October 3, 2011

Mr. Walter Lee Knox, Quality Assurance Manager
GERDAU
Charlotte Reinforcing Steel
301 Black Satchel Drive
Charlotte, NC 28216-2941

SUBJECT: NRC INSPECTION REPORT NO. 99901407/2011-201, NOTICE OF NONCONFORMANCE

Dear Mr. Knox:

On August 1 through August 4, 2011, the U.S. Nuclear Regulatory Commission (NRC) conducted an inspection at the GERDAU, Charlotte Reinforcing Steel (GERDAU) facility in Charlotte, NC. The purpose of this limited scope inspection was to assess GERDAU's compliance with the provisions of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 21, "Reporting of Defects and Noncompliance," and selected portions of Appendix B, "Quality Assurance Program Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities." The inspection focused on GERDAU manufacturing and fabrication of rebar steel for safety-related applications at nuclear fuel facilities and construction projects for AP1000 new reactor applicants (Vogtle and Summer Projects). The enclosed report presents the results of this inspection. This inspection report does not constitute NRC endorsement of your overall quality assurance (QA) or 10 CFR Part 21 programs.

During this inspection, the NRC inspection team found that the implementation of your QA program failed to meet certain NRC requirements imposed on you by your customers. Specifically, the NRC inspection team determined that GERDAU was not implementing aspects of its procurement document control, document control, corrective action, and audit programs consistent with regulatory requirements or the GERDAU QA manuals. The enclosures to this letter identify specific findings and references to the pertinent requirements, and the enclosed inspection report describes in detail the circumstances surrounding them.

Please provide a written statement or explanation within 30 days from the date of this letter in accordance with the instructions specified in the enclosed Notice of Nonconformance. We will consider extending the response time if you show good cause for us to do so.

In accordance with 10 CFR 2.390, "Public Inspections, Exemptions, Requests for Withholding," of the NRC's "Rules of Practice," The NRC will make a copy of this letter, its enclosures, and your response available electronically for public inspection in the NRC Public Document Room or from the NRC's Agencywide Documents Access and Management System, accessible at http://www.nrc.gov/reading-rm/adams.html. To the extent possible, your response (if applicable), should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the public without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request that such material be

withheld from public disclosure, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information). If Safeguards Information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21, "Protection of Safeguards Information: Performance Requirements."

Sincerely,

/RA/

Juan D.Peralta, Chief
Quality and Vendor Branch 1
Division of Construction Inspection
and Operational Programs
Office of New Reactors

Docket No. 99901407

Enclosures:
1. Notice of Nonconformance
2. Inspection Report No. 99901407/2011-201 and Attachment

withheld from public disclosure, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information). If Safeguards Information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21, "Protection of Safeguards Information: Performance Requirements."

Sincerely,

/RA/

Juan D.Peralta, Chief
Quality and Vendor Branch 1
Division of Construction Inspection
and Operational Programs
Office of New Reactors

Docket No. 99901407

Enclosures:
1. Notice of Nonconformance
2. Inspection Report No. 99901407/2011-201 and Attachment

DISTRIBUTION:

RidsNroDcipCQVA	RPrato	JJenkins	MShannon (RII)
RidsNroDcipCQVB	FTalbot	BClarke	JBartleman (RII)
RidsNroDcip	RidsNrrDeEQVB	TKendzia	lknox@GERDAUamersteel.com

ADAMS Package Accession No.: ML112580496 *concurred via email

OFFICE	NRO/DCIP/CQVA	R-II/DCI/CIB3	NRO/DE/SEB1	R-II/DCI/CIB3	NRO/DCIP/CQVA
NAME	RPrato*	JBartleman*	JJenkins*	MShannon*	FTalbot*
DATE	09/07/2011	09/15/2011	09/15/2011	09/15/2011	09/15/2011
OFFICE	NRO/DCIP/CQVA	NRO/DCIP/CQVA	NRO/DCIP/CAEB/BC	NRO/DCIP/CQVA	QTE
NAME	BClarke*	TKendzia	TFrye	JPeralta	QTE Resource*
DATE	09 /15/2011	09/22/2011	10/03/2011	10/03/2011	09 21/2011

OFFICIAL RECORD COPY

NOTICE OF NONCONFORMANCE

GERDAU, Charlotte Reinforcing Steel
Charlotte, NC 28216-2941

Docket No. 99901407
Inspection Report No. 2011-201

Based on the results of a U.S. Nuclear Regulatory Commission (NRC) inspection conducted at the GERDAU, Charlotte Reinforcing Steel (GERDAU), facility in Charlotte, NC, on August 1-August 4, 2011, certain activities were not conducted in accordance with NRC requirements that were contractually imposed on GERDAU:

A. Criterion IV, "Procurement Document Control," in Appendix B, "Quality Assurance Program Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities," states, in part, that "[m]easures shall be established to assure applicable regulatory requirements, design bases, and other requirements which are necessary to assure adequate quality are suitably included or referenced in the documents for procurement of material, equipment, and services, whether purchased by the applicant or by its contractors or subcontractors. To the extent necessary, procurement documents shall require contractors or subcontractors to provide a quality assurance program consistent with the pertinent provisions of this appendix."

