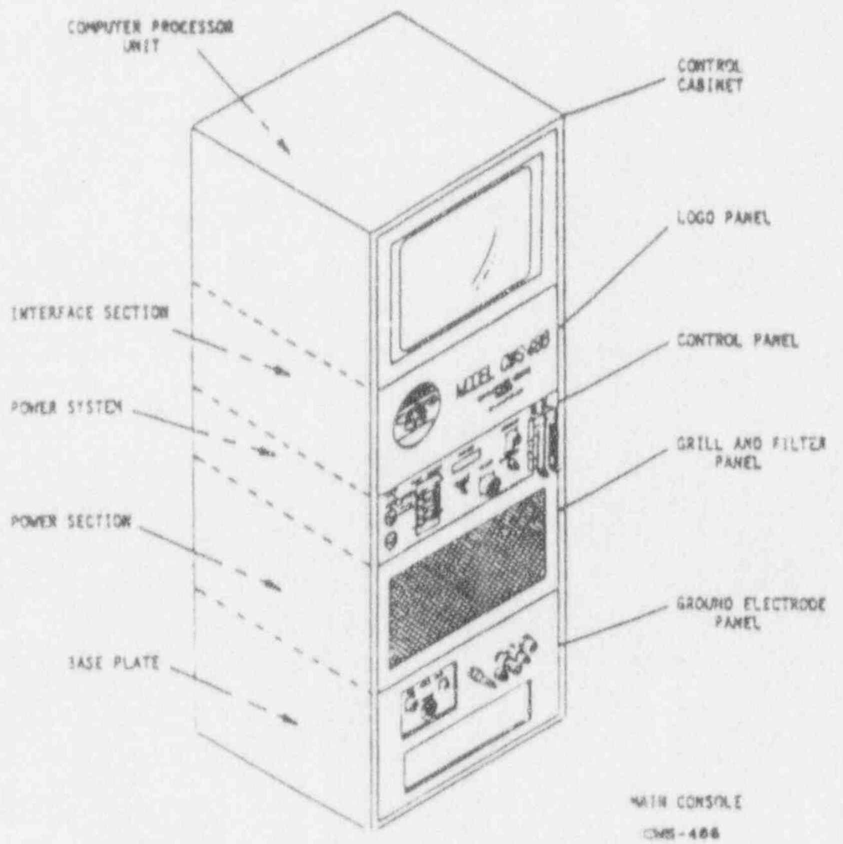


Figure 2.5-7: Welder Console

2.5.7 Glass Level Measuring Tool

While a variety of means are available for measuring the level of glass in the canister or inferring the glass level from measurements of weight, only one these will become a part of the canister production records. The others will be used by production personnel to monitor and control the vitrification process. The measurement for production records will be done at the canister welding station using a depth gage to measure from the top of the canister to the surface of the glass.

This depth gage is shown on drawing TBD.

2.6 Instrumentation and Control

2.6.1 Instrumentation

The list of instruments in the Canister Welding System is given in Table 2.6.

Table 2.6: Instrumentation

Weld Head				
Parameter	*Instrument*	*Nominal*		*Control Range*
		For Primary Welds:	*For Repair Welds:*	
High Current	TBD Sensor	220 amps	220 amps	210 to 230 amps
Low Current	TBD Sensor	70 amps	80 amps	60 to 90 amps
Arc Voltage (Dwell	TBD Sensor	10 v	10.5 v	5 to 20 v
Carriage Travel Speed	TBD Sensor	152 mm/min (6 inch/min)	152 mm/min (6 inch/min)	12.7 to 203.2 mm/min (0.5 to 8.0 inch/min)
Wire Feed	TBD Sensor	None	1524 mm/min (60 inch/min)	127 to 2032 mm/min (5 to 80 inch/min)

Table 2.6: Instrumentation (Continued)			
Flange Conditioning Tool			
Parameter	*Instrument*	*Nominal*	*Control Range*
Turntable Speed	Speed Potentiometer	21.53 to 28.74 RPM	0 to 35.6 RPM
Milling Spindle Speed	Speed Potentiometer	As Needed	TBD
Jib Crane			
Parameter	*Instrument*	*Nominal*	*Control Range*
Carriage Speed	Speed Potentiometer	28.57 RPM, or 8 m/min (25 ft/min)	0 to 35.3 RPM
Hoist Speed	Speed Potentiometer	3.7 m/min (12.0 ft/min)	0.2 to 8.0 m/min (0.4 to 26.0 ft/min)
Trolley Speed	Speed Potentiometer	1.3 m/min (4.3 ft/min)	0.4 to 12.2 m/min (1.3 to 40.0 ft/min)

2.6.2 Control

The weld head is interlocked such that welding cannot be initiated if cover gas supply is interrupted. The weld head arc will extinguish if weld parameters exceed acceptable range limits.

2.7 System Interfaces

The Canister Welding System interfaces with the systems identified in Table 2.7. The specific interfaces are itemized and quantified in the appendices.

Table 2.7: List of Interfacing Systems

Number	*System*
63F	Cell Walls & Ex-Cell Arrangement
63K	In-Cell Remote Handling Maintenance & Viewing System
63ED	VF Electrical Power Distribution System
63IA	VF Instrument Air System
63UA	VF Utility Air System
69A	VF Sampling System
200B	VF Instrumentation and Control Software System

3.0 OPERATION

3.1 Summary

The Canister Welding System is controlled locally, at the Weld Station, not from the control room. Canisters and lids are brought to the Weld Station by the process crane which may be controlled from several locations. The CCTV cameras over the Weld Station may also be controlled from several locations besides the Weld Station. All other operations, placing the lid onto the canister, taking glass shard samples, making glass fill height measurements, inspecting the canister flange, operating the flange conditioning tool, placing the lid onto the canister, welding the lid, inspecting the lid weld, and making weld repairs (if necessary), are totally controlled at the Weld Station.

Normal safety precautions for Gas Tungsten Arc Welding and hoisting and rigging should be observed during this procedure.

CAUTION

Care must be exercised when either the jib crane or MSMs are engaged to retrieve tools, lids, storage covers, or the weld head. Do not exceed the maximum load limit of 230 kg (500 lbs) for the jib crane. The MSMs should be limited to lifting objects about 7 kg (15 lbs) or less.

CAUTION

Before a canister is transported to or from the weld station by the process crane, the weld station operator should use some precautions. The MSMs should not be extended in the path of the canister to or from its holding compartment. The jib crane should be moved away from the canister holding compartment so that a suspended canister does not bump it or get caught on it.

3.2 Positioning of Filled Canister

3.2.1 Transport to CWS

Canister transport from the turntable or in-cell storage rack is controlled by the cell crane operator. The weld station operator should check that the MSMs are not extended in the path of the suspended canister. Also check that the jib crane is not positioned too close to the canister compartment. Move the jib crane out of the way if necessary.

Once the process crane is in position over the workbench, lower the canister into its holding compartment at a rate no greater than 1.5 m/min (5 ft/min).

Once the canister is secure, release the grapple hold, and raise the crane hook.

If a temporary cover is on the canister, remove and store it for reuse.

3.2.2 Storage Compartments

Two canister compartments in the CWS workbench allow for holding of canisters during off-normal situations (i.e. backup at decon station, removal/repair of a grapple "stuck" on a canister). Normally, the glass shard sampling equipment is stored in the spare canister compartment. If required, equipment can be placed elsewhere on the CWS workbench and a canister temporarily stored in the compartment.

3.3 Glass Shard Sampling

Refer to the System Description Document WVNS-SD-69A for a detailed description of the Glass Shard Sampler and its operation at the Weld Station.

3.4 Glass Fill Height Measurement

Prior to welding a lid onto the canister the glass level will be measured, from the top of the canister down. This information will be reported in the production records.

A measuring tool, shown on drawing TBD and in Figure TBD, is stored at the Weld Station and is used as a depth gage to measure the distance from the top of the canister flange to the glass level.

3.5 Weld Prep Area Inspection and Cleaning

3.5.1 Inspection

By remotely maneuvering CCTV cameras, visually inspect the weld prep area. This area includes the canister neck and flange. Primarily check for debris that could prevent the lid installation or that could contaminate the weld, causing porosity or other undesirable features.

3.5.2 Cleaning and Conditioning

If any anomalies are found such that the prep area is not acceptable for a weld, clean and condition the flange as necessary. This is achieved by using the flange conditioning tool for milling or wire brushing.

Using the jib crane, remove the cover from the tool storage compartment. Place cover on workbench.

Using the jib crane, retrieve the flange conditioning tool from its storage compartment. Place the tool on top of the canister neck and tighten the four clamps on the base of the flange conditioning tool to the canister flange. Check visually via CCTV cameras to verify that the conditioning tool is properly seated.

Using the MSMs, plug the tool's power cord into electrical connection plug from penetration #9811.

Using the MSMs, plug the tool's utility air hose into quick-connect nozzle 9407-B on the workbench.

If machining is required:

Press main power "ON" button on operator control panel.

Position the cutter where needed. Verify correct depth stop is in place.

Begin milling operation by pressing "START" button, for the milling spindle..

Plunge cutter to depth and engage quill lock.

Initiate motor operation and select turntable direction by moving three-position "FORWARD/OFF/REVERSE" switch to appropriate setting.

Adjust turntable speed and milling spindle speed as necessary using Speed Control Potentiometer on control panel. Monitor these speeds from meters on the panel.

After milling is complete, push "STOP" buttons, first for turntable then for spindle. Push main power "OFF" button on control panel.

Release Quill Stop.

Raise Spindle/Cutter.

If wire brushing is required:

Press main power "ON" button on operator control panel.

Press "START" button for turntable.

Initiate motor operation and select turntable direction by moving three-position "FORWARD/OFF/REVERSE" switch to appropriate setting.

Position the wire brush where needed.

To initiate wire brush motor, turn on utility air supply to nozzle 9407-B.

Complete wire brushing as needed.

Turn off utility air supply. Press "STOP" button for turntable. Press main power "OFF" button on control panel.

After machining and/or wire brushing:

Using MSMs, unplug electrical power cord and utility air hose from supply connections. Return hose to tool storage compartment.

Return the flange conditioning tool to its storage compartment using the jib crane. Replace cover.

Perform a final check by visual inspection.

