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JOSH OLUND  
REVIEWER

06/13/2014

DATE

Vermont Agency of Transportation

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ON: **June 2, 2014**

and Checked for

**CONFORMANCE**

BY: Jennifer Fitch DATE: 06/16/2014

## KENWAY CORPORATION

## QUALITY ASSURANCE PROGRAM

### GENERAL COMMENT:

- PER SECTION 70(j) OF THE SPECIAL PROVISIONS, PLEASE IDENTIFY HOLD POINTS (CRITICAL PRODUCTION POINTS AT WHICH INSPECTION WILL OCCUR PRIOR TO CONTINUING WORK EFFORTS)

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## **SECTION 1.0 QUALITY ASSURANCE POLICY**

### **1.1 Scope**

This policy establishes the requirements, systems, and procedures for the Quality Assurance Program.

### **1.2 Purpose**

The purposes of the Quality Assurance Program are to:

- 1.2.1 Ensure adherence to the general principles of ASME RTP-1 requirements through correct and thorough processing of purchase orders, drawings, specifications, and other documents.
- 1.2.2 Establish an inspection system to monitor the variability of workmanship, processes, and materials in order to produce a consistent, uniform product.
- 1.2.3 Establish and monitor the quality requirements related to materials and services of Vendors or Subcontractors based on surveillance and performance analysis.
- 1.2.4 Provide a system for the detection of defect trends and institute corrective measures

### **1.3 Laboratory Standards**

- 1.3.1 A laboratory standards program is to be maintained for the calibration of the measuring and test equipment.
- 1.3.2 The program will provide confidence in the accuracy of the measuring and test equipment.

### **1.4 Test Methods**

Specific written inspection and test procedures will be followed for all inspection and test operations.

### **1.5 Operating Procedures**

- 1.5.1 Parts will be made in the sequence and by the conditions specified in Kenway

Corporation's standard operating procedures.

- 1.5.2 These production procedures shall be available to Quality Assurance personnel during their audits so as to confirm adherence to them.

## **1.6 Documentation**

- 1.6.1 Inspection results shall be documented and kept on file as specified by contractual requirements and/or as designated by the project manager.
- 1.6.2 Inspection documentation shall be by reference to shop order number, part number, or in any manner that will link inspection results with a specific part.
- 1.6.3 Only approved forms shall be used for the entering of inspection results, as well as for such related items as the purchasing of raw materials, processing orders, and sub-contracting work on orders.
- 1.6.4 Any change in documentation must be approved by the Quality Assurance Manager and Kenway Management Team.
- 1.6.5 To ensure that the latest revision of each document is recorded and used during the fabrication process, Engineering shall maintain, update, and distribute the Document Control Sheet at regular intervals. Verification of correct documentation shall occur weekly during management team Production Meetings.

## **1.7 Nonconformity Correction Reports**

- 1.7.1 When nonconformities or imperfections requiring correction are discovered, a Nonconformity Correction Report shall be initiated by the Quality Assurance Manager.
- 1.7.2 The report shall be forwarded to Engineering and production management to determine the cause of the nonconformity and to initiate proper corrective action.
- 1.7.3 The determination shall include:
  - (a) manufacturing and processing procedures
  - (b) purchase orders
  - (c) results of tests
- 1.7.4 The report shall be reviewed and approved by the Quality Assurance Manager, who will also secure all other reviews and approvals as required.

## **1.8 Distribution of Quality Assurance Manual**

- 1.8.1 The manual shall be distributed, as necessary, by the Quality Assurance Manager.

## **1.9 Quality Assurance Manual Revision**

- 1.9.1 The manual shall be revised, as necessary by the Quality Assurance Manager, subject to review and approval of the President.
- 1.9.2 The manual index shall also be periodically updated by the Quality Assurance Manager.
- 1.9.3 Manual updating shall be done by all holders upon receipt of a revised section, and the superseded parts shall be destroyed.
- 1.9.4 The Quality Assurance Manager shall maintain a master record of all manual revisions. See (Table NM6-7).

## **1.10 Notification of In-Process Changes**

- 1.10.1 Initiator will notify all responsible parties in writing or verbally with written confirmation, depending on the impact of the change.
- 1.10.2 Changes require engineering approval before implementation.
- 1.10.3 Necessary documentation will be changed and clearly marked.

# **SECCION 2.0 QUALITY ASSURANCE ORGANIZATION**

## **2.1 Scope and Purpose**

This section sets forth:

- 2.1.1 The organization of the Quality Assurance Department.
- 2.1.2 The definition of the responsibilities and authorities associated with each job.
- 2.1.3 The relationship of each job to other jobs within the organization.

