Fan Equipment Co., Inc.

Standard Procedures Manual

Revision (17): 6/7/23

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Standard Procedure for Control of Plasma & Parts Operation

1.0 Purpose and Scope

1.1 This procedure assigns responsibility and establishes methods for controlling quality in the cutting operations for production of fan equipment and accessories.

1.2 This procedure forms an integral part of the Corporate Quality Program and is applicable to all plasma and cutting operations.

2.0 General Requirements

2.1 The Plasma & Parts Department Manager is responsible for implementing this procedure.

2.2 Materials, machinery, and equipment needed for this operation shall be suitable to accomplish a first class, finished product.

2.3 Persons performing cutting operations in accordance with this procedure shall be knowledgeable of the procedures required and shall be instructed in proper cutting techniques.

2.4 The Plasma & Parts Department Manager shall verify that the materials, machinery, and equipment used in this department are orderly, clean, and in satisfactory working order.

3.0 Procedure for Cutting Operation

3.1 The Plasma & Parts Department Manager is responsible for submitting an accurate requisition for materials, for each job, to the President or Purchasing Manager in adequate time to preclude delays in final equipment ship dates.

3.2 The Plasma & Parts Department Manager shall prepare material cut lists for distribution to the equipment operator. The Plasma & Parts Department Manager shall verify that the cut lists are accurate as to proper gauge and type of material to be cut.

3.3. The Plasma & Parts Department Manager will ensure that workmen cut material in accordance with the fabrication drawings and is properly marked with the identifying shop order numbers and part numbers.

3.4 For controlled material jobs, all material is to be color coded and stored in a designated area. No other material is to be stored in this designated area.

3.5 All materials received shall be segregated by material type. No storage of unlike

Alloys are to be mixed or stored together. Reviewed weekly by Dept. Manager.

4.0 Acceptance Criteria for Shearing Operation

4.1 When cut material is transferred to the next workstation, it shall be inspected to verify that the proper gauge, type of material, and shape of cut were provided. Special care shall be taken to assure the controlled material is properly identified and dispositioned.

5.0 Records

5.1 Records of each cutting operation will not be kept.

5.2 Individual jobs requiring special documentation, such as material certifications or traceability will be controlled on an individual job basis.

Standard Procedure for Control of Welding Processes

1.0 Purpose and Scope

1.1 This procedure assigns responsibility and establishes methods for controlling arc fusion welding of structural members and plate shapes during the fabrication of air moving equipment and accessories.

1.2 This procedure forms an integral part of the Corporate Quality Program and is applicable to all projects. It addresses the following welding processes:
Gas Tungsten Arc Welding (GTAW)
Gas Metal Arc Welding (GMAW)
Shielded Metal Arc Welding (SMAW)

2.0 General Requirements

2.1 The Fabrication Manager is responsible for implementing this procedure.

2.2 Welding equipment used for each operation shall be capable of making satisfactory welds when operated by a qualified welder using approved welding procedures. Welding equipment shall be maintained in good operating condition at all times. Maintenance shall be in accordance with the manufacturer's recommendations.

2.3 All welders and welding operations shall be in accordance with Fan Equipment Co.'s standards, which are in accordance with ASME Section IX and AWS D1.1 requirements.

2.4 All welding electrodes, filler materials and shielding gases shall be controlled in a manner that will provide protection from damage, deterioration, contamination, misuse, or other condition that could alter their characteristics and/or welding properties.

2.5 Controlled welding electrode for traceable material orders will be stored in ovens and managed in accordance with specification FEWRC-1 and Form Q.C. 20.

3.0 Welding Procedure Specifications

3.1 Before performing production welding on structural members or formed plate shapes, Welding Procedure Specifications shall be identified, qualified, and approved for use by Fan Equipment Co. and the buyer.

3.2 Welding Procedure Specifications shall be reviewed for adequacy and approved by the engineering department before use.

4.0 Welding Requirements

4.1 Prior to welding, the base metal shall be prepared as follows:

4.1.1 Material that has been flame cut shall have a minimum of 1/16 inch of material removed from the surfaces to be joined. The material shall be removed by sawing, machining, grinding, or filing.

4.1.2 All foreign materials imbedded in the base metal in the vicinity of the weld joint shall be removed prior to welding.

4.1.3 Joint preparation shall conform to the welding joint dimensions of the applicable Welding Procedure Specification and shop drawings.

4.1.4 Prior to welding, the surface of the base metal within one inch of the joint preparation shall be cleaned to remove all foreign material such as: grease, oil, dirt, oxides, paint, etc.

4.2 Joint alignment for welding shall be in accordance with the requirements of the applicable Welding Procedure Specification and shop drawings.

4.3 Items to be joined by welding shall be assembled using the necessary jigs and fixtures, or by tack welding, so that alignment and configuration will conform to the shop drawings.

4.4 Jigs, fixtures, chill bars, and other items in the immediate vicinity of the weld joint shall be clean and free of moisture prior to and during welding.

4.5 Preheat shall be in accordance with the applicable Welding Procedure Specification.

4.6 Welding shall be accomplished as follows:

4.6.1 The welding equipment shall be set to the electrical power setting specified in the applicable Welding Procedure Specification.

4.6.2 For welding processes requiring an inert gas shielding, the weld area shall be blanketed with the shielding gas until it has cooled to a non-oxidizing temperature. Shielding gas composition, flow rate and cup size shall be in accordance with the applicable Welding Procedure Specification.

4.6.3 For welding processes requiring a backing purge, shielding gas composition and flow rates shall be in accordance with the applicable Welding Procedure Specification.