   GERDAU Fabricated Products Group Quality Assurance Manual (FQAM), "Fabricated Products Group Quality Assurance/Control Program for the Fabrication of Steel Products," Revision 17, dated July 15, 2011, Section 4.2.1.2, "Pertinent Information," states, in part, that "Purchase Orders shall contain all pertinent information such as: end use (i.e., safety-related), date, certification requirements, records retention, vendor identification and quality, and technical specification requirements. Vendors shall have a Quality Assurance program which is applicable to the quality requirements stated in the Purchase Order and will be on GERDAU's approved supplier list."

   Contrary to the above, as of August 4, 2011, GERDAU failed to establish procedural guidance for developing procurement documents to ensure adequate quality of safety-related material, equipment, and services. Specifically, GERDAU procurement documents failed to identify applicable inspection and testing records needed from ERICO for subsequent review by GERDAU and did not include any requirements for ERICO's reporting and dispositioning of nonconformance during fabrication.

   This item is identified as Nonconformance 99901407/2011-201-01.

B. Criterion VI, "Document Control," in Appendix B to 10 CFR Part 50, states, in part, that "[m]easures shall be established to control the issuance of documents, such as instructions, procedures, and drawings, including changes thereto, which prescribe all activities affecting quality. These measures shall assure that documents, including changes, are reviewed for adequacy and approved for release by authorized personnel and are distributed to and used at the location where the prescribed activity is performed."

   GERDAU FQAM, Revision 17, Section 6.4.2.1, "Control," states, in part, that "Upon receipt, the Design Drawings will be forwarded to the Engineering Manager or Detailing Supervisor, who is responsible for control and distribution. The Engineering manager or Detailing

Supervisor is responsible for verifying receipt of drawings as indicated on customer's letter of transmittal and for stamping the date of receipt on each drawing."

Contrary to the above, as of August 4, 2011, GERDAU failed to control the issuance of drawings. Specifically, GERDAU failed to stamp customer drawings received from Shaw Nuclear with the date of receipt.

This item is identified as Nonconformance 99901407/2011-201-02.

C. Criterion XVI, "Corrective Action," in Appendix B to 10 CFR Part 50, states, in part, that "[m]easures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected. In the case of significant conditions adverse to quality, the measures shall assure that the cause of the condition is determined and corrective action taken to preclude repetition."

GERDAU Corporate Quality Assurance Manual (QAM), "Quality Assurance/Control Program for the Manufacturing and Fabrication of Steel Products," Revision 26, dated July 15, 2011, Article 16, "Corrective Action," Section 16.1.1, "Definition," states that "Corrective Actions and/or Failure Analysis are those actions necessary to identify and correct Conditions Adverse to Quality, or Significant Conditions Adverse to Quality. In the case of significant adverse conditions, the cause will be determined, a failure analysis shall be performed (when applicable) and corrective action taken to preclude repetition."

GERDAU QAM Section 16.1.2, "Responsibility," states that "It is the responsibility of those persons working to and with the Quality Assurance Programs to alert their immediate supervisor and/or Quality Control personnel of conditions adverse to or potential adverse to quality. It is the responsibility of the Quality Control personnel, or quality-related management personnel to initiate and distribute the Corrective Action Request. The department requiring corrective action is responsible for effecting the corrective action."

GERDAU FQAM Section 15.5, "Externally Shipped Nonconforming Material," and QAM Section 15.3, "Externally Shipped Nonconforming Material," direct the use of QAM Section 16.5, "Corrective Action – Externally Shipped Nonconformance (10 CFR Part 21)," for nonconforming externally shipped safety related material. QAM Section 16.5 states "In the event that nonconforming safety related material has been externally shipped, from a mill or fabricating location, corrective action shall be taken in accordance with procedure 1000138-RP-001-0 "10 CFR Part 21 – Reporting of Defects and Noncompliances"" and the need to do a 10 CFR Part 21 evaluation is documented only on the CAR form.

Contrary to the above, as of August 4, 2011, GERDAU failed to establish adequate procedural guidance to establish measures to ensure that all conditions adverse to quality were identified in the corrective action program (CAP) and to ensure that significant conditions adverse to quality are not recurring. Specifically, GERDAU failed to:

- Provide adequate procedural guidance in the QAM, to require documentation if an issue is a repeat of a significant condition adverse to quality.

- Provide adequate procedural guidance in the QAM to enter all conditions adverse to quality identified in internal audits into the CAP in accordance with QAM section 16.1.2.
- Provide adequate procedural guidance in the QAM for external audit conditions adverse to quality to be entered into the CAP in accordance with QAM section 16.1.2.

- Promptly (10 CFR 50 Appendix B requirement) enter nonconformance report Shaw 2011-8, for a externally shipped safety-related material, into the CAP in accordance FQAM section 15.5, and QAM section 15.3.