3.6 Lid Placement

Canister Air Purge:

It may be necessary to purge the air from the canister before placing the lid. This will be so if it is determined that the moisture content of the air in the canister is high enough to allow condensation within the canister during normal handling, storage or shipping. Tests which are currently planned will determine whether such a purge is necessary.

Clean dry air or an inert gas will be piped to one of the six ports on the weld station in front of the window if purging is required. A flexible hose and nozzle will also be provided. This hose will be connected to the appropriate port on the weld station using the MSM. The nozzle end of this hose assembly will be inserted into the top of the canister and the purge gas turned on. After the purge gas has been allowed to flow for sufficient time, the gas is turned off, the nozzle is withdrawn from the canister, and the lid placed as quickly as possible to prevent convection currents diluting the purge gas in the canister.

Lid Placement:

Using the jib crane, remove the cover from the lid lifter storage compartment and place it on the workbench. Remove the cover from the lid magazine and place it on the workbench.

Using the MSMs, retrieve the lid lifter device from its storage compartment. Position lifter over lid magazine.

To engage vacuum, turn on supply to utility air line UA-1/2-4909 (same as nozzle 9407-C).

Lower the device onto a lid.

Lift one lid and place it on the canister. Visually check alignment and fit within allowable tolerances (see Figure 2.2-1).

To disengage vacuum, turn off utility air supply.

Return lid lifter device to storage compartment by MSMs. Using the hoist replace covers on storage compartments for both the lid magazine and the lid lifter.

3.7 GTAW Welding Process

Using the jib crane, remove the cover from the weld head storage compartment and place on the workbench.

Using the jib crane, retrieve the portable welding head from its storage compartment. Place welding head on canister using MSMs to guide into alignment. Visually check the weld head setup. Verify the fit of the weld head on the canister and the general condition of all equipment is acceptable.

Using the MSMs, raise the cable support arm on the weld head so that cables will not interfere with weld head operations.

At the welder console, connect the following 4 weld head cables to indicated plugs on front panel: control signals, electrode, ground, and arc gas hose.

Verify that the local safety switch for the 480 VAC is open. Connect the main power cable, 3-phase 480 VAC, from the wall to the plug at the back of the console. Connect the cover gas supply hose, Line 6-SG-3/8-4910B, from the wall to the plug at the back of the console.

Verify cover gas system supplies 7.25 kPa (50 psi) minimum of helium-argon mix by reading PI-4910 on wall at weld station.

Throw local safety switch for 480 VAC receptacle on wall to "ON" position.

Open door to disk drive on upper right side of console. Insert 3½" program disk into drive and close door.

Visually check condition of tungsten electrode. Visually check lateral and angular positions of torch block by indications on slider bracket (next to adjustment knobs). Assure conditions are appropriate for primary lid welding as dictated by the lid welding SOP.

Notify Shift Supervisor and obtain permission to proceed.

Throw circuit breaker switch on front of main console to "ON" position.

Following on-screen program, enter required data through the keyboard: canister ID number, welder ID number and name, time, date, etc. [TBD].

At Screen 0, select "WELD" mode by pushing "+" (plus sign) key twice on keypad. Verify Weld Schedule #1 is chosen for tacking procedure.

Press "GAS TEST" button beneath screen. Verify cover gas flow rate shown on screen is at least TBD CFH. After 10 seconds, press "GAS TEST" button again to stop test.

Verify strip chart recorder and printer are turned on and paper is aligned.

Press "START" button beneath screen. Press "ENTER" key on keypad to initiate automatic tacking sequence.

Visually verify that 3 tack welds have been made.

Select "WELD" mode by pushing "+" (plus sign) key twice on keypad. Press "↑" (up arrow) key once and "+" (plus sign) key once to select Weld Schedule #2, Primary Weld Procedure.

Press "START" button beneath screen. Press "ENTER" key on keypad to initiate automatic procedure.

Monitor parameters on screen during weld procedure. Using CCTVs, verify welding is complete.

Print weld information by pressing "5" key on keypad.

Throw circuit breaker switch on front of main console to "OFF" position.

Return weld head to storage compartment using jib crane. Replace cover.

Weld is visually inspected by WVNS Quality Assurance Certified Welding Inspector. Acceptance is based on: 1) weld parameters, as documented in production records, are within qualified range, and 2) weld passes visual acceptance criteria.

If weld is acceptable, remove program disk from console. Remove output from printer and strip chart recorder; save as production records. Turn off printer and chart recorder. Throw local safety switch on wall to "OFF" position. Disconnect all lines, 4 in front, 2 in back of console.

If weld is unacceptable, remove program disk from console. Remove output from printer and strip chart recorder; save as production records. Turn off printer and chart recorder. Throw local safety switch on wall to "OFF" position. Disconnect all lines, 4 in front, 2 in back of console. Follow repair weld procedures as necessary.

3.8 Weld Inspection and Repair

NOTE

Helium leak tests will not be performed in-cell during hot operations.

3.8.1 Visual Inspection

Visual inspection is performed via CCTV by a Certified Welding Inspector (CWI).

Check weld parameters from output of printer and strip chart recorder at welder console. Assure weld parameters are within qualified range.

Acceptance criteria for remote visual inspection of the canister lid closure weld were developed using the ASME Code criteria methodology. The criteria to be used are as follows:

A. No linear indications are allowed. Any indication with a length greater than 3 times its width is considered to be linear.

B. No singular round indication greater than 2.4 mm (3/32") is allowed. Indications are singular if they are more than 25.4 mm (1") from each other.

C. A group or string of more than 4 rounded indications 1.6 mm (1/16") in diameter and 4.8 mm (3/16") apart is not allowed.

3.8.2 Repair Weld

If the weld fails inspection, some recovery options may include the following:

Schedule	Description
#2	Reweld primary lid (autogenous)
#3	Local repair of primary weld (autogenous)
#4	Local repair of primary weld with filler metal
#5	Reweld primary lid with filler metal
#6	Tacking procedure for secondary lid
#7	Autogenous weld of secondary lid

#8	Local repair of secondary lid weld (autogenous)
#9	Local repair of secondary lid weld with filler metal

The above options are each programmed as a separate schedule for the welder control program provided by the vendor.

Filler material must be Type 308L stainless steel weld metal, which conforms to AWS specifications and the additional constraints on filler metal found in WVNS-EQ-382, The WVNS HLW Canister Equipment Specification. Assure this wire is available on the spool; install the wire feeder assembly on the weld head.

Another repair option is to mill out a local defect, then perform a local repair with filler metal. Yet another option is to mill off the entire primary and/or secondary lid(s), replace and repair as necessary. Use the flange conditioning tool if any milling is necessary.

Secondary lids are to be brought in-cell as needed. Before welding a secondary lid, the welder torch angle and position may have to be adjusted. Do this remotely by using the MSMs to turn the appropriate knobs at the weld head. Above the torch block, connected to the slide bracket are the angle and position adjustment knobs. The upper knob adjusts the lateral (in/out) position of the torch block cross-seam. Graduations on the side of the bracket indicate cross-seam position. The lower knob adjusts the torch tilt angle within ±10° from the vertical axis. Graduations on the side of the bracket near the lower knob indicate angular position. See Figure 3.7-1 for location of adjustment knobs.

Actual repair procedures will be developed and qualified and then performed according to approved SOPs.

The CWI shall perform visual inspections after repair welds are completed.