4.6.4 Arc striking shall take place in the weld groove, and not on the base metal outside the groove. Accidental arc strikes on the base metal adjacent to the weld shall be removed by grinding. All visual defects in welding starts and stops shall be removed by grinding.

4.6.5 Tack welds shall become an integral part of the completed weld. They shall be uniform in thickness and shall be of the same composition as subsequent filler passes. Tack welds containing visual defects shall be removed.

4.6.6 Backing rings or bars shall be used only when specified by applicable design documents. When used, the material for backing rings or bars shall be compatible with the base material.

4.6.7 All oxides, slag and scale shall be removed from the weld groove after each pass. This shall be accomplished by wire brushing, grinding, or chipping with clean tools.

4.6.8 Interpass temperatures shall be as specified in the applicable Welding Procedure Specification. The temperature shall be measured on the base metal adjacent to the weld - but no further than one inch to either side of the weld.

4.6.9 When using the GTAW process, the arc shall be broken by current delay or by increasing the rate of travel and inclining the electrode, so the arc is extinguished on the joint bevel. When using the SMAW process, the arc shall be broken by increasing the rate of travel and lengthening the arc slightly to reduce the puddle size.

4.6.10 Butt weld reinforcement and fillet weld throat size shall be in accordance with the applicable Welding Procedure Specification and shop drawings.

4.6.11 Gas tungsten arc welding without the addition of filler metal (wash-pass welding) shall not be used unless specifically authorized by the Engineering Department.

4.7 Post heating and cooling shall be in accordance with the applicable Welding Procedure Specification.

4.8 The surface welds shall be free from coarse ripples or grooves, overlaps, undercuts and abrupt ridges or valleys. Abrupt changes in weld reinforcement not exceeding 1/16 inch and which do not encroach on the minimum weld thickness are suitable for proper interpretation of required non-destructive examinations. If the surface of the weld requires grinding, care shall be taken to avoid reducing the weld or base material below the required thickness.

4.9 Welds requiring repair shall be repaired in accordance with approved weld repair procedures. Prior to repair welding, the defective area shall be removed and visually examined to verify removal of the defect. Specific approval shall be obtained from the engineering department to make more than two repairs on any weld.

5.0 Quality Control Provisions

5.1 The responsibility for preliminary inspection of welds is assigned to the Fabrication Manager. Final authority to inspect welds is assigned to the Quality Control Manager.

FEWRC-1 Procedure for Weld Rod Control

1.0 Purpose and Scope

1.1 This procedure assigns responsibility and establishes methods for the storage and distribution of mild steel covered arc-welding electrodes, and low-alloy steel covered arc-welding electrodes, plus GTAW filler sticks (TIG) and GMAW (MIG).

2.0 Requirements for the Use of This Procedure

2.1 All electrodes having low hydrogen coverings conforming to specifications, shall be purchased in hermetically sealed containers, and stored in ovens held at a temperature between 200° F and 250° F after removal of the electrodes from the hermetically sealed containers. Electrodes (E70XX/E80XX) not used within the manufacturer's recommended exposure time after removal from the storage oven or hermetically sealed containers shall be dried or destroyed.

2.2 All electrodes having low hydrogen coverings, purchased in other than hermetically sealed containers, shall be placed in ovens and dried for two hours between a temperature of 700° F and 800° F before they are used. After remaining in the oven for the specified time, they are suitable for distribution to the welding department for use.

2.3 Welding electrodes given to individual welders shall be issued in quantities not to exceed the manufacturer's recommended exposure time to prevent over exposure of filler metal to environmental conditions.

2.4 Electrodes which have been wet shall not be used.

2.5 Electrodes shall be baked and dried prior to use if the hermetically sealed container shows evidence of puncture damage.

2.6 GTAW filler sticks and GMAW wire shall be kept clean and free of moisture and other contamination.

3.0 Requirements for Use of the Weld Rod Control Log

3.1 All filler metals used for controlled material jobs must be signed out immediately upon their release from the oven or hermetically sealed container.

3.2 The release of welding rods for controlled material jobs shall be made by the Blower Department and Wheel Department Managers or their designated personnel.

The Blower Department and Wheel Department Managers or their designated personnel are responsible for filling out the *Weld Rod Control Log, Form Q.C. 20*, in its entirety at the time of weld rod removal.

3.3 The Blower Department and Wheel Department Managers, or their designees, shall be responsible for removing all electrodes from shop use within the manufacturer's maximum recommended exposure time after their release from the oven or hermetically sealed container, and at the termination of each shift.

3.4 Issuance of filler metals shall be dictated by the welding procedure directives noted on the shop drawings.

3.5 The Blower Department and/or Wheel Department Manager or his designated personnel shall release only the amount of filler metal usable within the manufacturer's recommended exposure time to weld the joint(s) documented on the *Weld Rod Control Log.*

3.6 For controlled material jobs, the Quality Control Manager shall review the *Weld Rod Control Log* at least once daily to assure compliance with all applicable specifications and requirements. He shall sign or stamp and date the *Weld Rod Control Log* as applicable.

WELD FILLER METAL ISSUANCE LOG

Date of Issue	Customer Job #	Time Out	Heat No.	Welder's Initials	Filler Metal Type & Size

Form Q.C. 20
October 10, 1989

Standard Procedure for Control of Fan Housing & Support Base Construction

1.0 Purpose and Scope

1.1 This procedure assigns responsibility and establishes methods for controlling quality in the construction of housings and support bases for fan equipment.