## **2.2 Organizational Responsibility**

- 2.2.1 The Kenway Management Team is responsible for the establishment and maintenance of an adequate Quality Assurance Program.
- 2.2.2 Additional personnel outside of the Quality Assurance Department may be assigned to act in various quality control functions.
- 2.2.3 Where inspection is done by non-Quality Assurance personnel, audits of the effectiveness of their work will be periodically performed by Quality Assurance.

## **2.3 Organizational Functions**

- 2.3.1 The total quality function encompasses many activities and personnel, but it is the function of Quality Assurance personnel to ensure conformance to specifications. These functions include:
  - (a) design review of applicable drawings
  - (b) inspection of incoming raw materials and components
  - (c) providing control at various stages of processing and fabricating
  - (d) determining product release or rejection
- 2.3.2 Quality Assurance Management will analyze rejection decisions. It may finalize the decision or make changes under permitted repair procedures.

## **2.4 Organization Chart (copy attached)**

**NOT ATTACHED**

## **SECTION 3.0 DOCUMENTATION**

### **3.1 Scope and Purpose**

- 3.1.1 This section establishes the minimum documentation required for quality assurance during fabrication of FRP equipment.
- 3.1.2 Adequate and meticulous documentation is the foundation of a good Quality Assurance Program.

## 3.2 Minimum Documentation

- 3.2.1 Minimum documentation for each job shall include:
- a) Work Order, including material specifications, fabrication procedures, operating conditions and design specifications
  - b) Purchase Order
  - c) Bill of Materials
  - d) Calculations (if required)
  - e) Approved Drawings
  - f) Job Review Meeting Sheet
  - g) Non-standard fabrication procedures
  - h) INSPECTION DOCUMENTATION (PRIMARILY THE INFORMATION NOTED IN SECTION 6)
- 3.2.2 Additional documentation as specified by the customer and/or project specifications.

## 3.3 Document Preparation Responsibility

The Project Manager/Engineer is responsible for preparing all required job documentation and distributing that information to the Production Director, Supervisors and the Quality Assurance Manager. The Production Director is responsible facilitating the Job Review Meeting with minimum participation of all parties referenced above.

## SECTION 4.0 INSPECTION OF RECEIVED GOODS

### 4.1 Resin

#### WHAT ABOUT FORM WORK INSPECTION?

The results of the following shall be recorded on the Resin Log Sheet, prior to use in fabrication. Material not in conformance shall be removed from circulation, properly labeled as non-conforming, and returned to the manufacturer.

- 4.1.1 The resin shall be checked to ensure it is the product ordered.
- 4.1.2 The resin shall have the proper label for the specified product, including the manufacturer's product name and Manufacturer's Specific Product Identification (MSPI).
- 4.1.3 The resin shall be visually checked to be of typical color and clarity for the specific resin, free from solid or gelled particles.
- 4.1.4 The resin must be within the manufacturer's specified limits for specific gravity, viscosity, and room temperature gel time as determined by industry standard test

methods.

- 4.1.5 Material certification and/or Certificates of Compliance where applicable shall be checked against the MSPI (if required by customer)
- 4.1.6 The storage environment of the resin must be in compliance with the manufacturer's recommendations.

## **4.2 Reinforcements**

The results of the following shall be verified prior to use in fabrication. Material not in conformance shall be removed from circulation, properly labeled as non-conforming, and returned to the manufacturer.

- 4.2.1 The reinforcement shall be checked to ensure it is the product ordered.
- 4.2.2 The reinforcement shall have the proper label, including the manufacturer's product name and the MSPI.
- 4.2.3 The reinforcement package shall be checked for damage.
- 4.2.4 Material certification and/or Certificates of Compliance where applicable shall be checked against the MSPI (if required by customer).
- 4.2.5 The storage environment of reinforcements must be in compliance with the manufacturer's recommendations.

## **4.3 Curing Agents**

The results of the following shall be verified prior to use in fabrication. Material not in conformance shall be removed from circulation, properly labeled as non-conforming, and returned to the manufacturer.

- 4.3.1 Curing agents shall be checked to assure they are the products ordered.
- 4.3.2 Curing agents shall have the proper label for the specified product, including the manufacturer's name and the MSPI.
- 4.3.3 Curing agents shall be visually checked to assure there is no stratification of the material in two or more phases. In the case of liquids, they shall be free of sediment or solid particles.
- 4.3.4 Curing activity of the curing agent shall be checked using industry standard methods.