- Identify repetitive deficiencies as a condition (trend) adverse to quality for deficiencies in meeting Society for Testing and Materials (ASTM) requirements at all the mills supplying safety-related rebar.

This item is identified as Nonconformance 99901407/2011-201-03.

D. Criterion XVIII, "Audits," in Appendix B to 10 CFR Part 50, states, in part, that "[a] comprehensive system of planned and periodic audits shall be carried out to verify compliance with all aspects of the quality assurance program and to determine the effectiveness of the program. The audits shall be performed in accordance with the written procedures or check lists by appropriately trained personnel not having direct responsibilities in the areas being audited."

GERDAU QAM Section 18.8.2.1, "Objective Evidence," states, in part, that "Checklists or procedures will be utilized when conducting a formal audit. The checklist should be pre-prepared, when feasible, to cover the major points of the area being inspected." GERDAU reinforcing steel manufacturing and fabrication processes are governed by ASTM and American Concrete Institute (ACI) requirements, and these requirements are invoked by the purchase orders for nuclear work.

Contrary to the above, as of August 4, 2011, GERDAU failed to list or document necessary quality requirements for internal audits contained in applicable ASTM and ACI codes. Specifically, GERDAU internal audits did not list applicable ASTM and ACI codes in the audit checklist, as required by QAM Section 18.8.2.1, and the audits conducted failed to identify that GERDAU Charlotte Mill failed to specify the test method on the Chemical and Physical Test Reports, as required by ASTM A751, "Standard Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products," Section 13, and Mill QAM Section 11.

This item is identified as Nonconformance 99901407/2011-201-04.

Please provide a written statement or explanation to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555-0001, with a copy to the Chief, Quality and Vendor Branch 1, Division of Construction Inspection and Operational Programs, Office of New Reactors, within 30 days of the date of the letter transmitting this Notice of Nonconformances. This reply should be clearly marked as a "Reply to a Notice of Nonconformance" and should include for each noncompliance: (1) the reason for the noncompliance, or if contested, the basis for disputing the noncompliance, (2) the corrective

steps that have been taken and the results achieved, (3) the corrective steps that will be taken to avoid noncompliance, and (4) the date when your corrective action will be completed. Where good cause is shown, the NRC will consider extending the response time.

Because your response will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's Agencywide Documents Access and Management System, which is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html, to the extent possible, it should not include any personal privacy, proprietary, or safeguards information so that it can be made available to the public without redaction. If personal privacy or proprietary information is necessary to provide an acceptable response, then please provide a bracketed copy of your response that identifies the information that should be protected and a redacted copy of your response that deletes such information. If you request that such material be withheld, you must specifically identify the portions of your response that you seek to have withheld and provide in detail the bases for your claim of withholding (e.g., explain why the disclosure of information will create an unwarranted invasion of personal privacy or provide the information required by 10 CFR 2.390(b) to support a request for withholding confidential commercial or financial information). If Safeguards Information is necessary to provide an acceptable response, please provide the level of protection described in 10 CFR 73.21, "Protection of Safeguards Information: Performance Requirements."

Dated at Rockville, MD, this 3rd day of October 2011.

U.S. NUCLEAR REGULATORY COMMISSION
OFFICE OF NEW REACTORS
DIVISION OF CONSTRUCTION INSPECTION AND OPERATIONAL PROGRAMS
VENDOR INSPECTION REPORT

Docket No.:	99901407
Report No.:	99901407/2011-201
Vendor:	GERDAU, Charlotte Reinforcing Steel 301 Black Satchel Drive Charlotte, NC 28216-2941
Vendor Contact:	Mr. Walter Lee Knox, Quality Assurance Manager lknox@GERDAUamersteel.com (704) 391-3811
Nuclear Industry Activities:	GERDAU, Charlotte Reinforcing Steel, provides rebar steel for safety-related applications at nuclear fuel facilities and construction projects for AP1000 new reactor applicants (Vogtle and Summer projects).
Inspection Dates:	August 1–4, 2011
Inspectors:	Robert Prato, Team Leader, NRO/DCIP/CQVA Joel Jenkins, NRO/DE/SEB1 Mel Shannon, R-II/DCI/CIB3 John Bartleman, R-II/DCI/CIB3 Frank Talbot, NRO/DCIP/CQVA Brent Clarke, NRO/DCIP/CQVA Thomas Kendzia, NRO/DCIP/CQVA
Approved by:	Juan D. Peralta, Chief Quality and Vendor Branch 1 Division of Construction Inspection and Operational Programs Office of New Reactors

EXECUTIVE SUMMARY

GERDAU Charlotte Reinforcing Steel
Report No. 99901407/2011-201

The U.S. Nuclear Regulatory Commission (NRC) inspection focused on quality assurance (QA) policies and procedures implemented to support manufacturing and fabrication of concrete reinforcing bar (rebar) steel for safety-related applications at nuclear fuel facilities and construction projects for AP1000 new reactor applicants (Vogtle and Summer projects). The purpose of this inspection was to verify that GERDAU, Charlotte Reinforcing Steel (GERDAU) in Charlotte, NC, implemented an adequate QA program that complied with the requirements of Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities." The inspection also verified that GERDAU implemented a program under 10 CFR Part 21, "Reporting of Defects and Noncompliance," that met the NRC regulatory requirements. GERDAU, Charlotte Reinforcing Steel, was previously known as GERDAU Ameristeel US, Inc. The NRC conducted the inspection primarily at the GERDAU fabrication facilities in Charlotte, NC, and a more limited scope inspection of the GERDAU mill facility, also located in Charlotte, NC.