1.2 This procedure forms an integral part of the Corporate Quality Program and is applicable to all fan equipment.

2.0 General Requirements

2.1 The Blower Department Manager is responsible for implementing this procedure.

2.2 Submittal data and/or fabrication drawings will be kept in the work area while performing all work.

2.3 Materials, machinery and equipment needed for this operation shall be suitable to accomplish a professional, first class finished product.

2.4 Persons performing fan construction operations in accordance with this procedure shall be knowledgeable of the procedural requirements and shall be instructed in proper fan construction techniques.

2.5 The Blower Department Manager shall oversee that workers keep all materials, machinery, and equipment used in neat, clean, and satisfactory operating condition.

3.0 Procedure for Fan Construction

3.1 The Blower Department Manager shall check fabrication drawings, instructions, and data for sizes and model designations, to confirm compliance with standard fan construction requirements.

3.2 The Blower Department Manager shall assist the Plasma & Parts Department Manager to prepare an accurate material cut list. The cut list shall be submitted to either the President or the Purchasing Manager for purchase of required items. When the applicable material is received, the cut list is to be assigned to the layout personnel for cutting and forming.

3.3 Before assembly, each sub-assembly is to have all welds cleaned and dressed by wire brushing and/or grinding. Grinding of welds is not permitted when non-destructive testing of these welds is required.

3.4 Company and Industry standards for welding shall be used for all welding operations.

3.5 For controlled material jobs, qualified welders only are to be utilized for welding operations.

3.6 For orders specifying such, qualified welders' logs will be maintained detailing each activity.

3.7 For controlled material jobs, all material is to be color coded and stored in a designated area. No other material is to be stored in this designated area.

3.8 Assignment of weld rod will be controlled by the procedure entitled *Weld Rod Control.*

4.0 Acceptance Criteria for Fans

4.1 There shall be no sharp edges or burrs that could constitute a safety hazard during subsequent handling and installation.

4.2 All fans will be inspected for conformance to: Dimensions, accessories and features as set forth by applicable drawings and specifications, and general quality of workmanship as dictated by industry standards.

4.3 Acceptance criteria shall also be in accordance with the customer's purchase order and specification requirements.

5.0 Records

5.1 For controlled material jobs, records of material receipt and usage shall be kept and stored in a designated area as required by the customer's specification.

5.2 For controlled material jobs, weld rod usage will be recorded as detailed in the section entitled *Weld Rod Control.*

5.3 All fabrication drawings and pertinent data will be stored along with the sales order pages and kept as a permanent file for future reference by Fan Equipment Co. These records are available for customer review at any time at our offices.

Standard Procedure for Control of Fan Rotors (Wheels)

1.0 Purpose and Scope

1.1 This procedure assigns responsibility and establishes methods for controlling quality in the construction of fan rotors (wheels).

1.2 This procedure forms an integral part of the Corporate Quality Program and is applicable to all fan equipment.

2.0 General Requirements

2.1 The Wheel Department Manager is responsible for implementing this procedure.

2.2 Submittal data and/or fabrication drawings will be kept in the work area while performing all work.

2.3 Materials, machinery and equipment needed for this operation shall be suitable to accomplish a professional, first class finished product.

2.4 Persons performing fan rotor construction operations in accordance with this procedure shall be knowledgeable of the procedural requirements and shall be instructed in proper fan rotor construction techniques.

2.5 The Wheel Department Manager shall oversee that workers keep all materials, machinery, and equipment used in neat, clean, and satisfactory operating condition.

3.0 Procedure for Fan Rotor Construction

3.1 The Wheel Department Manager shall check fabrication instruction data for sizes and model designations and verify with standard fan rotor construction requirements.

3.2 The Wheel Department Manager shall assist the Plasma & Parts Department Manager to prepare an accurate material cut list. The cut list shall be submitted to either the President or the Purchasing Manager for purchase of required items. When the applicable material is received, the cut list is to be assigned to the layout personnel for cutting and forming. Hubs will be assigned to the machine shop sub-department for required operations at the proper time.

3.3 Before assembly, each rotor is to have all welds cleaned and dressed by wire brushing and/or grinding. Grinding of welds is not permitted when non-destructive testing of these welds is required. Fan rotors (wheels) shall be statically and dynamically balanced.

3.4 Company and Industry standards for welding shall be used for all welding operations.

3.5 For controlled material jobs, all material is to be color coded and stored in a designated area. No other material is to be stored in this designated area.

3.6 For controlled material jobs, qualified welders only are to be utilized for welding operations.

3.7 For orders specifying such, qualified welders' logs will be maintained detailing each activity.

3.8 Assignment of weld rod will be controlled by the procedure entitled *Weld Rod Control.*

4.0 Acceptance Criteria for Fan Rotors

4.1 There shall be no sharp edges or burrs that could constitute a safety hazard during subsequent handling and installation.

4.2 All fan rotors will be inspected for conformance to dimensions and features as set forth by applicable drawings and specifications, and general quality of workmanship as dictated by industry standards.

4.3 Acceptance criteria shall also be in accordance with the customer's purchase order and specification requirements.

5.0 Records

5.1 For controlled material jobs, records of material receipt and usage shall be kept and stored in a designated area as required by the customer's specification.

5.2 For controlled material jobs, weld rod usage will be recorded as detailed in the section entitled *Weld Rod Control.*

5.3 All fabrication drawings and pertinent data will be stored along with the sales order pages and kept as a permanent file for future reference by Fan Equipment Co. These records are available for customer review at any time at our offices.

Standard Procedure for Control of Damper Construction

1.0 Purpose and Scope

1.1 This procedure assigns responsibility and establishes methods for controlling quality for the construction of dampers, variable inlet vane type, opposed blade and parallel blade type, and wafer type.