- 4.3.5 The storage environment of curing agents must be in compliance with the manufacturer's recommendations.

#### **4.4 Purchased and/or Sub-vended Items**

The results of the following shall be verified prior to use in fabrication. Material not in conformance shall be removed from circulation, properly labeled as non-conforming, and returned to the manufacturer.

- 4.4.1 The item(s) must be checked to assure that it is the product ordered.
- 4.4.2 The item(s) must be inspected for damage.
- 4.4.3 The item(s) must be in compliance with the applicable drawings, specifications, and test methods that are part of the Fabricator/Subvendor/User agreement.
- 4.4.4 The item(s) shall be properly stored to insure integrity.

#### **4.5 Common Additives**

The results of the following shall be verified prior to use in fabrication. Material not in conformance shall be removed from circulation, properly labeled as non-conforming, and returned to the manufacturer.

- 4.5.1 Additives must be checked to assure that they are the product ordered.
- 4.5.2 Additives shall have the proper label for the specified product, including the manufacturer's product name and the MSPI.
- 4.5.3 Additive packaging must be checked for damage.
- 4.5.4 Additives must be stored in an environment that complies with the manufacturer's recommendations.

### **SECTION 5.0 IN-PROCESS INSPECTION**

#### **5.1 Resin Mixing**

The following data shall be recorded on the Resin Log Sheet.

- 5.1.1 All resin mixing and primary preparation shall be done in one location under controlled conditions.

- 5.1.2 Formulas which have been predetermined for each particular type of resin must be kept in a log book containing completed Mixing Data Sheets.
- 5.1.3 Mixing Data Sheets are also filled out for each batch and kept in a separate log with reference to the particular job number(s) (if required by customer)

## 5.2 Material Dispersement

- 5.2.1 Resin must be dispersed in containers that are clearly marked identifying their contents. In-process inspection must verify that the resin matches that specified on the Job Tag.
- 5.2.2 Reinforcements must be visually inspected, as they are dispersed, for imperfections such as holes, cuts, thin spots, and separations and contaminants such as dirt, oil, grease, and foreign objects under adequate overhead lighting.

## 5.3 Component Fabrication

The following data must be reported on the component Job Tag, prior to assembly.

- 5.3.1 As components are fabricated, the materials used must be verified.
- 5.3.2 The lamination sequence of a particular component must be recorded and verified to be correct.
- 5.3.3 On machine-made components, pertinent machine settings must be recorded.
- 5.3.4 Curing agent system and amount utilized for each component must be recorded (if outside standard parameters).
- 5.3.5 Barcol readings of fabricated components must be taken and recorded.

**ANY QC OF THE FOAM OR MMA APPLICATION?**

## 5.4 Assembly

The following data must be recorded on the Inspection Checklist. The Quality Assurance Manager is responsible for developing this checklist per each job so that it appropriately documents the conformance/non-conformance of the various components and the finished product. This checklist will be reviewed with the Project Manager/Engineer prior to use.

- 5.4.1 Throughout the assembly procedure, proper sequences, materials, and dimensions must be verified.

## SECTION 6.0 FINISHED EQUIPMENT INSPECTION

The following data must be recorded on the Inspection Checklist.

### 6.1 Resin Cure

6.1.1 Surface hardness shall be checked in accordance with ASTM D 2583. Random readings must be taken on all parts and overlays. Certain corrosion barriers and cure systems may result in lower than typical hardness. If this is anticipated, an adjusted Barcol hardness value must be established with the User prior to fabrication.

6.1.2 All surfaces including overlays must pass an acetone sensitivity test. This is done by rubbing several drops of acetone on a small area and allowing the acetone to evaporate. Tackiness indicates improper resin cure.

HOW OFTEN ARE TESTS? SPACING OF TESTS?

6.1.3 All repairs to correct a nonconformity must be made in accordance with ASME RTP-1 or as designed by a qualified composites engineer.

ANY TESTING FOR FULL WETTING OF PARTS?

### 6.2 Dimensions and Laminate Thickness

6.2.1 Thicknesses of all components and overlays shall be verified. Thickness can be checked by measuring actual cutouts, where possible, employing an ultrasonic or magnetic gage, or with calipers.

6.2.2 All dimensions and locations must be checked against the equipment drawing and recorded.

IS THERE A DOCUMENT USED FOR LOGGING QC OF PROJECT TOLERANCES?

6.2.3 All repairs to correct a nonconformity must be made in accordance with ASME RTP-1 or as designed by a qualified composites engineer.