The NRC inspection was based on the following regulations:

- 10 CFR Part 21
- Appendix B to 10 CFR Part 50

During this inspection, the NRC inspection teams implemented Inspection Procedure (IP) 43002, "Routine Inspections of Nuclear Vendors", dated April 25, 2011, and IP 36100, "Inspection of 10 CFR Part 21 and 50.55(e) Programs for Reporting Defects and Noncompliance", dated April 25, 2011.

The NRC has never conducted an inspection at the GERDAU fabrication facility in Charlotte, NC, but did conduct an observation at this facility in 2008 to evaluate the Shaw AREVA MOX Services QA audit of GERDAU's fabrication of rebar to be used at the mixed-oxide (MOX) fuel facility at the Savannah River Project, SC.

With the exception of the four nonconformances described below, the NRC inspection team concluded that GERDAU's QA policies and procedures comply with the applicable requirements of 10 CFR Part 21 and Appendix B to 10 CFR Part 50 and that GERDAU personnel are implementing these policies and procedures effectively.

10 CFR Part 21

The NRC inspection team concluded that the GERDAU program for compliance with the requirements of 10 CFR Part 21 was consistent with the requirements of 10 CFR Part 21. Based on its review, the NRC inspection team determined that the GERDAU policies and procedures reviewed as part of this inspection provided sufficient guidance for the identification, evaluation, and timely notification of defects and failures to comply that could cause a substantial safety hazard. In addition, the inspection team verified that GERDAU meets the requirements for posting the applicable regulations and procedures, or the alternative posting requirements, as outlined in 10 CFR 21.6, "Posting Requirements." No findings of significance were identified.

Training and Qualification of Personnel

The NRC inspection team concluded that the GERDAU program for training and qualifying personnel was consistent with the requirements of Criterion II, "Quality Assurance Program," in Appendix B to 10 CFR Part 50. Based on its review, the NRC inspection team determined that GERDAU's is effectively implementing its training and qualification program in accordance with its QA manuals. No findings of significance were identified.

Design Control

The NRC inspection team concluded that GERDAU's design control policies and procedures were consistent with the requirements of Criterion III, "Design Control," in Appendix B to 10 CFR Part 50 and with the requirements of American Society of Mechanical Engineers (ASME) for rebar manufacturing and fabrication. The NRC inspection team determined that GERDAU's implementation of these processes and practices provides appropriate design controls. An issue with mill test report documentation is included in a nonconformance in Section 15, "Internal and External Audits," of this report. No findings of significance were identified.

Procurement Document Control

The NRC inspection team identified Nonconformance 99901407/2011-201-01 associated with GERDAU's failure to implement the requirements of Criterion IV, "Procurement Document Control," in Appendix B to 10 CFR Part 50. Specifically, GERDAU failed to provide adequate procedural guidance for developing procurement documents associated with nuclear safety-related material. This resulted in procurement documents failing to identify applicable requirements for ERICO to provide test and inspection records and corrective action documents.

Instructions, Procedures, and Drawings

The NRC inspection team concluded that the GERDAU program for instructions, procedures, and drawings was consistent with the regulatory requirements of Criterion V, "Instructions, Procedures, and Drawings," in Appendix B to 10 CFR Part 50. Based on its review, the NRC inspection team determined that GERDAU instructions, procedures, and drawings conform to the requirements of Basic Requirement 5 of ASME NQA-1-1994 and the GERDAU Corporate Quality Assurance Manual (QAM) and are being effectively implemented. An issue with the drawings control program is included in a nonconformance in Section 6, "Document Control," of this report. No findings of significance were identified.

Document Control

The NRC inspection team identified Nonconformance 99901407/2011-201-02 associated with GERDAU's failure to implement the requirements of Criterion VI, "Document Control," in Appendix B to 10 CFR Part 50. Specifically, GERDAU failed to stamp customer drawings received from Shaw Nuclear with the date of receipt as required by Section 6.4.2.1 of GERDAU's Fabricated Products Group Quality Assurance Manual (FQAM).

Control of Purchased Material, Equipment, and Services

The NRC inspection team concluded that the GERDAU Charlotte Fabricating Facility and Charlotte Melt Mill processes for the control of purchased material, equipment, and services were consistent with the requirements of Criterion VII, "Control of Purchased Material, Equipment, and Services," in Appendix B to 10 CFR Part 50. Based on its review, the NRC inspection team determined that GERDAU effectively implements the control of purchased material, equipment, and services in accordance with the applicable GERDAU policies and procedures, in support of nuclear safety-related work. No findings of significance were identified.