1.2 This procedure forms an integral part of the Corporate Quality Program and is applicable to all fan equipment dampers.

2.0 General Requirements

2.1 The Blower Department Manager is responsible for implementing this procedure.

2.2 Submittal data and/or fabrication drawings will be kept in the work area while performing all work.

2.3 Materials, machinery and equipment needed for this operation shall be suitable to accomplish a professional, first class finished product.

2.4 Persons performing damper construction operations in accordance with this procedure shall be knowledgeable of the procedural requirements and shall be instructed in proper damper construction techniques.

2.5 The Blower Department Manager shall oversee that workers keep all materials, machinery, and equipment used in neat, clean, and satisfactory operating condition.

3.0 Procedure for Damper Construction

3.1 The Blower Department Manager shall check fabrication instruction data for sizes and model designations and verify with standard damper construction requirements. Shaft and bearing sizes and tolerances shall also be verified.

3.2 The Blower Department Manager shall assist the Plasma & Parts Department Manager to prepare an accurate material cut list. The cut list shall be submitted to either the President or Purchasing Manager for purchase of required items. When the applicable material is received, the cut list is to be assigned to the layout personnel for cutting and forming. Shafting will be assigned to the machine shop sub-department for required operations at the proper time.

3.3 Before assembly each sub-assembly is to have all welds cleaned and dressed by wire brushing and/or grinding. Grinding of welds shall not be permitted when nondestructive testing of these welds is required.

3.4 Company and industry standards for welding shall be used for all welding operations.

3.5 During damper assembly, specific care is to be taken to insure proper fit of blades and movement of linkages and control shafts.

3.6 It is the responsibility of the Quality Control Manager to assure that the requirements of section 3.5 above are accomplished.

3.7 For controlled material jobs, all material is to be color coded and stored in a designated area. No other material is to be stored in this designated area.

3.8 For controlled material jobs, qualified welders only are to be utilized for welding operations.

3.9 For orders specifying such, qualified welders' logs will be maintained detailing each activity.

3.10 Assignment of weld rod will be controlled by the procedure entitled "Weld Rod Control".

4.0 Acceptance Criteria for Dampers

4.1 There shall be no sharp edges or burrs that could constitute a safety hazard during subsequent handling and installation.

4.2 All dampers will be inspected for conformance to dimensions, accessories and features as set forth by applicable drawings, specifications, and general quality of workmanship as dictated by industry standards.

5.0 Records

5.1 For controlled material jobs, records of material receipt and usage shall be kept and stored in a designated area as required by the customer's specification.

5.2 For controlled material jobs, weld rod usage will be recorded as detailed in the section entitled *Weld Rod Control*.

5.3 All fabrication drawings and pertinent data will be stored along with the sales order pages and kept as a permanent file for future reference by Fan Equipment Co. These records are available for customer review at any time at our offices.

Standard Procedure for Control of Painting Operation

1.0 Purpose

1.1 This procedure assigns responsibility and establishes methods for controlling quality in the painting of parts with protective coatings for fan equipment and accessories.

2.0 General Requirements

2.1 The Assembly Manager is responsible for implementing this procedure.

2.2 The Assembly Manager is responsible for having a copy of submittal data or engineering instructions on hand to outline his department's work.

2.3 Materials and equipment required for this operation shall be selected so as to accomplish a first class, professional job.

2.4 Persons performing painting operations in accordance with this manual shall be knowledgeable of procedures required and shall be instructed in proper painting techniques.

2.5 The Assembly Manager shall oversee that workers keep all materials and equipment for this operation in orderly, clean, and satisfactory operating condition.

3.0 Procedure for Painting Operation

3.1 The Assembly Manager shall review the submittal data and engineering instructions for type, thickness, and color of coating.

3.2 The Assembly Manager is responsible to see that an accurate requisition for materials is submitted to the President or Purchasing Manager in adequate time to maintain the required ship date.

3.3 Workers are to prepare and clean the surfaces to be coated in accordance with the coating manufacturer's recommendations, and other instructions called out by the engineering department.

3.4 Workers are to apply the primer and/or finish coats to the prepared surfaces in the proper thickness and color.

3.5 All paint received, for General Electric Co. orders, shall be marked with receipt date and expiration date.

3.6 Paint Vessel Gauges shall be kept clean, visible, & calibrated. The Assembly Manager is responsible for the weekly inspection of equipment.

4.0 Acceptance Criteria for Painting Operation

4.1 When the coating operations are complete, the Quality Control Manager shall inspect each piece to verify that each item has been coated in accordance with the submittal data and satisfactory aesthetic quality.

5.0 Records

5.1 Specific records of each painting operation will not be kept. Painting operations that have been identified as unacceptable will be dispositioned at the time of each finding. The factory order pages, and fabrication instructions will serve as the permanent record of the coating system provided for each project.

5.2 Specific coating documentation will be provided for each project requiring such. All required documentation will be submitted and stored as required by the customer's specification.

Standard Procedure for Control of Unit Assembly

1.0 Purpose and Scope

1.1 This Procedure assigns responsibility and establishes methods for controlling quality in the assembly of fans and accessories.

1.2 This procedure forms an integral part of the Corporate Quality Program and is applicable to all fan equipment.

2.0 General Requirements

2.1 The Assembly Manager is responsible for implementing this procedure.

2.2 Submittal data and/or fabrication drawings will be kept in the work area while performing all work.

2.3 Materials, machinery and equipment needed for this operation shall be suitable to accomplish a professional, first-class final product.