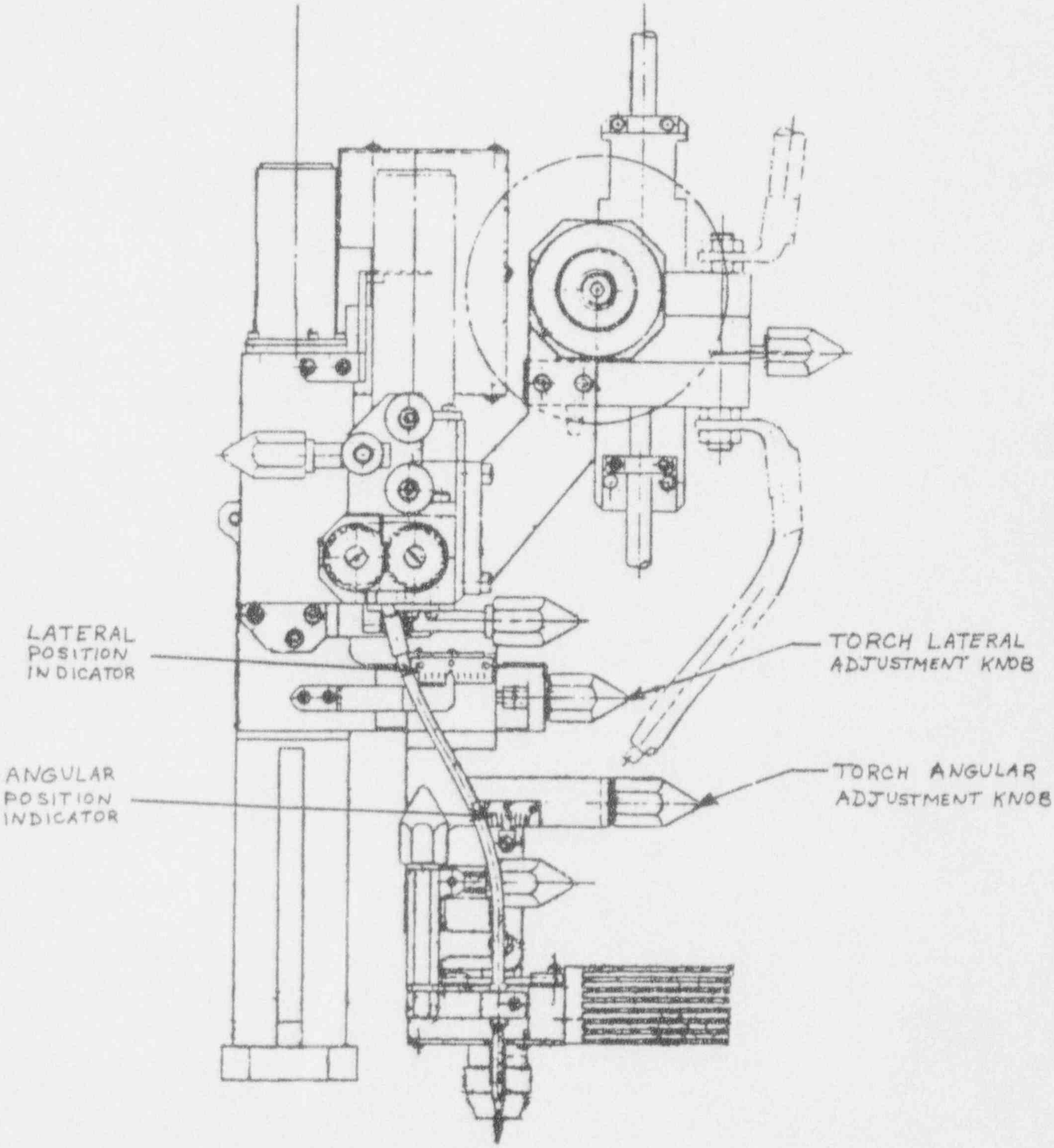


Figure 3.7-1: Weld Head Assembly Showing Torch Adjustment Knobs

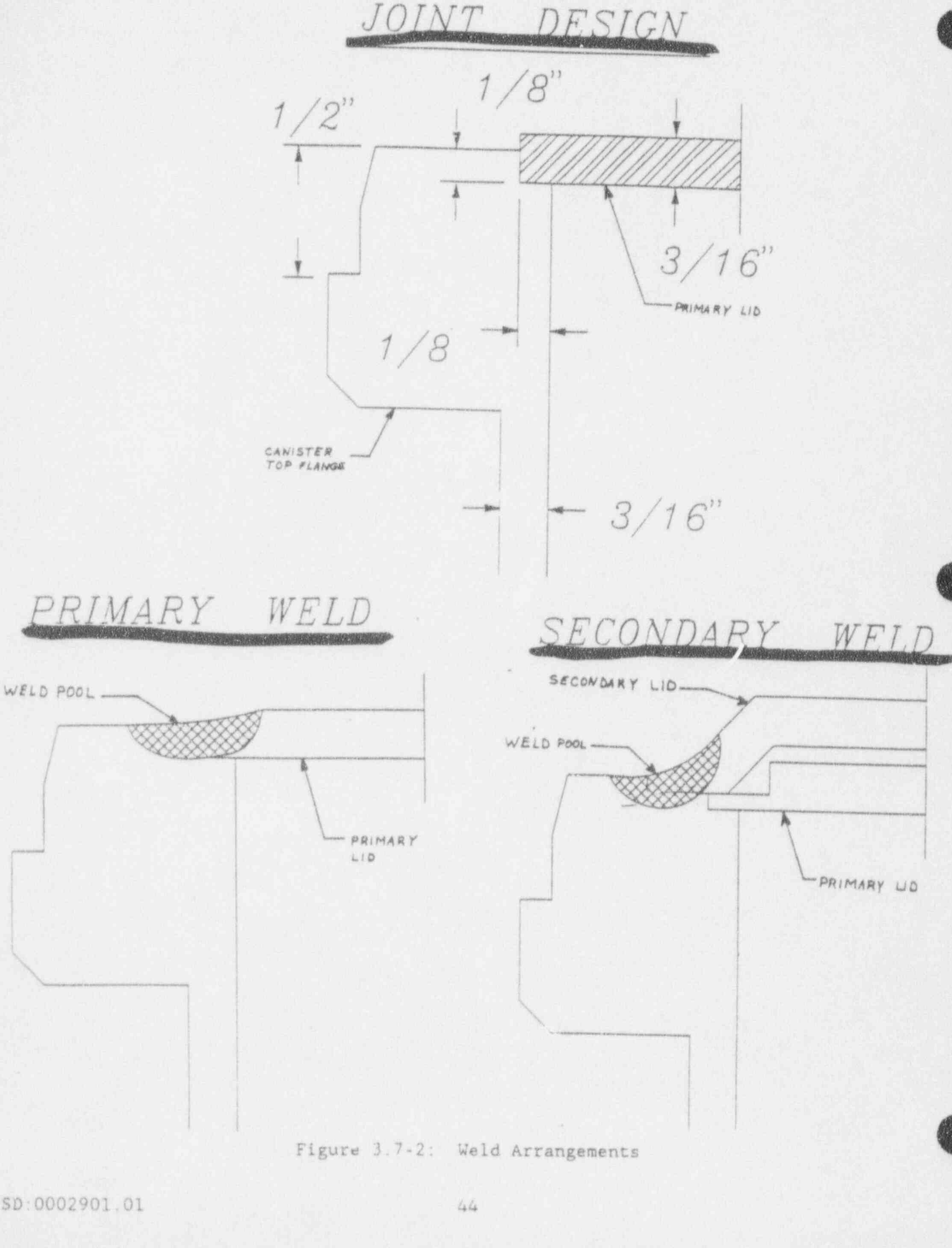


Figure 3.7-2: Weld Arrangements

3.9 Canister Transfer

Once canister closure is complete, the cell crane operator shall position the process crane with a grapple over the sealed canister in its CWS compartment.

Lower the grapple onto the canister, assuring that the lifting flange is engaged. Lift at a rate no greater than 1.5 m/min (5 ft/min).

Transfer the canister to the decon station or in-cell storage rack, as needed.

3.10 Valve Position Table

Table 3.9 lists normal positions for all valves during operation, and valve descriptions.

Table 3.9: Operational Valve Position Table		
Valve Number	*Valve Description*	*Normal Position*
AR-H-001	Block Valve, Argon Gas Supply to Line 4906A, Nozzle 9608-A	Closed
AR-H-002	Block Valve, Argon Gas Supply to Line 4904A, Nozzle 9608-C	Closed
IA-H-090	Block Valve, Instrument Air Supply to PI-4905	Open
IA-H-091	Block Valve, Instrument Air Supply to Line 4905A, Nozzle 9608-B	Open
SG-GV-002	Gauge Valve, Cover Gas Supply to PI-4910	Open
SG-H-001	Isolation Valve, Cover Gas Supply from Main Line 4910	Open
UA-GL-078	Block Valve, Utility Air Supply to Line 73, Nozzle 9407-C	Open
UA-H-130	Block Valve, Utility Air Supply to Line 96A, Nozzle 9407-A	Open
UA-H-131	Block Valve, Utility Air Supply to Line 95A, Nozzle 9407-B	Open

3.11 Alarm Responses

3.11.1 Cover Gas Supply Low

A. Verify alarm condition exists as indicated by red light and buzzer alarm on PAL-4910 at weld station.

B. The probable cause is the switching of an automatic changeover manifold from one exhausted set of ex-cell cover gas supply cylinders to the full backup set. Another possible cause is that the gas supply in both sets of gas cylinders is close to being depleted (pressure is low).

C. If the cause of the alarm is the automatic switching from one set of gas cylinders to the backup set, allow any welding process that is in progress to go to completion, and immediately replace the depleted set of gas cylinders before initiating another weld. Reset the alarm.

D. There should never be a case in which the cause of the alarm is that the gas supply in both sets of cylinders is low because each set is replaced by a new set as soon as possible after it is depleted. If, however, due to some error or malfunction, the cause of alarm is that both sets of gas cylinders is close to being depleted, verify availability of adequate gas supply by noting that PI-4910 indicated at least 7.25 kPa (50 psig) in the operating gas supply cylinders. Allow any welding process that is in progress to go to completion, and immediately replace the depleted set of gas cylinders before initiating another weld. Reset the alarm.

E. The red alarm lights on PAL-4910 will remain lit until cover gas pressure of 7.25 kPa (50 psig) has been reestablished. The a green light on the alarm panel will indicate adequate supply of cover gas. Be sure that empty canisters are replaced.

3.11.2 Cover Gas Not Engaged

A. Verify alarm condition exists as indicated by automatic procedure stop and "No Arc Gas" program interrupt message on welder console display screen.

B. The direct cause is absence of cover gas at the weld head. Possible root causes include (1) valve to gas supply is closed, (2) rupture or blockage in supply line, and (3) all supply cylinders are empty, and (4) failure of the automatic switchover mechanism.

C. Lack of cover gas during the welding procedure will result in a contaminated, oxidized molten pool and, possibly, an unacceptable seal. Absence of cover gas trips an interlock which extinguishes the arc and stops weld head movement.

D. Assure that computer program interrupt procedure has occurred. Assure that arc is extinguished. Do not initiate welding until cover gas flow is restored. Then, resume normal operations.

E. Investigate and correct the root cause for the alarm.

3.11.3 Weld Parameters . d Limits

A. Verify alarm condition exists as indicated by automatic procedure stop and "Tungsten arc voltage too high [OR] too low" program interrupt message on welder console display screen.

B. The probable cause is that arc voltage or amperage has reached or come very close to shutoff limits. This will occur when amperage varies by ±10 amps from the input value. This shutoff will also occur when arc voltage drops to 5 volts or increases to 20 volts.

C. Continuation of welding under conditions which exceed limits may produce a seal that does not meet leak tightness criteria, and may damage the weld head. When welding parameters exceed limits, an interlock will extinguish the arc, stop weld head movement, and allow cover gas to flow for TBD (about 20) seconds to allow the molten pool to cool properly. Cover gas is then automatically shut off.

D. Assure that computer program interrupt procedure has occurred. Assure that arc is extinguished. Assure cover gas remains flowing over weld for TBD seconds, and supply to weld head is then automatically turned off. Notify Shift Supervisor, Site Welding Engineer, and QA Engineer. Visually inspect weld head for damage, and inspect weld for anomalies. Use TBD procedure to complete weld. Then, resume normal operations.

E. Investigate and correct the root cause for the alarm.

3.11.4 Other Program Interrupt Messages

A. Verify alarm condition exists by one of the following program interrupt messages appearing on the console screen:

- No ground feedback from welding head
- No open circuit voltage
- No boost voltage
- Check arc starter

B. The probable cause is an internal problem with the power source, computer, or connections within the console or weld head.

C. Continuation of any welding operations under these conditions may seriously damage the electrical connections, power source, and computer for the weld head.

D. Assure that computer program interrupt procedure has occurred. Assure that arc is extinguished and cover gas supply closed. Notify Site Welding Engineer. Normal operations cannot proceed until corrections have been made by Welding Engineer.