Control of Special Processes

The NRC inspection team concluded that the control of special processes does not apply to the GERDAU QA program for the production and fabrication of safety-related carbon or alloy steel and rebar for nuclear power plants.

Inspections and Test Control

The NRC inspection team concluded that GERDAU's implementation of inspection activities for steel and rebar were consistent with the inspection requirements in Criterion X, "Inspections," in Appendix B to 10 CFR Part 50, The NRC inspection team also concluded that seven of Shaw's safety-related nuclear shipments to Vogtle Units 3 and 4 and V.C. Summer Units 2 and 3 and nine nuclear nonsafety-related shipments were consistent with the test controls requirements in Criterion XI, "Test Control," in Appendix B to 10 CFR Part 50, and in American Society for Testing and Materials (ASTM) A706/A706M, "Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement." Based on its review, the NRC inspection team determined that GERDAU is effectively implementing its policy and procedures in support of inspections and test control. No findings of significance were identified.

Control of Measuring and Test Equipment

The NRC inspection team concluded that the GERDAU process and procedures for control of measuring and test equipment (MTE) were consistent with NQA-1, Basic Requirement 12, and Criterion XII, "Control of Measuring and Test Equipment," in Appendix B to 10 CFR Part 50. Based on its review, the NRC inspection team determined that the measuring devices used at the GERDAU mill quality control (QC) testing shop (i.e., extensometers, gauges, micrometers, scales, and transducers) and end/thread gauges used at the GERDAU fabrication shop meet the GERDAU process and procedures for control of MTE. No findings of significance were identified.

Handling, Storage, and Shipping

The NRC inspection team concluded that the GERDAU program for handling, storage, and shipping was consistent with the requirements of Criterion XIII, "Handling, Storage, and Shipping," in Appendix B to 10 CFR Part 50. Based on its review, the NRC inspection team determined that GERDAU is effectively implementing the procedures for handling, storage, and shipping. No findings of significance were identified.

Control of Nonconforming Materials, Parts, or Components

The NRC inspection team concluded that the GERDAU program for the control of nonconforming materials, parts, or components was consistent with the requirements of Criterion XV, "Nonconforming Materials, Parts, or Components," in Appendix B to 10 CFR Part 50. Based on its review, the NRC inspection team determined that GERDAU is effectively implementing the policies and procedures for nonconforming material in accordance with GERDAU's QAM, FQAM, and applicable implementing procedures. One nonconforming item, which was shipped, is included in a nonconformance in Section 13, "Corrective Actions," of this report. No findings of significance were identified.

Corrective Action

The NRC inspection team identified Nonconformance 99901407/2011-201-03 associated with GERDAU's failure to implement the requirements of Criterion XVI, "Corrective Action," in Appendix B to 10 CFR Part 50. Specifically, GERDAU procedural guidance currently in place is not adequate to establish measures to ensure conditions adverse to quality are identified in the corrective action program (CAP) and to ensure that significant conditions adverse to quality are not recurring.

Quality Assurance Records

The NRC inspection team concluded that the GERDAU program for QA records was consistent with the requirements of Criterion XVII, "Quality Assurance Records," in Appendix B to 10 CFR Part 50. Based on its review, the NRC inspection team determined that GERDAU is effectively implementing the procedures for QA records. No findings of significance were identified.

Internal and External Audits

The NRC inspection team identified Nonconformance 99901407/2011-201-04 associated with GERDAU's failure to implement the requirements of Criterion XVIII, "Audits," in Appendix B to 10 CFR Part 50. Specifically, GERDAU internal audits did not list applicable ASTM and American Concrete Institute (ACI) codes in the audit checklist, and the audits conducted failed to identify where GERDAU's Charlotte Mill failed to specify the test method on the chemical and physical test reports as required by ASTM A751, "Standard Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products," Section 13.

REPORT DETAILS

1. 10 CFR Part 21 Program

   a. Inspection Scope

   The NRC inspection teams reviewed GERDAU's fabrication facility policies and procedures that govern the programs and activities used to implement and verify compliance with the requirements of 10 CFR Part 21, in order to verify compliance with the requirements of 10 CFR Part 21. In addition, the NRC inspection teams evaluated the 10 CFR Part 21 postings and a sample of the documentation used to process internal orders for material obtained from one of GERDAU's five mills to evaluate GERDAU's compliance with the requirements of 10 CFR 21.6, "Posting Requirements"; 10 CFR 21.21, "Notification of Failure to Comply or Existence of a Defect and its Evaluation"; and 10 CFR 21.31, "Procurement Documents." Specifically, the NRC inspection teams reviewed the following GERDAU policies, procedures, and documentation:

   - GERDAU Corporate Quality Assurance Manual (QAM), "Quality Assurance/Control Program for the Manufacture and Fabrication of Steel Products," Revision 26, dated July 15, 2011
   - GERDAU Fabrication Products Group Quality Assurance Manual (FQAM), "Quality Assurance/Control Program for the Fabrication of Steel Products," Revision 17, dated July 15, 2011
   - GERDAU Procedure 1000138-RP-001-0 "10 CFR Part 21—Reporting of Defects and Noncompliance," Revision 0, dated April 1, 2009
   - GERDAU Procedure 1000138-RP-004, "Procedure for 10 CFR 50.55(e)," Revision 0, dated October 7, 2009
   - GERDAU Procedure 3112600-RP-008-00 "Procedure for Using the Non Conformance in Process Material Disposition Log," Revision 0, dated April 1, 2009
   - Form #1000-210-F-022-0, "Nuclear QA Evaluation/Order Tracking Form," for Vogtle and V.C. Summer nuclear projects, dated January 18, 2010
   - Form #1000-210-F-022-0, "Nuclear QA Evaluation/Order Tracking Form," for Vogtle and V.C. Summer nuclear projects, dated March 23, 2010
   - Form #1000-210-F-022-0, "Nuclear QA Evaluation/Order Tracking Form," for Vogtle and V.C. Summer nuclear projects, dated January 22, 2010
   - Form #1000-210-F-022-0, "Nuclear QA Evaluation/Order Tracking Form," for Vogtle and V.C. Summer nuclear projects, dated January 11, 2010
   - Purchase Order (PO) Job Number 3112-5677, PO for ERICO Mechanical Couplers, dated July 28, 2011
   - E-mail from McDowell, Tom, to Phillips, Eric, "Shaw Loads," dated July 26, 2011
   - E-mail from McDowell, Tom, to Phillips, Eric, "Shaw," dated July 28, 2011
   - E-mail from McDowell, Tom, to Phillips, Eric, "Shaw Load," dated August 01, 2011
   - E-mail from Harrington, Tommy, to Knox, Lee, "SRNS," dated January 06, 2011
   - NRC Operations Center Event Report 46480, "Hirschfeld Part 21 Report," dated December 15, 2010
   - QA Corrective Action Report (CAR) No. CLT 2011-2, "Bars in Fab shop and field location that experienced bar breaks and scabbing," dated March 25, 2011

- Shaw Nuclear Services Inc., Audit Report No. V2011-06, Audit of GERDAU Ameristeel US, Inc. dated May 6, 2011

b. Observations and Findings

b.1 Postings

The NRC inspection team reviewed the content of the 10 CFR Part 21 postings and location of each posting at the GERDAU Charlotte fabrication and milling facilities. The inspection team verified that the information required by 10 CFR 21.6 was included on each posting distributed in two locations at each facility. The inspection team walked down each of the four locations and verified that the required documents were posted in conspicuous locations consistent with the intent of 10 CFR 21.6(2).

b.2 10 CFR Part 21 Procedures

The NRC inspection team reviewed the GERDAU Corporate QAM and FQAM and GERDAU implementing procedures for 10 CFR Part 21. Both the QAM and FQAM prescribe conformance to 10 CFR Part 21 requirements, including imposing the 10 CFR Part 21 requirements on other GERDAU business units using Form 1000-210-F022-0, "Nuclear QA Evaluation/Order Tracking Form." The FQAM includes policy-level guidance for the purchase of steel products and accessories from other than one of the GERDAU business units and imposed the requirements of Appendix B to 10 CFR Part 50, NQA-1, and 10 CFR Part 21, as applicable. The QAM also prescribes that, in the event "that nonconforming safety-related material has been externally shipped, from a mill or a fabricating facility, corrective action shall be taken in accordance with procedure 1000138-RP-001-0 "10 CFR Part 21—Reporting of Defects and Noncompliance."

GERDAU Procedure 1000138-RP-001-0, "10 CFR Part 21—Reporting of Defects and Noncompliance," is the primary procedure used to implement the requirements of 10 CFR Part 21 for reporting defects and failures to comply. The procedure includes purpose, scope, references, procedure activities, and QA records for posting, assigned responsibility, and imposing 10 CFR Part 21 requirements on subtier vendors. The NRC inspection team reviewed the GERDAU 10 CFR Part 21 procedure and verified that it provides adequate guidance to implement the requirements of 10 CFR Part 21 and other related requirements associated with timely identification, evaluation, and reporting of defects and failures to comply that could create a substantial safety hazard, in accordance with 10 CFR 21.21(a)(1), (a)(3), (b), and (d), and the guidance for interim reporting in accordance with 10 CFR 21.21(a)(2).

The 10 CFR Part 21 procedure states, in part, that deviations "are documented on Form QAM 21, 'Corrective Action Request,' which is controlled by the latest revision of the corporate QAM." The Corporate QAM provides policy-level guidance for the CAP, and Form QAM 21 specifically requires a determination as to whether a 10 CFR Part 21 evaluation is needed. The CAP does not have an implementing procedure to provide detailed guidance, which is further discussed in Section 13, "Corrective Actions," of this report.