2.4 Persons performing assembly operations in accordance with this procedure shall be knowledgeable of the procedural requirements and shall be instructed in proper assembly techniques.

2.5 The Assembly Manager shall oversee that workers keep all materials, machinery, and equipment used in neat, clean, and satisfactory operating condition.

3.0 Procedure for Unit Assembly

3.1 The Assembly Manager shall check submittal instruction data for sizes and model designations and verify the accuracy of the various parts assigned to his department.

3.2 The Assembly Manager is responsible for submitting an accurate requisition for materials for each job to the President or Purchasing Manager in adequate time to maintain the required ship date.

3.3 The Assembly Manager shall assure that all parts fit well together both operationally and aesthetically. During fan assembly, specific care is to be taken to ensure proper fit of inlet cones to rotor shroud, bearings to shaft, and that bearing locking collars are accurately and securely in place. V-belt drives, and direct flexible couplings must be precisely aligned, and securely fit. The Standard Procedures for welding shall be followed if any additional welding is required.

3.4 Upon completion of the assembly of the unit, the Assembly Manager shall verify that the unit is in accordance with the submittal and shop drawings, and that all other specification requirements are satisfied. Fans shall be properly identified and fitted with a company nameplate after final assembly.

3.5 Upon completion of the unit a final running test shall be performed to ensure proper running clearances, bearing temperature rise, V-belt drive alignment, drive motor starting time and operating temperature, and rotor residual unbalance.

3.6 It is the responsibility of the Quality Control Manager to ensure that the requirements of sections 3.3, 3.4, and 3.5 are accomplished.

4.0 Acceptance Criteria for Unit Assembly

4.1 There shall be no burrs or sharp edges that could constitute a safety hazard during subsequent handling or installation of the unit.

4.2 The final balance and run test results must satisfy all specification requirements and confirm that the unit is mechanically correct by all industry standards.

The Quality Control Manager shall confirm that final rotor residual unbalance does not exceed quality grade G6.3 of ANSI S2.19, and is in accordance with ISO 1940/1 - 1986, Permissible Residual Unbalance; and Figure 2-53, General Machinery Vibration Severity Chart. This requirement is detailed in the table below:

RPM	Displacement (mils)	Velocity (in./sec.)
3600	0.53	0.10
1800	1.06	0.10
1200	1.59	0.10
900	2.12	0.10
720	2.66	0.10
600	3.18	0.10

5.0 Records

5.1 A balance signature record will be taken for all fans furnished with motors and drives during the final running test. Signature records will be stored or submitted to the customer per specification requirements.

Standard Procedure for Control of Packaging and Shipping

1.0 Purpose and Scope

1.1 This procedure assigns responsibility and establishes methods for controlling quality in the packaging (when applicable) and shipping of air moving equipment.

1.2 This procedure forms an integral part of the Corporate Quality Program and is applicable to all pieces of equipment.

2.0 General Requirements

2.1 The Assembly Manager is responsible for implementing this procedure.

2.2 The Assembly Manager is to have a copy of the submittal data outlining the packaging requirements.

2.3 Materials and equipment required for this operation shall be suitable to accomplish a professional job.

2.4 Persons performing packaging operations in accordance with this procedure shall be knowledgeable of the procedure requirements and shall be instructed in proper packaging techniques.

2.5 The Assembly Manager shall insure that workers keep all materials and equipment for this operation in orderly, clean, and satisfactory operating condition.

3.0 Procedure for Packaging and Shipping

3.1 The Assembly Manager shall check the submittal data and fabrication instructions for special considerations required for each piece of equipment.

3.2 The Assembly Manager is responsible for acquiring the proper materials and services needed for each job in adequate time to maintain shipping commitments. The Assembly Manager and/or Purchasing Manager may issue purchase orders as required to obtain these materials.

3.3 Units not covered by a customer's packaging specification shall be prepared for shipment to comply with the carrier's handling procedures. Generally, free standing fan equipment will be metal banded or bolted to wooden pallets, suitable for forklift handling. All shipments shall be prepared so that all parts are properly restrained to avoid damage during transit.

4.0 Acceptance Criteria for Packaging

4.1 When the packaging process is complete, the Quality Control Manager shall verify that the packaging complies with all applicable specifications, and that the equipment will remain in first class condition during transit.

5.0 Records

5.1 Records of packaging preparations will not be kept unless required by the customer's purchase order.

Visual Weld Acceptance Criteria Procedure #1.01-INSP.

1.0 Purpose and Scope

1.1 This procedure is intended to define acceptance standards for welding of Fan Equipment Co. products. The standards established in this procedure meet or exceed those standards set forth in the latest edition of AWS D1.1.

2.0 Static Components

2.1 Static components such as: bearing support pedestals, common channel bases, and fan housings shall be evaluated as follows:

2.2 Porosity shall refer to pin holes or voids open to the surface. The maximum diameter of any one void shall not exceed 1/16 inch. The sum of the diameters shall not exceed 1/8 inch in any six (6) inches of linear weld, or 1/16 inch in any two (2) inches of linear weld.

2.3 Undercutting shall be limited as follows:
- 10-gauge material and thinner ..... 1/64 inch allowed.
- 8-gauge material up to and including 3/8 inch material ..... 1/32 inch allowed.
- 7/16 inch and thicker material ..... 3/64 inch allowed.

2.4 Fillet weld size - A single continuous weld shall be allowed to under run the nominal fillet size required by a maximum of 1/16 inch without correction, provided the undersize weld does not exceed 10% of the nominal fillet size and does not exceed 10% of the length of the weld.