E. Investigate and correct the root cause for the alarm.

4.0 SYSTEM LIMITATIONS, SET POINTS AND PRECAUTIONS

4.1 Weld Parameter Limitations

All weld parameter alarms consist of program interrupt messages from the controlling computer. These occur when one or more welding parameters deviate from the input value(s) by more than 5%. These limits will be different for each different weld sequence.

Program interrupt messages appear on the console screen as the program stops the procedure in progress. The computer will extinguish the arc, stop weld head movement, and allow cover gas to flow in a post-purge sequence for several seconds.

During the post-purge sequence, a small, emergency reserve of cover gas is released over the molten weld pool for about 20 [TBD] seconds. This precaution prevents oxidation and contamination of the weld pool until it solidifies. The post-purge will initiate if normal cover gas flow is interrupted during a welding procedure. Causes for such an interruption may include a power failure, closed valve to gas supply, and automatic program stop.

4.2 Cover Gas Interlock

The only control panel alarm at the welding station is the alarm which sounds when the automatic changeover manifold at the welding gas supply switches from one depleted set of canisters to the full backup set. This interlock does not effect a welding procedure in progress since constant gas supply pressure is maintained. An alarm light and sound will turn on at the TBD control panel at the weld station.

4.3 Crane and MSM Load Limits

Caution must be exercised when either the jib crane or MSMs are engaged to retrieve tools, lids, storage covers, or the weld head. The maximum load limit for the jib crane is 230 kg (500 lbs). The MSMs should be limited to lifting objects about 7 kg (15 lbs) or less. Although their manufacturer's specifications allow a much higher load, higher loads shorten the life of the MSM.

4.4 Canister Transfer Precautions

Before a canister is transported to or from the weld station by the process crane, the weld station operator should use some precautions. The MSMs should not be extended in the path of the canister to or from its holding compartment. The jib crane should be moved away from the canister holding compartment so that a suspended canister does not bump it or get caught on it.

4.5 Instrumentation Limits

The instrumentation limits for the jib crane and milling controls are listed in Table 4-1.

Table 4-1: Limits, Set Points, and Alarms

Weld Head

Parameter	*Instrument*	*Limits*	*Set Points*		*Alarms & Interlocks*
			For Primary Welds:	*For Repair Welds:*	
Current	TBD Sensor	±10 amps	High: 220 A Low: 70 A	High: 220 A Low: 80 A	Greater than ±10 A variance (extinguish arc)
Arc Voltage (Dwell)	TBD Sensor	MIN: 5v MAX: 20v	10 v	10.5 v	LOW or HIGH (extinguish arc)
Cover Gas Supply Pressure	PAL-4910 PI-4910	MIN: 7.25 kPa (50 psig)	7.25 kPa (50 psig)	7.25 kPa (50 psig)	LOW (supply changeover or extinguish arc)

Table 4-1: Limits, Set Points, and Alarms (Continued)

Valves

Valve Number	*Description*	*Set Point*	*Alarms & Interlocks*
PRV-4905	Pressure Reducing Valve, Instrument Air Supply	TBD	N/A
PRV-4909	Pressure Reducing Valve, Utility Air Supply	TBD	N/A
PRV-4910A	Pressure Reducing Valve, Cover Gas Automatic Manifold to Atmosphere	1724 kPa (250 psig)	N/A
PRV-4910B	Pressure Reducing Valve, Cover Gas Supply Line to Atmosphere	517 kPa (75 psig)	N/A

5.0 CASUALTY EVENTS AND RECOVERY PROCEDURES

This section identifies the casualty events that could affect the system, and the protection provided against those casualties by the system design. It also outlines the system design features and recovery procedures which will mitigate the consequences of the casualties and restore the system to a known and confirmed safe condition.

5.1 Casualty Events

The following is a list of the casualty events considered. This list is not intended to be all inclusive.

- Loss of Site Power
- Loss of Cover Gas
- Loss of Utility Air
- Loss of Instrument Air
- Tornado
- Earthquake

5.2 Design Features to Mitigate Effects of Casualty Events

This subsection briefly outlines the design features which provide protection from casualty events and mitigate the effects of such events.

5.2.1 Loss of Site Power

Upon loss of site power, the ability to use cranes, tools, CCTV cameras, the weld head, and the welder console computer and printer will be lost. Normal operations must stop.

No auxiliary power supply exists for the console computer and printer. However, all data is not lost because the strip chart recorder has continuously recorded several weld parameters during weld procedures.

Normal flow of welding cover gas will also be lost. If site power is lost while welding, the arc is extinguished, carriage travel stops, but emergency gas supply maintains cover gas for about 20 [TBD] seconds until the molten pool solidifies. The system is then set in a safe condition before power is restored.

5.2.2 Loss of Cover Gas

Upon loss of the helium-argon mix cover gas, the ability to protect the molten weld pool from oxidation and contamination during welding will be lost. This is considered a serious problem that will halt routine operations of the Canister Welding System. An interlock will extinguish the arc and stop carriage movement. Emergency gas supply will automatically maintain cover gas for about 20 [TBD] seconds until the molten pool solidifies. Welding cannot be initiated if cover gas flow is not restored.

5.2.3 Loss of Utility Air

Upon loss of utility air, the ability to operate the lid lifter vacuum generator, the shard sampling wand vacuum generator, and the wire brush on the flange conditioning tool will be lost. A temporary loss of utility air is considered a problem to overall system operation, however, actual lid welding can still occur.

5.2.4 Loss of Canister Purge Gas (Instrument Air or Argon, TBD)

Upon loss of canister purge gas, the ability to purge the air within the canister will be lost. In the case of instrument air loss, the constant flow of purge air over the lids in the storage rack will be lost. While a temporary loss of this nature is a problem, it is not critical to the actual welding process. Purging of the canister may or may not be required. If it is required, loss of purge gas will stop weld station operations at the point where purging should occur (before lid placement).

5.2.5 Tornado

The Vitrification Cell which contains the Canister Welding System is designed to withstand a design basis tornado. Therefore, a tornado would not be expected to damage, or to release radioactive materials from, the Canister Welding System.

5.2.6 Earthquake

The Canister Welding System has been designed to withstand seismic loads and to remain standing following a design basis earthquake. The Vitrification Cell in which the Canister Welding System is located, and the associated ventilation system, have been designed to survive such an earthquake, thereby effectively containing any contamination which may be released from the Canister Welding Station during or after an earthquake. All system equipment mountings and supports are seismically designed to UBC Zone III, importance factor 1.5.

with the addition of a vertical acceleration equal to 2/3 of the horizontal component.

5.3 Recovery from Casualties

This subsection outlines the recovery procedures performed by facility operating personnel to restore the system to a known, safe condition; to mitigate the effects of casualty events; and to assure personnel safety.

5.3.1 Loss of Site Power

While efforts are made to restore electrical power, routine operations must cease. In the event that power is lost during a welding procedure, and normal cover gas flow is lost, assure that the emergency reserve of cover gas is deployed over the weld pool for 20 [TBD] seconds. During a power failure, the welder controlling computer and printer will be down. Assure the strip chart recorder has provided continuous output of weld parameters up to the point of power failure.

Return the system to a safe condition by throwing the console circuit breaker switch to the "OFF" position. Throw the main circuit breaker switch on the wall to the "OFF" position. Disconnect the three weld head cables and cover gas hose from the front of the console. Disconnect the main power cable and cover gas supply hose from the back of the console.

5.3.2 Loss of Cover Gas

While efforts are made to restore cover gas, all welding operations must cease. If normal cover gas flow is suddenly lost during a welding procedure, assure that the emergency reserve of cover gas is deployed over the weld pool for 20 [TBD] seconds. Assure that automatic program interruption has occurred.

5.3.3 Loss of Utility Air

While efforts are made to restore utility air, canister welding can still proceed with caution as follows. MSMs may be used on a temporary basis to lift and place lids if MSM weight and lifting precautions are followed. The flange conditioning tool wire brush may not be necessary for those canisters with acceptable weld prep areas. Only such acceptable canisters shall be welded during loss of utility air when the flange conditioning tool wire brush is unavailable. Glass shard sampling procedure must be modified or halted.

5.3.4 Loss of Instrument Air

While efforts are made to restore instrument air, normal operations can proceed with canisters that may not require an air purge. If purging is required, weld station operations will stop at the point where purging should occur (before lid placement).

5.3.5 Tornado

Following a tornado, an engineering assessment will need to be performed to determine what damage occurred, and what corrective actions must be taken before the system can be safely returned to service.

5.3.6 Earthquake

The Canister Welding Station can withstand such earthquakes as described in the Uniform Building Code Zone III specifications. Following such earthquakes, the CWS shall remain operable and undergo an engineering assessment to confirm this. Following larger earthquakes, an engineering assessment will need to be performed to determine what damage occurred, and what corrective actions must be taken before the system can be safely returned to service.

6.0 MAINTENANCE

6.1 Maintenance Approach/Philosophy

All items of equipment in the Canister Welding System located inside the Vitrification Facility cell are designed for remote maintenance or replacement. Equipment with a likely operating life of less than seven years is designed to be remotely replaceable.

A discussion of decontamination and decommissioning is presented in Appendix G.

6.2 Corrective Maintenance

Spare parts for all tools, weld head, and jib crane are available on-site. A second complete weld head is available for use when the first one needs extensive repairs.

Parts have been designed to facilitate easy remote repair and replacement. Most repairs will be made remotely in-cell.

6.2.1 Jib Crane

The hoist and trolley sub-assembly on the jib crane is easily removable.

Using the MSMs, unplug the hoist and trolley motors from the junction box on the mast.

Using the process crane, pull out the stop pin at the end of the beam. Slide the hoist and trolley sub-assembly off the track, using the process crane.

Scrap the defective unit in-cell and bring in a replacement. Install new hoist and trolley unit on mast using the process crane.

6.2.2 Tungsten Electrode

When the tungsten electrode at the weld head is damaged, use the following procedure for remote replacement.

Using the MSMs, grip and twist the torch block holding the electrode, and remove from weld head.

Place the torch block in the transfer drawer, and slide to the ex-cell position.

HOLD Move torch block to the glove box. Manually [TBD] fit the torch block with a new electrode holder containing new tungsten. Return assembly back through the transfer drawer.