### 6.3 Visual Imperfections

6.3.1 The entire fabrication shall be checked for visual imperfections as described in Table 6-1 of ASME RTP-1, ASTM 2563, or customer specification. The equipment must comply with the Visual Inspection Level that has been specified.

6.3.2 All repairs to correct an imperfection must be made in accordance with Appendix M-9 of ASME RTP-1 or as designed by a qualified composites engineer.

M-7?

REPAIR PROCEDURES, IF NECESSARY AND NOT OTHERWISE PROVIDED IN A REVISED VERSION OF THIS PLAN, WILL NEED TO BE SUBMITTED AND APPROVED PRIOR TO IMPLEMENTATION. PLEASE ALSO REFER TO SPECIAL PROVISIONS SECTION 73(k).

## 6.4 Physical Property Tests

### TESTS ARE REQUIRED

Physical Property Tests shall be conducted when required by the customer or if other circumstances suggesting such testing is advisable.

- 6.4.1 Reinforcement to resin ratio is established through loss by ignition testing in accordance with ASTM D 2584. Components shall be tested if a cutout or trim area is available and required by customer specification or if determined to be necessary by the Project Manager, Production Director or Supervisor, and/or the Quality Assurance Manager.
- 6.4.2 Laminate proof tests on a cutout or end sample from the shell shall be done in accordance with ASTM D 638 if required by customer specification or if determined to be necessary by the Project Manager, Production Director or Supervisor, and/or the Quality Assurance Manager. Values obtained must be equal to or greater than those specified and used in design calculations

## 6.5 Equipment Pressure Tests

- 6.5.1 See para. 6-950 of ASME RTP-1 for requirements on pressure tests.
- 6.5.2 It is company safety policy that Kenway Corporation's a Compressed Air Permit be secured prior to testing; and that:
  - a) a relief valve set at 2 psig to 3 psig above the maximum test pressure be installed at the top of all vessels to be hydro-tested under positive pressure;
  - b) prior to applying pressure, all air must be displaced by water on vessels to receive a hydro test at a positive pressure;
  - c) all vacuum tests must be conducted outside behind ample safety barriers;
  - d) the Director of Quality Assurance must review and approve all test setups for safety prior to applying pressure or vacuum.

## SECTION 7.0 RECORD RETENTION AND CONTROLS

### 7.1 Scope

- 7.1.1 This procedure shall ensure that the records retained are complete and reliable.
- 7.1.2 Inspection and testing records shall, as a minimum, indicate the nature and number of observations made, and the number and type of nonconformities found.
- 7.1.3 Records shall be available for review as one of the principal forms of objective evidence of the Quality Assurance Program

## **7.2 Application and Retention**

- 7.2.1 In general, records must be retained by the Quality Control Department.
- 7.2.2 These records shall be used basically to verify product conformance. They shall indicate the acceptability of work or products and the action taken in connection with nonconformities.

## **7.3 Record Retention**

The Quality Assurance Department shall maintain inspection and test records of complete assembled units or subassemblies. These records shall be stored and maintained as specified by contractual requirements and/or as designated by the project manager.

## **7.4 Procedure for Record Handling**

- 7.4.1 Records shall be filed primarily according to Work Order number.
- 7.4.2 For incoming inspection, records shall be subdivided according to part number or alphabetically according to the name of the supplier.
- 7.4.3 Serialized items for shipment to a customer shall be filed sequentially. A separate file will be maintained to show dates of shipments of individual items or groups of serialized items.
- 7.4.4 Records of shipped items shall show part name, part number, and serial number of the product. This shall be followed by a record of inspections, tests, etc., that will verify that the product conformed to specification at time of shipment.
- 7.4.5 Records shall form a basis of analysis and management action regarding the Quality Assurance Program.