The 10 CFR Part21 procedure also states that the "local Quality Assurance Manager shall review Nonconformance Reports for 10 CFR 21 applicability." The FQAM addresses the disposition of potentially nonconforming material designated for use in safety-related projects, which is processed using FQAM 19, "Non Conformance in Process Material Disposition Log." The form was recently changed to eliminate the documentation of the need for a 10 CFR Part 21 review. GERDAU procedures require use of QAM Section 16.5, "Corrective Action—Externally Shipped Nonconformance (10 CFR Part 21)," for externally shipped nonconforming materials. The NRC inspection team made the observation that this change leaves GERDAU at risk for not documenting a 10 CFR Part 21 review requirement if a CAR (Form QAM 21) is not initiated. There is also a link from the nonconformance process to the requirements of 10 CFR Part 21 by requiring that a CAR be initiated if the entry for significant condition adverse to quality is "yes," which requires a 10 CFR Part 21 evaluation. GERDAU Procedure 3112600-RP-008-00 provides sufficient guidance for processing potential 10 CFR Part 21 nonconformances; however, the guidance would be clearer and more consistent with the requirements in 10 CFR Part 21 if the terminology used by GERDAU were more consistent with the terminology used in 10 CFR Part 21 (e.g., substantial safety hazard versus significant condition adverse to quality). These are observations.

The NRC inspection team determined that GERDAU does not have a procedure for developing POs. To the agency's knowledge, PO Job Number 3112-5677, the PO for ERICO mechanical couplers, dated July 28, 2011 was the first safety-related PO generated by GERDAU, at least in current corporate memory. The absence of a procurement procedure and deficiencies identified with this PO are further addressed in Section 4, "Procurement Document," of this report. However, PO Job Number 3112-5677 did impose the requirements of 10 CFR Part 21 and Appendix B to 10 CFR Part 50 on the supplier.

The NRC inspection team did a 1-day visit of GERDAU milling facility, also located in Charlotte, NC, to better understand how the mill receives, processes, and controls purchase requests from this GERDAU fabrication facility. The inspection team performed a very limited review of the mill's 10 CFR Part 21 program and verified that it follows the Corporate QAM, the Mill QAM, and the corporate implementing Procedures 1000138-RP-001-0 and 3112600-RP-008-00, "Procedure for Using the Non Conformance in Process Material Disposition Log." The inspection team reviewed the basic implementing activities associated with these procedures and verified that the mill did keep records of nuclear-related jobs, including notification from GERDAU headquarters to initiate a job, the Form 1000-210-F022-0, "Nuclear QA Evaluation/Order Tracking Form," that imposes the requirements of Appendix B to 10 CFR Part 50, NQA-1, and 10 CFR Part 21, and the applicable specification required for the material being manufactured. Although GERDAU does not issue formal POs for stock rebar material manufactured by a company mill for a company rebar fabricating facility, the NRC inspection team did not identify any quality concerns with the intercompany "purchase" process and applicable documentation.

b.3 10 CFR Part 21 Implementation

The NRC inspection team reviewed the 10 CFR Part 21 reports received by the NRC and determined that the GERDAU fabrication facility and mill in Charlotte, NC, has never reported any defects or failures to comply that could create a substantial safety hazard. The inspection team reviewed the GERDAU Corporate QAM and applicable implementing procedures relating to the implementation of GERDAU's 10 CFR Part 21, corrective action, and nonconformance programs and verified that each of these programs provides adequate guidance for identifying defects and failures to comply that could create a substantial safety hazard.

Because GERDAU has never issued a 10 CFR Part 21 report, the NRC inspection team reviewed a recent GERDAU evaluation of potential defects of safety-related reinforcing steel bars that could have created a substantial safety hazard, which involved six heat numbers at three locations. In response to the applicable rebar failures, GERDAU initiated a CAR CLT 2011-2 on March 25, 2011, to evaluate each heat number to determine if the fabrication process can be improved. The scope of the CAR included heat numbers C011804, C011805, and C011819 for rebar that broke during bending as part of the fabrication process and were not shipped (passed bend testing during manufacturing at the mill but at the identification marks of the bar during fabrication); heat number C006418 that Louisiana Enrichment Services identified as having scabbing (which is allowed by ASTM A706/A706M, "Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement," Sections 11.2 and 11.3); and heat numbers C902535 and C900429 that had individual bars break during bending in cold weather at Oconee Nuclear Station (notification by Duke Energy included metallurgy report confirming material met chemical and mechanical specifications).