Replace torch block in the weld head using MSMs.

6.2.3 Electrical Cables

All electrical cables for in-cell equipment at the CWS are remotely replaceable. Plugs at either end of cables allow them to be easily unplugged and scrapped in-cell. Bring new cables in-cell through the transfer drawer, the CMR, or the EDR (as Deemed Appropriate) and set in place by using MSMs.

Wall penetrations for electrical cables have been designed to allow easy replacement of through-the-wall cables and to prevent contaminations of ex-cell connections. Cables are shrink-wrapped on the ex-cell side, and pushed through the small wall penetrations. A plug receptacle on the in-cell end attaches to the equipment cables, supplying power as needed. If an electrical cable is damaged, cut the cable at the ex-cell side, pull it into the cell by MSM, and scrap the cable in-cell. Then push a new cable through the same penetration and shrink-wrap to seal the ex-cell end.

See 900D-5750 and 900D-5751 for electrical cable layout at the weld station.

6.3 Preventive Maintenance

A routine maintenance schedule includes remote replacement of the tungsten electrode at the weld head after 15 [TBD] welds. Follow the same procedure outlined in Section 6.2.2 for removing the torch block.

Perform periodic visual inspections of the weld head to check for wear, burned areas, and crushed or damaged cables. If the weld head cable assembly is damaged, remove it by disconnecting the plugs at both ends using MSMs. Bring a new cable assembly in-cell through the transfer drawer. Install at the weld head and penetration 9C01 using MSMs.

Some of the motors for the jib crane and flange conditioning tool may have to be replaced periodically [TBD] due to wear.

Perform periodic visual inspections of the cutters and wire brush on the flange conditioning tool to check wear conditions. Both the cutters and the wire brush are easily removable by MSM. Replacement procedure is TBD.

The driver shaft and coupler on the jib crane carriage have been designed to allow easy remote replacement when necessary due to wear. The coupler sub-assembly, including round bar and hex screws, can be lifted, removed, and replaced with an MSM. Perform periodic visual inspections [TBD] of the coupler to check wear conditions.

6.4 In-Service Inspection

In-service inspection is accomplished by carefully monitoring the available instruments and reviewing production records provided by the system and the operator. Records include disk files, strip charts, and computer printouts.

6.5 Surveillance

Surveillance and visual inspection of the welding process are accomplished by observation through a shield window in the cell wall, which provides a direct view of the canister in its compartment and any devices in operation above it. Closed circuit television (CCTV) cameras mounted above the workbench provide detailed views. CCTV monitors exist both at the weld station and in the vitrification cell control room.

Weld parameters and cover gas flow are continuously monitored at the welder console.

APPENDIX A

References

West Valley Nuclear Services, Canister Lid Welding System Testing, WVNS-TRQ-054

West Valley Nuclear Services, Canister Lid Welding System Process Variation Testing, WVNS-TP-054

West Valley Nuclear Services, Hydrostatic Burst Testing of Canister Flange Mock-Ups, WVNS-TP-054C

West Valley Nuclear Services, General CTS Component Design Criteria, WVNS-DC-011

West Valley Nuclear Services, Vitrification of High-Level Wastes, WVNS-DC-022

West Valley Nuclear Services, Waste Form Compliance Plan for the West Valley Demonstration Project High-Level Waste Form, WVNS-WCP-001

U.S. Department of Energy Office of Environmental Restoration and Waste Management, Waste Acceptance Product Specifications for Vitrified High-Level Waste Forms, EM-WAPS

Astro Arc Company, Sun Valley, California, Operating and Maintenance Manual for Computerized Welding System Model CWS-486 & Canister Lid Welder Model WVN

APPENDIX B

Drawing List - System 63L

* - Preliminary Only, not Eng. Released

Drawing No.	Sheet	Description
WORKBENCH:		
900E-4228		
900D-4229	1-13	Weldment Sub-Assembly
900D-4333	1	Station Top Plate
900D-4339	1	Lid Holder Compartment Sub-Assembly
900D-4341	1	Nozzle Piping & Bracket Sub-Assembly
900D-4347	1	Lid Holder Sub-Assembly
900D-4348	1	Lid Holder Compartment Details
900D-4350	1	Canister Storage & Cover Sub-Assembly
900D-4351	1	Lid Magazine Cover Sub-Assembly
900D-4353	1	Equipment Storage Compartment Sub-Assembly
900E-3071	1,2	CWS General Arrangement and Installation
900E-3072	1-3	CWS Elevation View and Installation
900E-4228	1,2	CWS Main Assembly
900E-705	24	CWS Piping & Instrument Diagram
905D-010	1	Shielding Gas & Argon Gas System P&ID
905D-046	1	Utility Air System P&ID
905D-046	2	Instrument Air System P&ID
JIB CRANE:		
900D-5195	1	Jib Crane Sub-Assembly
900D-5196	1,2	Column Sub-Assembly and Details
900D-5197	1	Beam Sub-Assembly and Details
900D-5198	1	Trolley Pin Stop and Bail Sub-Assembly
900D-5199	1	Jib Crane Carriage Sub-Assembly
900D-5200	1,2	Carriage Base Sub-Assembly
900D-5201	1,2	Carriage Base Attachment Sub-Assembly
900D-5202	1	Chain Drive Sub-Assembly #1
900D-5203	1,2	Chain Drive Weldment Sub-Assemblies
900D-5204	1-4	Chain Drive Sub-Assembly #2
900D-5205	1,2	Chain Drive Sub-Assembly #3
900D-5206	1	Chain Drive Mounting Plate Sub-Assembly
900D-5207	1,2	Gearhead Motor Mount and Bail Sub-Assembly
900D-5208	1,2	Driver Shaft and Coupler Sub-Assemblies
900D-5209	1-3	Jib Crane Chain Drive Sub-Assembly

APPENDIX B (Cont.)

Drawing No.	Sheet	Description
900D-5210	1	Two Inch Hex Head Bolts and Sub-Assembly
900D-5259	1	Chain Drive Sprocket Sub-Assembly
VACUUM LID LIFTER:		
900D-4288	1	Lid Lifter Vacuum Generator Sub-Assembly
900D-4289	1	Lid Lifter Vacuum Generator Details
900D-4340	1	Lid Lifter Compartment Sub-Assembly
GLASS SHARD SAMPLING TOOLS:		
900D-5648	1, 2	VF Glass Shard Sampler Arrangement
900D-5649	1	VF Glass Shard Sampler Sorter
900D-5650	2	VF Glass Shard Sampler Tray Assembly
900D-5651	1, 2	VF Glass Shard Sampler Frame Assembly
900D-5652	1, 2	VF Glass Shard Sampler Vial Rack Assembly and Details
900D-5653	1, 2	VF Glass Shard Sampler Pickup Assembly
900D-5654	1, 2	VF Glass Shard Sampler Pickup & Tool Bracket
900D-5655	1	VF Glass Shard Sampler Tool Assemblies
WELD HEAD:		
4472501	1-28	In-Cell Welding Head, Astro Arc Co.
FLANGE CONDITIONING TOOL:		
900D-4312	1,2	Canister Flange Conditioning Tool Assembly
900D-4722	1	Flange Conditioning Tool Turntable Assembly
900D-4723	1	Mill Indicator Assembly
900D-4724	1	Turntable Bottom Assembly
900D-4725	1	Drive Assembly
900D-4726	1	Drive Details
900D-4727	1	Mill Assembly & Base Detail
900D-4728	1	Wire Brush Assembly
900D-4729	1,2	Wire Brush Bracket Weldment & Details
900D-4730	1,2	Clamp Assembly & Details
900D-4821	1,2	Turntable Bottom Details
900D-4822	1	Turntable Top Plate Weldment
900D-4823	1	Retaining Ring Top Detail
900D-4824	1	Carrier Yoke Assembly
900D-4825	1-3	Carrier Yoke Weldment & Details
900D-4826	1,2	Lifting Bail Weldment & Details
900D-4827	1	RT Meter Assembly, Weldment, & Details
900D-5063	1-3	Mill Indicator Weldment & Details
900D-5064	1	Mill Stops Weldment & Details
900D-5065	1	Wiring Diagram
900D-5072	1	Indicator & Mill Stops Setup
900D-5158	1	Canister Milling Tool Schematic & Wiring
900D-5159	1,2	Canister Milling Tool Operator Panel Angmt
900D-5160	1	Canister Milling Tool Control Panel Arngmt
900D-5310	1	Air Supply Hose Assembly

APPENDIX B (Cont.)

Drawing No.	Sheet	Description
905B-305	718,719	Control Wiring Diagram
905D-5159	1-4	Electrical Cable Assembly
MISCELLANEOUS:		
18911C	1	Sample Vial, Wheaton Glass Co.
900D-1092	1,2	CTS WVNS Canister
900D-4173	1	Canister Mockup and Details
900D-5066	1,2	Pntr.9C01 Welder Elec. Push-thru Assembly
900D-5087	1	VTF Weld Station Mockup Wall Module
900D-5151	1-9	Electrical Penetration Cable Assemblies
900D-5721	2	Transfer Drawer
PNL-755-01	1	Jumper Assembly 9608-V-048-A
PNL-756-01	1	Jumper Assembly 9407-V-048-C