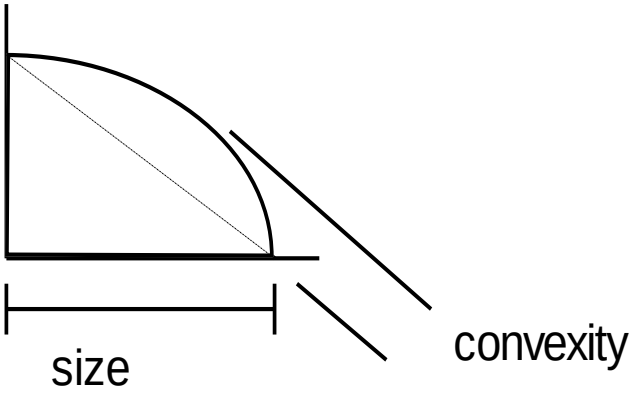
2.5 Convexity in fillet welds is acceptable as follows:

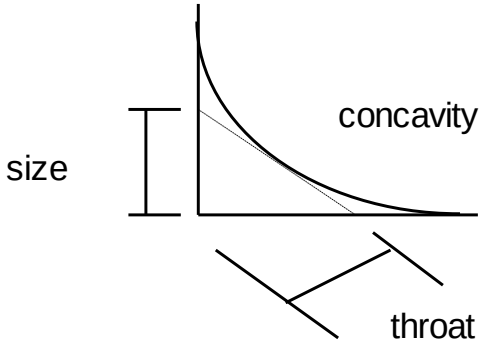
Weld Size (inches)	Max. Allowable Convexity
3/32 to 1/8	1/32
5/32 to 5/16	1/16
3/8 to 1/2	3/32
9/16 to 3/4	1/8

2.6 Concavity in fillet welds, or insufficient throats shall be allowed provided the maximum concavity is not less than the required throat of a given weld size.

2.7 Visual inspection of welds in all steels may begin immediately after the completed welds have cooled to ambient temperature. Acceptance criteria for ASTM A514 and

A517 steel shall be based on visual inspection performed not less than 48 hours after completion of the weld.





3.0 Rotating Components (Rotors - Wheels)

3.1 Porosity shall refer to pin holes or voids open to the surface. The maximum diameter of any one void shall not exceed 1/16 inch. The sum of the diameters shall not exceed 1/8 inch in any six (6) inches of linear weld, or 1/16 inch in any one (1) inch of linear weld.

In addition - The weld wrap, including up to two (2) linear inches of weld from the blade and blade tip.

- The weld wrap on thrust fins, including up to two (2) linear inches of weld from the wrap.
- The weld wrap on blade stiffening members (heel rings, tip rings, full gussets), including one (1) linear inch of weld from the wrap on each side.

3.2 Undercutting shall be limited as follows:

10-gauge material and thinner ..... 1/64 inch allowed.
8-gauge material up to and including 3/8-inch material... 1/32 inch allowed.
7/16 inch and thicker material ..... 3/64 inch allowed.

3.3 Fillet weld size - a continuous weld shall be allowed to under run the nominal fillet size required by a maximum of 1/16 inch without correction, provided the undersize weld does not exceed 10% of the nominal fillet size and does not exceed 10% of the length of the weld.

3.4 Convexity in fillet welds is acceptable as follows:

Weld Size (inches)	Max. Allowable convexity
3/32 to 1/8	1/32
5/32 to 5/16	1/16
3/8 to 1/2	3/32
9/16	1/8

3.5 Concavity in fillet welds, or insufficient throats shall be allowed provided the maximum concavity is not less than the required throat of a given weld size.

3.6 Visual inspection of welds in all steels may begin immediately after the completed welds have cooled to ambient temperature. Acceptance criteria for ASTM A514 and A517 steels shall be based on visual inspection performed not less than 48 hours after completion of the weld.

4.0 Acceptance Criteria

4.1 An acceptable weld shall exhibit thorough fusion between the filler metal and the base metal, with all craters filled to the full cross section of the weld, in accordance with the weld characteristics detailed in the previous sections of this procedure. The Quality Control Manager shall be responsible for acceptance of weld inspections.

5.0 Correction of Non-conforming Welds

5.1 The rework or repair of any unacceptable weld shall be performed under the direction of the Blower Department and/or Wheel Department Manager. Non-destructive testing may be performed to confirm that a satisfactory correction has been made.

5.2 Unacceptable welds shall be corrected as follows:

- Overlays or excessive convexity - reduce by removal of excess weld filler metal.
- Excessive concavity of weld or crater, undersize welds, or undercutting - clean and deposit additional weld filler metal.
- Cracks in weld - determine the extent of the crack by liquid penetrant inspection, or other equally positive means; remove the crack and sound metal 2 in. beyond each end (if possible); and re-weld.

6.0 Visual Weld Inspection & Personnel Qualifications

- Persons performing fan welding operations in accordance with this procedure shall be knowledgeable of the procedural requirements and shall be instructed in proper welding techniques.

- Welding personnel shall be certified and tested by third party testing after three years of daily welding. These personnel will not be re-tested by the third party as daily welding experience and quality is inspected by the Fabrication Manager and Quality Control Manager. Daily Logs will not be kept.

- Third Party Dye Penetrant and/or Mag Particle Testing will be performed if specified by Customer during the quoting process or added at order entry.

Supplier Approval Procedure #SAP-001

1.0 Purpose

1.1 This procedure defines methods of evaluating vendors (suppliers) to qualify for supplying materials, processes, and services to be used or incorporated into Fan Equipment Co. products.