**Vacuum Infusion Checklist - Fabrication**

**PART**

Part #: \_\_\_\_\_ Work Order#: 8420 Date: \_\_\_\_\_

**MOLD**

Mold Prep By: \_\_\_\_\_ Date: \_\_\_\_\_ Inspected By: \_\_\_\_\_

Cleaner: \_\_\_\_\_ Sealer: \_\_\_\_\_ Release: \_\_\_\_\_

**LAMINATE**

Stacked By: \_\_\_\_\_ Date: \_\_\_\_\_ Inspected By: \_\_\_\_\_

Vac/Feed By: \_\_\_\_\_ Date: \_\_\_\_\_ Inspected By: \_\_\_\_\_

Bagged By: \_\_\_\_\_ Date: \_\_\_\_\_ Inspected By: \_\_\_\_\_

Fabric Lot #: \_\_\_\_\_ Description: PPG C33 C-veil

\_\_\_\_\_ Description: Vectorply 4008

\_\_\_\_\_ Description: TEAM 54

Core Lot #: \_\_\_\_\_ Description: \_\_\_\_\_

**DROP TEST**

Drop Test By: \_\_\_\_\_ Date: \_\_\_\_\_ Requirement: 1" Hg in 5 min

Drop Test Start: \_\_\_\_\_ / \_\_\_\_\_ Drop Test End: \_\_\_\_\_ / \_\_\_\_\_ → Result: \_\_\_\_\_  
(in. Hg) (Time) (in. Hg) (Time)

Mold Temp.: \_\_\_\_\_ Resin Temp.: \_\_\_\_\_ Inspected By: \_\_\_\_\_

**RESIN**

Resin Prep By: \_\_\_\_\_ Date: \_\_\_\_\_ Inspected By: \_\_\_\_\_

Resin: 8100-50GY Catalyst: MEKP 925 Cat. (phr): \_\_\_\_\_

# of Pounds: \_\_\_\_\_ # of Strokes: \_\_\_\_\_ Cat. (cc/lb): \_\_\_\_\_  
(High Flow Pump) (See Conv. Chart)

Resin Lot #: \_\_\_\_\_ Catalyst Lot #: \_\_\_\_\_

Batch#	Catalyst Time	Feed Opened	Part Filled	Gel Time	Part Clamped
1					
2					
3					

QA Inspec. By: \_\_\_\_\_ Date: \_\_\_\_\_ Reject/Accept: \_\_\_\_\_  
(R or A)

*See opposite side for inspection categories and a description of repair work if required.*

**Notes:**

Vacuum Infusion Checklist - Inspection

STANDARD

ASTM D 2563 Acceptance Level II

DEFECTS

- Resin starved area or dry fiber
- Resin rich area or missing fiber
- Delamination or disbond
- Entrapped air, void, or blister
- Surface pit or crater
- Tacky surface or uncured resin
- Inclusions or debris on laminate

SHOULD THERE BE AN "OTHER" CATEGORY LISTED HERE TO COVER ALL POTENTIAL DEFECTS NOTED IN ASTM D 2563?

- Length not within tolerance
- Width not within tolerance
- Thickness not within tolerance
- Barcol below specified value
- Improper raw materials or layup sequence
- Improper size or location of holes or other machined features

REPAIRS

Is the part repairable per customer specifications?

YES

NO

If yes, describe the nature of the repairs to be completed in the space below.

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Repaired By: \_\_\_\_\_

Date: \_\_\_\_\_

Reject/Accept: \_\_\_\_\_ (R or A)

Final Inspec. By: \_\_\_\_\_

Date: \_\_\_\_\_

Describe any additional repairs to be completed if necessary.

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Repaired By: \_\_\_\_\_

Date: \_\_\_\_\_

Reject/Accept: \_\_\_\_\_ (R or A)

Final Inspec. By: \_\_\_\_\_

Date: \_\_\_\_\_

## QUALITY ASSURANCE INSPECTION FORM: Assembly

WO#: 8420 PART#: \_\_\_\_\_

THIS SPECIFICATION ISN'T ENTIRELY APPLICABLE TO ASSEMBLY OF THE FRP COMPONENTS

PROJECT NAME: Brookfield Floating Bridge Pontoons

PART DESCRIPTION: \_\_\_\_\_

INSPECTION STANDARD: ASTM D 2563

STRUCTURAL QUALITY LEVEL: Acceptance Level II

	DATA	TECH INITIALS	QA INITIALS	NOTE
<b>COMPONENT ASSEMBLY</b>				
Jig/Layout Inspection (P/F)				
Component Set-up Inspection (P/F)				
Dry Fit of Bonded Components (P/F)				
Adhesive Gun Functionality & Material Quan. (P/F)				
Adequate Adhesive Squeeze Out (P/F)				
Nominal Bond Line Thickness (in.)				
Final Coat Quality (if applicable) (P/F)				
Dimensions Match Drawing Specifications (P/F)				

- 1) All spaces must be completed with exception of "NOTE". If no entry is required, then enter "N/A".
- 2) Reference attached Quality Assurance Drawing for verification of dimensions and tolerances.
- 3) Write a number in the "NOTE" column that matches the number of any applicable comments written in the notes section below.

**INSPECTION NOTES:**

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