APPENDIX C

Equipment List - System 63L

No.	SYS	ID	EQ. No.	Description	P&ID #	Sht
1	63L	E	63-V-049	Weld Station	900-E-705	24
2	63L	E	63-V-061	Weld Head & Connections/Cables	900-E-705	24
3	63L	E	63-V-114	Flange Conditioning Tool	900-E-705	24
4	63L	E	63-V-115	Weld Station Hoist/Jib Crane	900-E-705	24
5	63L	E	63-XX-83	Welder Connect. Penetration 9C01	900-E-705	24
6	63L	E	6-SG-M-001	Automatic Manifold, Cvr Gas Supply	905-D-010	1
7	63L	I	63-V-060	Welder Control Console	900-E-705	24
8	63L	I	63-WMS-01	Milling Eqmt./Hoist Control Panel	900-E-705	24
9	63L	I	63-WMS-02	Milling Operator Panel & Cables	900-E-705	24
10	63L	I	PI-4905	Pressure Indicator, IA Supply	900-E-705	24
11	63L	I	PI-4909	Pressure Indicator, UA Supply	900-E-705	24
12	63L	I	PI-4910	Pr. Ind., Weld Cover Gas Supply	900-E-705	24
13	63L	I	PRV-4905	Press. Reducing Valve, IA Supply	900-E-705	24
14	63L	I	PRV-4909	Press. Reducing Valve, UA Supply	900-E-705	24
15	63L	I	PRV-4910A	Pr. Reduc., Gas Manifold to Atm	900-E-705	24
16	63L	I	PRV-4910B	Pr. Reduc., Gas Supply Line to Atm	900-E-705	24
17	63L	L	63-AR-4904	Jumper, Argon from 9608-A to Nzl	900-E-705	24
18	63L	L	63-AR-4906	Jumper, Argon from 9608-C to Nzl	900-E-705	24
19	63L	L	63-A-4905	Jumper, IA from 9608-B to Nozzle	900-E-705	24
20	63L	L	63-A-4907	Jumper, UA from 9407-A to Nozzle	900-E-705	24
21	63L	L	63-A-4908	Jumper, UA from 9407-B to Nozzle	900-E-705	24
22	63L	L	63-A-4909	Jumper, UA from 9407-C to Nozzle	900-E-705	24
23	63L	L	9407-V-048-C	Jumper Assembly, Utility Air	PNL-756-01	
24	63L	L	9608-V-048-A	Jumper Assembly, Instrument Air	PNL-755-01	
25	63L	L	AR-1/2-4904A	Quick-Conn. Nozzle 9608-A, Closed	905-D-010	1
26	63L	L	AR-1/2-4906A	Quick-Conn. Nozzle 9608-C, Closed	905-D-010	1
27	63L	L	IA-1/2-4905A	Lid Mag. & Quick-Connect 9608-B	905-D-046	2
28	63L	L	SG-1/2-4910	Cover Gas Main Supply to Weld Stn.	905-D-010	1
29	63L	L	SG-1/2-4910A	Cover Gas Line to PI-4910	905-D-010	1
30	63L	L	SG-1/2-4910C	Cover Gas Line to PRV-4910B	905-D-010	1
31	63L	L	SG-3/8-4910B	Gas Supply Hose to Welder Console	905-D-010	1
32	63L	L	UA-1/2-073	Lid Lifter & Quick-Connect 9407-C	905-D-046	1
33	63L	L	UA-1/2-095A	Qk-Conn.9407-B to Mill Turntbl Dr	905-D-046	1
34	63L	L	UA-1/2-096A	Quick-Connect Nozzle 9407-A	905-D-046	1
35	63L	V	AR-H-001	Block Valve, Line 4906A,Nzl 9608-A	905-D-010	1
36	63L	V	AR-H-002	Block Valve, Line 4904A,Nzl 9608-C	905-D-010	1
37	63L	V	AR-XV-4904	Check Valve, Argon Sply to 9608-A	900-E-705	24
38	63L	V	AR-XV-4906	Check Valve, Argon Sply to 9608-C	900-E-705	24
39	63L	V	IA-H-090	Block Valve, IA Supply to PI-4905	905-D-046	2
40	63L	V	IA-H-091	Block Valve, Line 4905A,Nzl 9608-B	905-D-046	2
41	63L	V	IA-XV-4905	Check Valve, IA Supply to 9608-B	900-E-705	24
42	63L	V	SG-GV-002	Gauge Valve, Cover Gas to PI-4910	905-D-010	1
43	63L	V	SG-HC-003	Hose Coupling Valve	905-D-010	1
44	63L	V	SG-HC-005	Hose Coupling, Supply to 4910B	905-D-010	1
45	63L	V	SG-HC-006	Hose Coupling, 4910B to Console	905-D-010	1

APPENDIX C (Cont.)

Equipment List - System 63L

No.	SYS	ID	EQ. No.	Description	P&ID #	Sht
46	63L	V	SG-H-001	Isolation Valve, Supply Line 4910	905-D-010	1
47	63L	V	UA-GL-078	Block Valve, Line 73, Nzl 9407-C	905-D-046	1
48	63L	V	UA-H-130	Block Valve, Line 96A, Nzl 9407-A	905-D-046	1
49	63L	V	UA-H-131	Block Valve, Line 95A, Nzl 9407-B	905-D-046	1
50	63L	V	UA-XV-4909	Check Valve, Supply to 9407-A,B,C	900-E-705	24

APPENDIX D

Interface List - System 63L

No.	THIS SYSTEM	OTHER SYSTEM		##DESCRIPTION	DEFINITION
1	63L	63ED	1	Elec. Pntr.#9809, CCTV	2" PUREX Connector
2	63L	63ED	2	Elec. Pntr.#9827, CCTV	2" PUREX Connector
3	63L	63ED	3	Elec. Pntr.#9811, Flange Cond. Tool	180 VDC & 120 VAC
4	63L	63ED	4	Elec. Pntr.#9807, Carriage Drive	180 VDC
5	63L	63ED	5	Elec. Pntr.#9829, Hoist	480 VAC
6	63L	63ED	6	Elec. Pntr.#9831, Trolley	480 VAC
7	63L	63F	1	Shield Wall and Penetrations	Misc.
8	63L	63F	2	Transfer Drawer & Glove Box Assembly	Misc.
9	63L	63IA	1	IA Supply, Line 4905, Pntr.#9608-B	50 psig req'd
10	63L	63K	1	Process Crane	For canister transfer
11	63L	63K	2	Canister Grapple	5470 lb lift cap.
12	63L	63K	3	CCTV Cameras, two	Remotely maneuverable
13	63L	63K	4	Crane Hooks, two	4.5 ton lift cap. ea.
14	63L	63K	5	Impact Wrench	2" Hex Socket
15	63L	63K	6	Master Slave Manipulators	Access to 63-V-049
16	63L	63K	7	Viewing Window	View of 63-V-049
17	63L	63UA	1	UA Supply, Line 063, Pntr.#9407	3-way, 90 psig req'd
18	63L	69A	1	Glass shard sampling tools	Sort tray, vacuum,etc
19	63L	200B	1	Master copy of welder software	Disk programs, manual

Key:

System	Description
63ED	VF Electrical Power Distribution
63F	Cell Walls & Ex-Cell Arrangement
63IA	VF Instrument Air
63K	In-Cell Remote Handling, Maintenance, & Viewing System
63UA	VF Utility Air
69A	Sampling System
200B	VF Instrumentation and Control Software

APPENDIX E

Weld Station Utility Requirements					
Electrical					
	Volts	*Amps*	*Phase*	*Recept.*	*Recept. Location*
Weld Head Welding Torch Carriage Motor AVC Motor Wire Fd Motor	 20 Max 10 Norm	 300 Max 220 Norm	 Pulse DC		Welder Console Front Panel
Welder Console	480 VAC		3		Cold Face Wall 3-3Z
Strip Chart Recorder	110 VAC	2 amp fuse		110V Outlet	Welder Console Control Panel
Printer	110 VAC	2 amp fuse		110V Outlet	Welder Console Control Panel
Flange Cond. Tool turntable milling spindle	 180 VDC 120 VAC			Size 4E 6 pin	#9811
Jib Crane: carriage trolley hoist	 180 VDC 480 VAC 480 VAC		 3 3	All: Size 4E 6 pin	 #9807 #9831 #9829
Control Panel					
CCTV Console					

APPENDIX E (Cont.)

Weld Station Utility Requirements

Utility Air			
	Supply Pressure	*Penetration Connection*	*Flow*
Flange Conditioning Tool	620 kPa (90 psig)	9407-B (Nozzle)	
Lid Lifter Vacuum	TBD	9407-C	
Shard Sampling Vacuum	TBD	9407-A (Nozzle)	
Instrument Air			
	Supply Pressure	*Penetration Connection*	*Flow*
Lid Magazine Purge	7.25 kPa (50 psig)	9608-B	
Canister Air Purge (IA or Argon Gas)	TBD	9608-A or C (Nozzle)	

APPENDIX F

Vendor Literature

The following figures are taken from the operating manual provided by the equipment vendor for the weld head and console computer.