2.0 Policy

2.1 A vendor must meet certain basic requirements to qualify for supplying material, processes, and services to Fan Equipment Co. or our customers. These requirements encompass technical capability, quality system management, and cost constraints. Purchasing, Quality Control, and management coordinate their efforts to select vendors who meet or exceed the requirements for an approved vendor.

3.0 Definitions

3.1 Approved Vendor(Supplier) - A vendor considered by Fan Equipment Co. as being fully capable of delivering a quality product or service and who is formally listed as such.

3.2 Approved Supplier List (ASL) - A list of approved and conditionally approved suppliers qualified to supply certain types of commodities. The ASL is a proprietary and confidential document.

3.3 Commodity - A classification of procured products or services usually related by function or manufacturing process.

3.4 Conditional Approval - Approval of a vendor for a limited time (6 months maximum) while further testing/evaluation is being performed or corrective action is being implemented and verified.

3.5 Disapproved Vendor - A vendor considered by Fan Equipment Co. as incapable of delivering a quality product or service at a competitive price.

3.6 Service - A function which does some operation on parts or assemblies such as plating, coating, testing, machining, etc.

3.7 Supplier (Vendor) - An individual or organization that enters into a contract to furnish specified products or services.

4.0 Procedure

4.1 Need for Supplier Approval

4.1.1 All new suppliers who wish to supply commodities for use in Fan Equipment Co. products must be approved. Evaluation and approval will be conducted/assessed at the F.E. facility, vendor facility, or by an outside independent test facility. The Quality Survey must be completed, and a need must exist for a new vendor product or service.

4.1.2 Distributors do not manufacture piece parts, therefore, are not considered vendors and need not be listed as approved vendors. Some distributors may be listed on the ASL so they can be monitored because of critical parts and/or delivery.

4.1.3 Projects requiring supplier compliance with **ASME NQA-1** guidelines shall require additional approval criteria. As a minimum the following applies:
A) Written Q.C. programs from the vendor must be received and approved by F.E.
B) The supplier must demonstrate compliance with NQA-1 basic requirement paragraphs: 1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 17, and 18.

4.1.3.1 Approval methods shall be per sections 4.2.3 and 4.2.5, or 4.2.6 below.

4.2 Approval Methods

Management, Quality Control, and Purchasing will qualify each new supplier by one or more of the following:

4.2.1 Physical testing of the supplier's product
4.2.2 Analysis of the supplier's product or process
4.2.3 Supplier survey of quality system and/or capabilities
4.2.4 Previous history with Fan Equipment Co.
4.2.5 Vendor site audit
4.2.6 Previous qualification of the supplier by another company or agency qualified to perform an appropriate Q.C. evaluation/audit.

4.3 Company Requirements

4.3.1 A semi-annual cumulative evaluation program will be used to track vendor performance based on quality, delivery, and price.

All supplier rating documents are proprietary and Company confidential.

A) Management, Quality Control, and Purchasing shall be the only departments with access to the approved supplier files.

B) Management shall be the only department that can revise the ASL.

C) Management, Quality Control, and Purchasing shall be the only departments that maintain an ASL printout. ASL hard copies will be considered out of date when the date printed on the hard copy is greater than one year.

4.3.2 The following rating system is used to evaluate approved suppliers based on quality, delivery, and price over the past six months. Each vendor is reviewed by Management, Quality Control, and Purchasing to determine their rating.

Rating

10 .....Best

1 .....Poor

Note: Reject/rework determined as follows:

1. Material does not comply with drawing, revision of P.O. or revision of drawing.
2. If material is rejected or rework is required due to F.E. Co., the vendor will receive **full** rating due.

4.4 Supplier Approval

Vendors are approved when they receive ≥ “8” in all three categories. Vendors receiving a “5”, “6”, or “7” in any category are placed on conditional approval. Vendors receiving a “4” or less in any category are disapproved.

4.4.1 Approved or conditionally approved suppliers will be used for all purchased parts, material and services that go into manufactured products and/or materials supplied to Fan Equipment Co.’s customers. Management is responsible for approving or conditionally approving suppliers and maintenance of the ASL. Conditionally approved suppliers may be used for the following reasons.

A) Urgency requires use prior to completion of the formal approval process.
B) The supplier has not been used in the past 12 months.
C) The supplier rating has fallen and remains below “8” in a category.

4.4.2 Specifications and/or drawings that list a specific supplier shall have commodities requisitioned from that supplier only.

4.4.3 If specifications and/or drawings do not specify a supplier, any approved supplier capable of producing the required material may be used.

4.5 Supplier Disapproval

4.5.1 Suppliers will be evaluated on a continuous basis using incoming inspection history and application history to assess their performance as a supplier. Any supplier with performance below F.E. standards must upgrade their performance or be disapproved. When necessary, F.E. will assist the vendor with upgrading of their performance through specification clarification, statistical process control, etc.

4.5.2 Suppliers not used for a period of 12 months must be re-evaluated and qualified the same as a new supplier (see section 4.2).

4.5.3 Any supplier with a continuing substandard performance and who is unwilling or unable to correct the conditions causing the problem will be removed from the specification and/or ASL.

A.) Suppliers with **cumulative** ratings below “4” will be removed from the ASL, subject to a supplier review conducted by Management, Quality Control, and Purchasing.

1. Suppliers which engage in “drop shipment” purchases may be exempted from formal review when rating on delivery causes the cumulative rating to reflect a substandard performance.

2. Suppliers subject to removal from the ASL shall be formally reviewed for allowances. Consideration shall be given for: Price changes (mandatory or justifiable) and delivery unaccountability (i.e., storms, strikes).

3. Formal reviews shall be documented on the Supplier Review Form and signed by a representative from Management, Quality Control, and Purchasing.

4. The completed Supplier Review Form shall be maintained chronologically by purchasing in the supplier profile jacket.

B.) Substandard performance in quality ratings are subject to conditional approval and review (allowance) only once per year for the same cause without removal from the ASL. Conditionally approved vendors may only remain approved for 60 days before either removed from the ASL or formally approved.

4.5.4 If the supplier is conditionally approved it will be management's responsibility to assure that the conditions required for approval are met. When the conditions required are met, the supplier will be added to the ASL. If the conditions are not met, the supplier will not be approved.

4.6 Supplier Review

4.6.1 Supplier Review Meetings will be scheduled as necessary by Management, Quality Control, or Purchasing. An on-going review shall take place at the daily morning production meeting, to exchange supplier performance evaluations as they occur. Supplier files shall be updated, as necessary.

4.6.2 The daily morning production meetings are attended by: The President, General Manager, Application Engineers, and the following managers: Plasma & Parts dept., Blower Dept., Wheel Dept., Assembly, Purchasing, and Quality Control, which are all the persons responsible for Q.C., at all levels.

Record of Revisions

Revision Number	Effective Date	Affected Sections
1	8/1/1989	All
2	2/1/1990	Added to Standard Procedures
3	3/14/1991	Added to Standard Procedures Weld Control page 26.
4	3/12/1993	Standard Procedure for Control of Fan Housing and Support Base Construction, Rev. 1. - Added date & Rev. No. - Added to paragraph 3.4 - Added paragraph 4.4 Standard Procedure for Control of Damper Construction; Rev. 1 - Added date & Rev. No. - Added to paragraph 3.4 Standard Procedure for Control of Unit Assembly; Rev. 1. - Added date & Rev. No. - Added to paragraph 3.3 Standard Procedure for Control of Painting Operation; Rev. 1 - Added date & Rev. No. Standard Procedure for Control of Packaging and Shipping; Rev. 1. - Added date & Rev. No. Standard Procedure for Control of Shear Operation; Rev. 1. - Added date & Rev. No. - Added to paragraph 4.1 Standard Procedure for Control of Welding Process; Rev. 1. - Added date & Rev. No. - Added to paragraph 3.1 FEWRC-1 Procedure for Weld Rod Control - Added date & Rev. No. Visual Weld Acceptance Criteria #1.01-INSP - Revised item #4 of "correction of non- conforming welds" - Deleted item #5 of "correction of non-conforming welds"

Revision Number	Effective Date	Affected Sections
5	11/22/93	Moved contents of sections: 3.6, 3.7, 3.12 & 5.3 of Standard Procedure for Control of Fan Housing & Support Base Construction to Standard Procedure for Control of Unit Assembly. Visual Weld Acceptance Criteria Procedure #1.01-INSP. - Added date & Rev. No. - Revised document format & page layout
6	5/31/94	Added aluminum welding procedure: AL-4.01. Added Supplier Approval Procedure: SAP-001 Added welding procedure NI-5.01
7	1/19/96	Removed Standard Procedures from Quality Control Manual, creating two (2) separate documents. Updated personnel assignments - all procedures Changed Standard Procedure for Control of Shear Operation - August 1, 1989; Rev. 2 to Standard Procedure for Control of Plasma & Parts Cutting Operation - January 19, 1996; Rev. 0 - Visual Weld Acceptance Procedure 1.01-INSP - Added to 1.1, 2.7, 3.6 - Revised 5.1 & 5.2 Supplier Approval Procedure SAP-001 - Revised 2.1, 3.5, 3.6 - Added 4.1.3.B, 4.2, 4.3.1, 4.3.1.A, 4.3.3.C, 4.3.2, 4.4, 4.5.3.A.3, & 4.6.2 - Deleted 4.3.3, 4.3.4, 4.6.3, 4.6.4
8	9/3/98	Noted corporate name change to Fan Equipment Co. Standard Procedure for Control of Welding Processes - August 1, 1989; Rev. 3 - Added to 2.3; 2.5 FEWRC-1 Procedure for Weld Rod Control - August 1, 1989; Rev. 2 - Corrected temperatures in 2.1 - Clarified section 3.0 is for controlled material jobs only. Visual Weld Acceptance Criteria Procedure #1.01-INSP. - March 12, 1998 Rev.4 Revised section 1.1 to “latest edition” of AWS D1.1

Revision Number	Effective Date	Affected Sections
9	5/15/05	Revised Standard Procedure of Painting Operation - August 1, 1989 Rev. 0 - Added Paint Expiration & Receipt Procedure, 3.5 - Added Paint Vessel Gauge Procedure, 3.6 Revised Standard Procedure for Control of Plasma & Parts Operation - January 19, 1996; Rev. 0 - Added Material Segregation Procedure – 3.5
10	5/21/08	Revised Standard Procedure for Control of Welding Processes – August 1, 1989 - Rev.3 - Revised job title in Sections 2.1 and 5.1.
11	8/12/09	Revised Visual Weld Acceptance Criteria Procedure #1.01INSP. - Aug 12, 2009; Rev. 5 - Added 6.0 Visual Weld Inspection/Personnel Qualifications
12	9/3/98	Noted corporate name change to Fan Equipment Co.
13	1/12/15	Revised entire Standard Procedures Manual format. - General changes.
14	4/19/17	Revisions of General changes.
15	12/12/17	Revisions of General changes.
16	7/16/19	Revisions of General changes.
17	6/7/23	General revisions, QA changed to QC, and removed all section revision numbers.