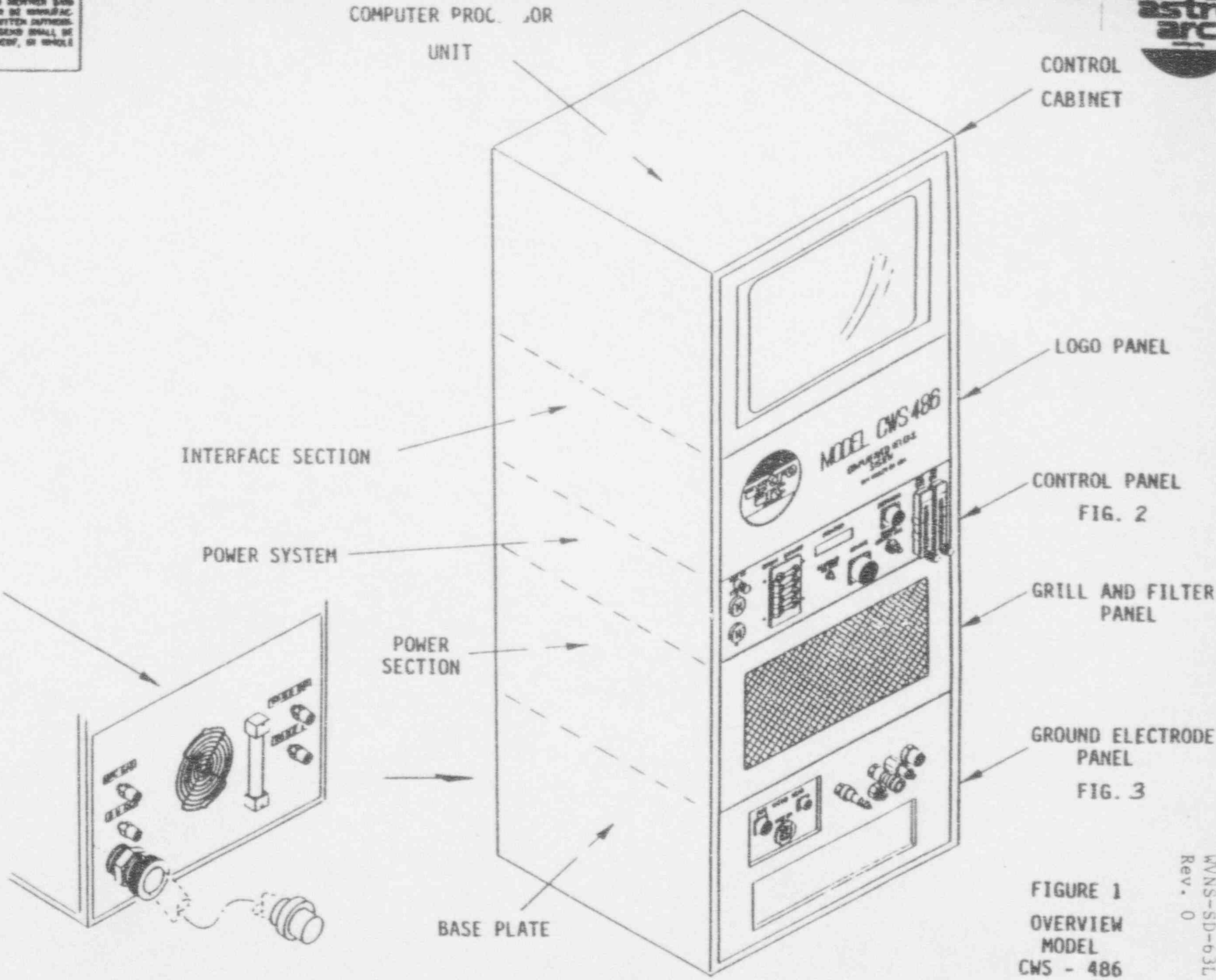
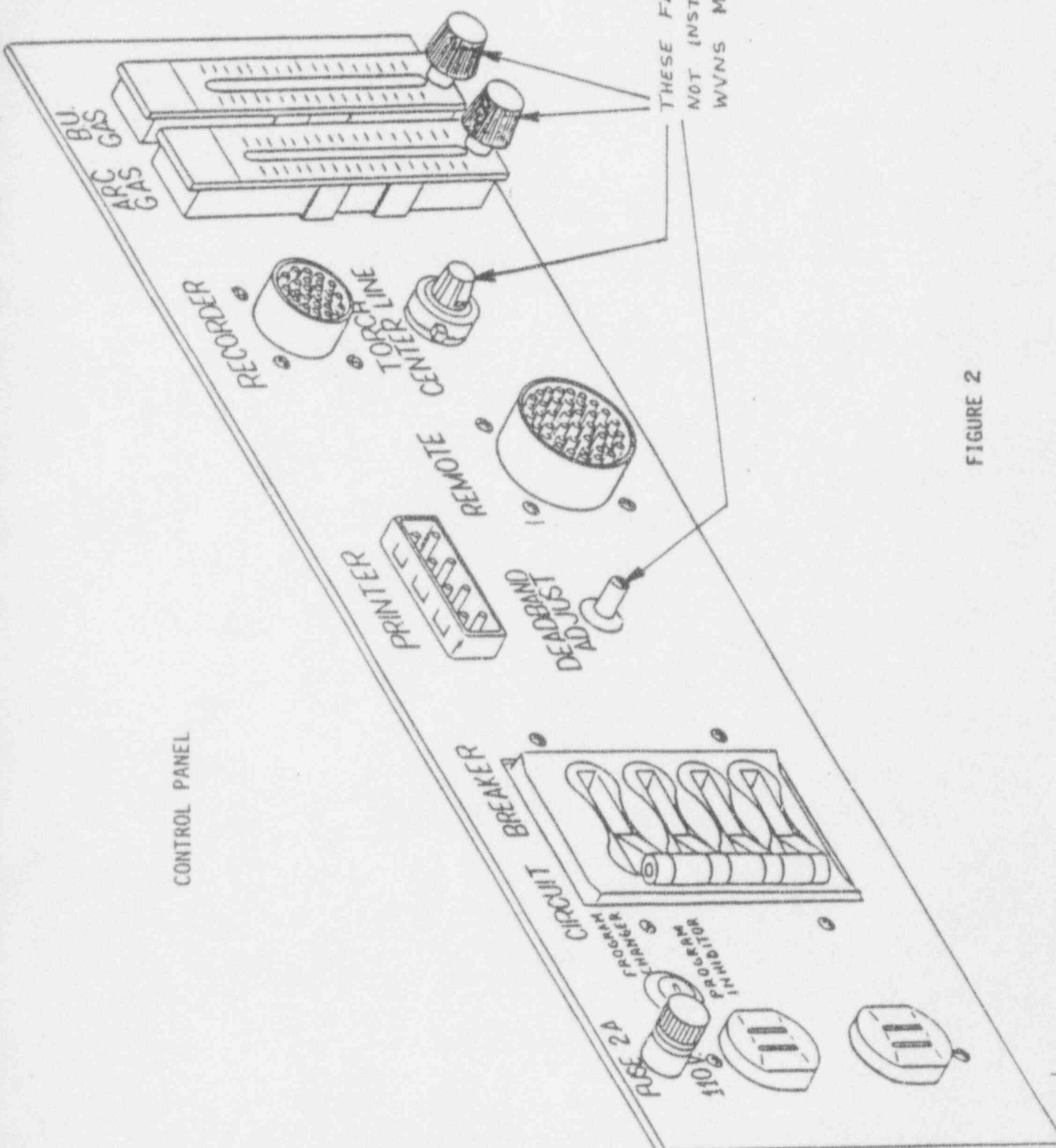


FIGURE 1
OVERVIEW
MODEL
CWS - 486



CONTROL PANEL

FIGURE 2

GROUND ELECTRODE PANEL

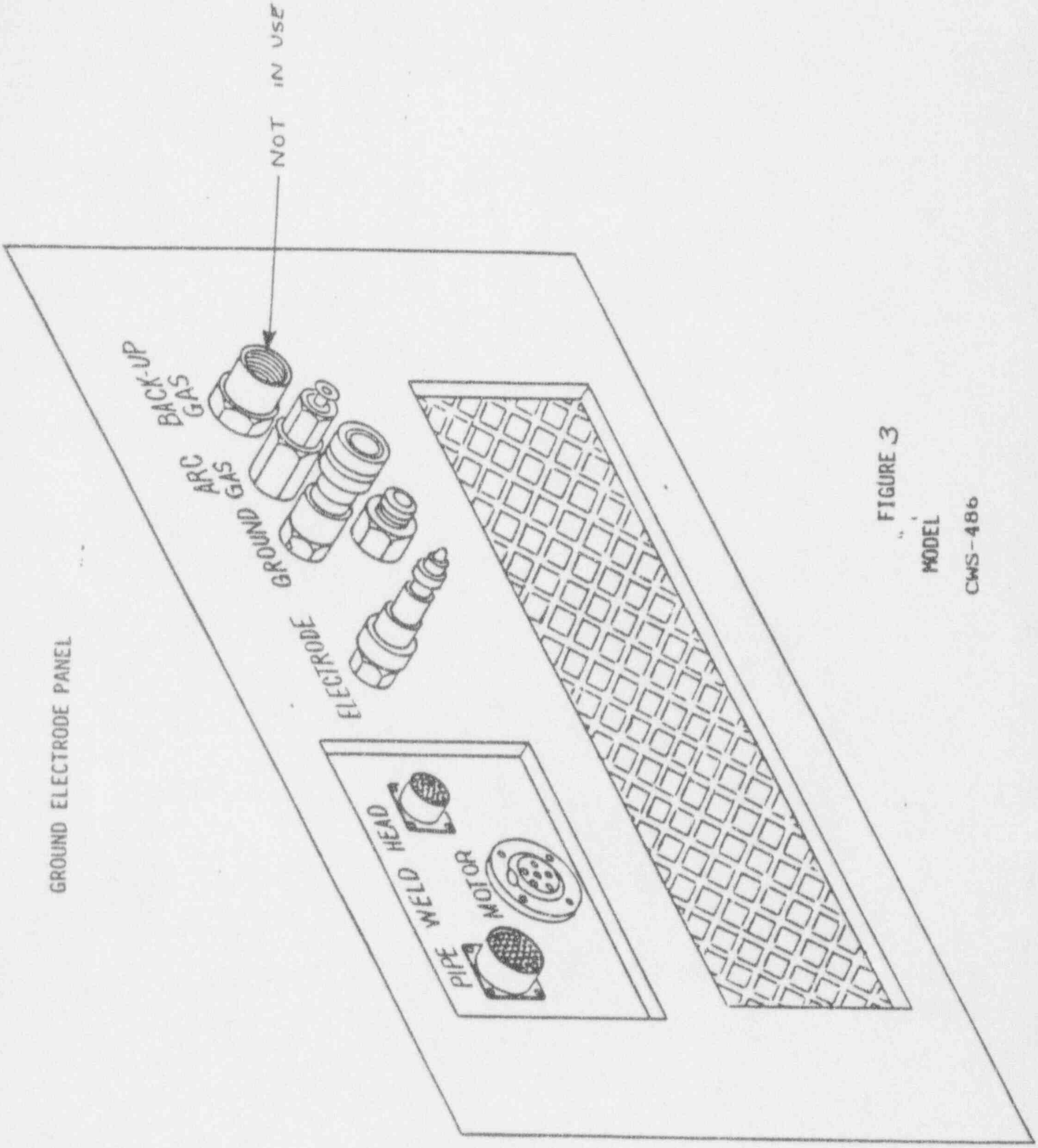


FIGURE 3
MODEL
CWS-486

CONTROLLER WORKSTATION
Front Panel Configuration

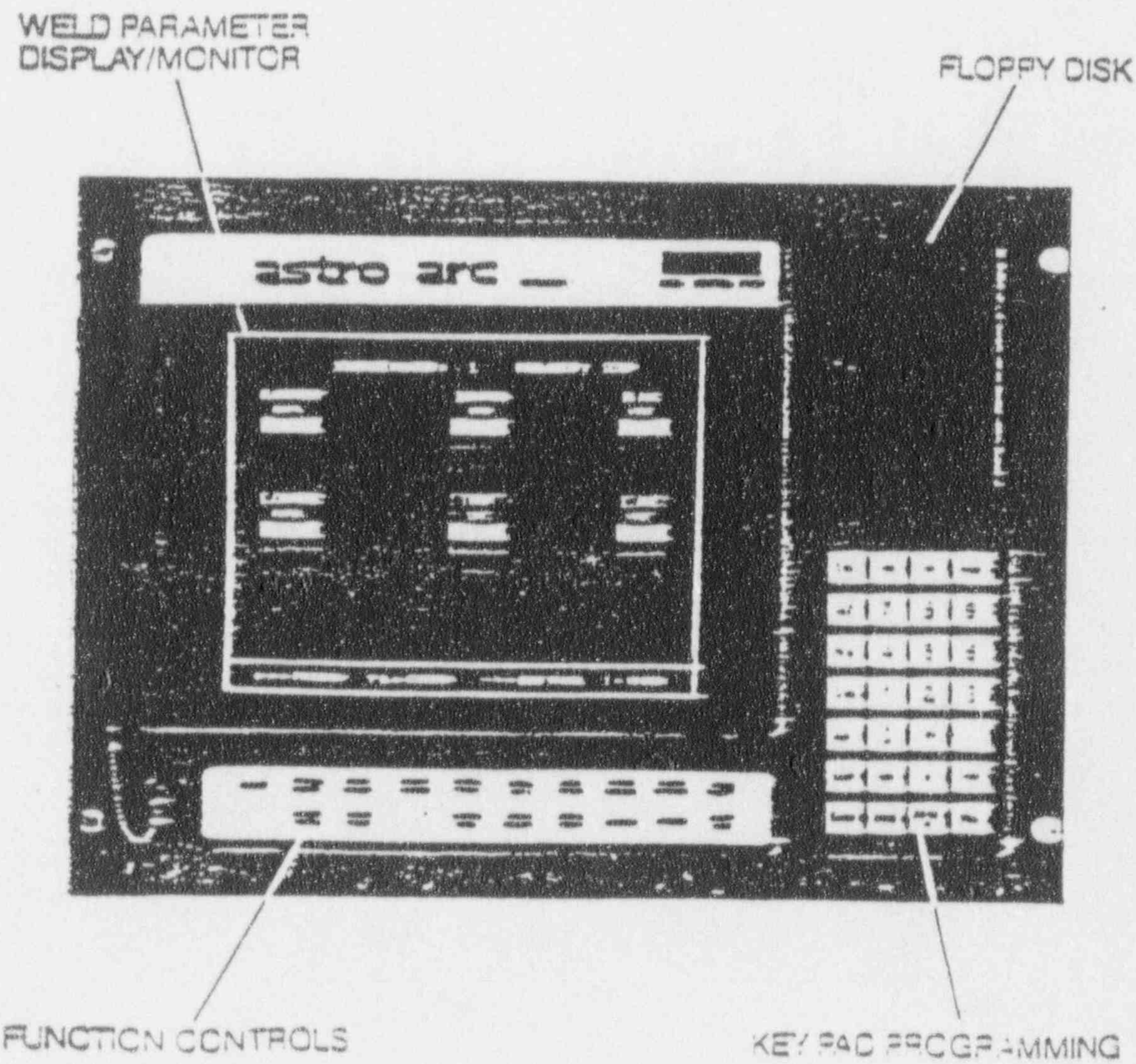
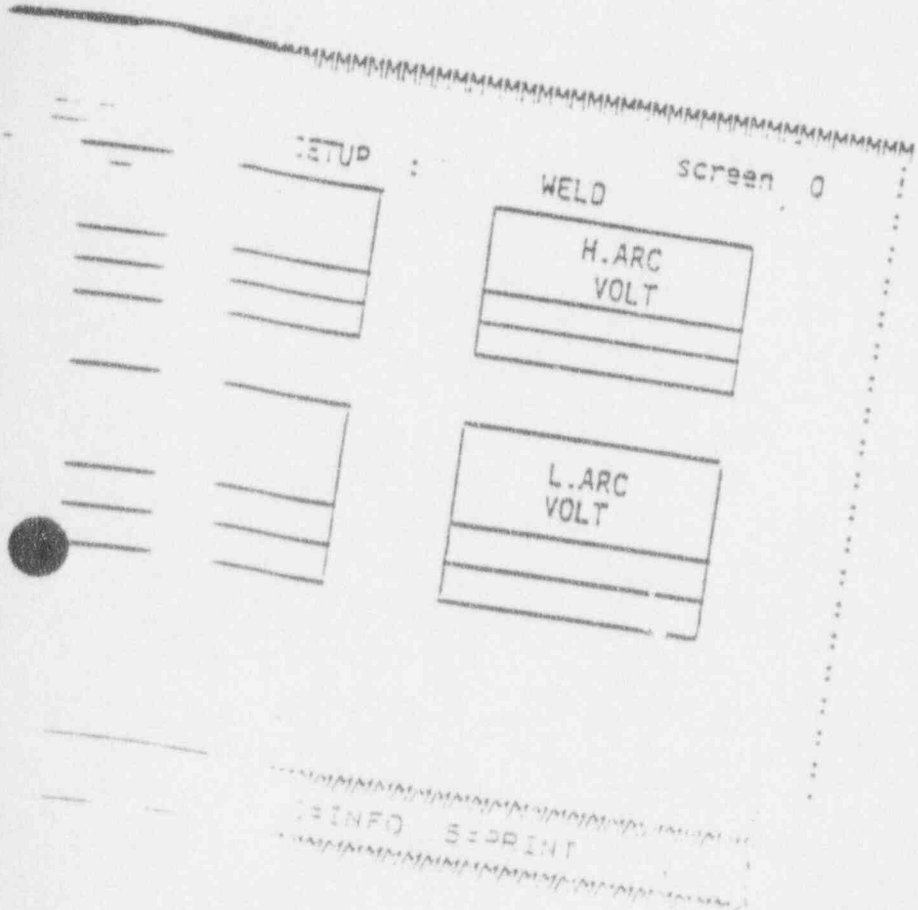
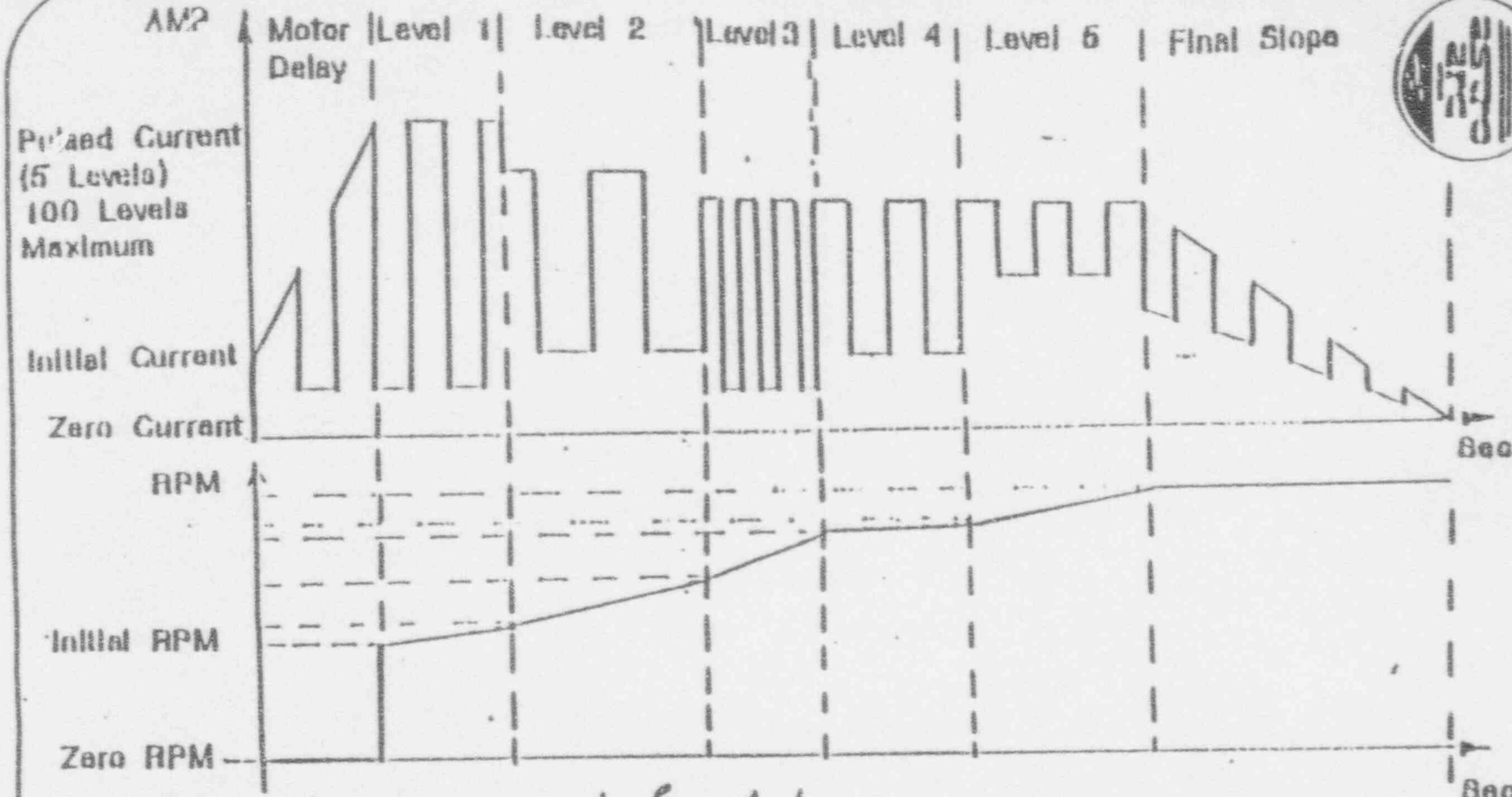


Figure 4

Controller Workstation

Front Panel Configuration


screen 0
WELD
H.ARC
VOLT
L.ARC
VOLT
INFO
PRINT



An Example of Pulsed Current Mode

Figure 6

AP-A-16

WVNS-SD-63L
Rev. 0

APPENDIX G

Decontamination and Decommissioning

TBD - procedure to implement after all canister welding is complete.

TBD - general disassembly procedures to be added here