The NRC inspection team determined that GERDAU did not mark CAR CLT 2011-2 as requiring evaluation for 10 CFR Part 21 reportability. An external audit of GERDAU had identified this as an issue. GERDAU's justification for not evaluating the conditions identified in the CAR for 10 CFR Part 21 reportability was that the first three heat numbers were not shipped to a nuclear project; scabbing is allowed by code because it does not affect the mechanical properties of rebar; and Duke Energy confirmed the mechanically damaged rebar met specification requirements. Therefore, no defective rebar was shipped that could cause a substantial safety hazard. The CAR resulted in the vendor changing its branding form to reduce potential braking during future fabrication. The NRC inspection team determined that GERDAU's 10 CFR Part 21 evaluation and conclusion for the subject heat numbers was consistent with the requirements of 10 CFR Part 21. The NRC inspection team observes that GERDAU does not require the documentation in the CAR of why an issue does not require evaluation for 10 CFR Part 21 reportability. Documenting why a CAR does not require an evaluation for 10 CFR Part 21 reportability would improve the process. The NRC inspection team identifies this as an observation.

c. Conclusions

The NRC inspection team concluded that the GERDAU program for compliance with the requirements of 10 CFR Part 21 was consistent with the requirements of 10 CFR Part 21. Based on its review, the NRC inspection team determined that the GERDAU policies and procedures reviewed as part of this inspection provided sufficient guidance for the identification, evaluation, and timely notification of defects and failures to comply that may cause a substantial safety hazard. In addition, the inspection team verified that GERDAU meets the requirements for posting the applicable regulations and procedures, or the alternative posting requirements, as outlined in 10 CFR 21.6. No findings of significance were identified.

2. Training and Qualification of Personnel

a. Inspection Scope

The NRC inspection team reviewed the GERDAU QAM and FQAM that govern the GERDAU training and qualification process to verify compliance with the requirements of Criterion II in Appendix B to 10 CFR Part 50. The NRC inspection team reviewed GERDAU's personnel training and qualification records and discussed personnel training and qualification activities with GERDAU management and QC staff.

Specifically, the NRC inspection team reviewed the following policies and procedures:

- GERDAU, Corporate QAM, Quality Assurance/Control Program for the Manufacture and Fabrication of Steel Products, Revision 26, dated July 15, 2011
- GERDAU, FQAM, Quality Assurance/Control Program for the Fabrication of Steel Products, Revision 17, dated July 15, 2011
- GERDAU Corporate QA records for three lead auditors
- GERDAU Charlotte Reinforcing Steel Facility QA records for four QC inspectors
- GERDAU Charlotte Mill Facility QA records for four QC technicians
- GERDAU Charlotte Reinforcing Steel Facility QA records for personnel training

b. Observations and Findings

The NRC inspection team reviewed the GERDAU QAM and FQAM that govern the GERDAU training and qualification process for indoctrination, QA, QC, and general employee proficiency training. The NRC inspection team found that GERDAU periodically provides general personnel training, including basic training and changes related to Appendix B to 10 CFR Part 50, 10 CFR Part 21, NQA-1, and the GERDAU QA manuals and procedures. The FQAM requires GERDAU personnel performing QC functions to be qualified, certified, and vision tested, as required by American National Standards Institute (ANSI)/ASME 45.2.6, Section 3.0. The QAM requires that the QA auditors be qualified and maintain qualification in accordance with ANSI N45.2.23.

The NRC inspection team reviewed the training records of the two GERDAU QC inspectors (both level 2) and verified that each QC inspector package included an oral evaluation (performed in 2010) that addressed the significant aspects of their jobs and an annual eye examination. The oral evaluation package was recently revised to include receipt inspection, and the documentation for the annual eye examination for this year

included a faxed copy of the doctor's signature. The NRC inspection team noted that the two QC inspectors and two trainees were trained on the receipt inspection requirements separately, since the requirement had been added after the last oral evaluation.

The NRC inspection team reviewed part of the training records of the four GERDAU Charlotte Mill QC technicians (who perform laboratory testing) and verified that each QC inspector had an oral evaluation (performed in 2009 and due in 2012) that included the significant aspects of the job but did not include questions on ASTM A706/A706M. The Charlotte Mill QA manager stated that the QC inspectors had been trained on the ASTM A706/A706M specification when the mill started that production, and the only difference in their activities was the bend testing, which was trained on and documented in the QC records. Observation at Charlotte Mill has verified that the bend testing has been revised for ASTM A706/A706M.

The NRC inspection team reviewed training records related to the three qualified GERDAU auditors. The NRC inspection team verified that the auditor personnel certifications were current and consistent with ASME N45.2.23. The NRC inspection team noted that all three auditors were qualified as lead auditors with significant experience.

c. Conclusions

The NRC inspection team concluded that the GERDAU program for training and qualifying personnel was consistent with the requirements of Criterion II, "Quality Assurance Program," in Appendix B to 10 CFR Part 50. Based on its review, the NRC inspection team determined that GERDAU's is effectively implementing its training and qualification program in accordance with its QA manuals. No findings of significance were identified.

3. Design Control

a. Inspection Scope

The NRC inspection team reviewed GERDAU policies and implementing procedures that govern the design control activities for fabricating rebar to be used in safety-related applications in nuclear power plants to verify compliance with the requirements of Criterion III in Appendix B to 10 CFR Part 50. The NRC inspection team performed its review through discussions with GERDAU personnel, review of GERDAU policies and procedures related to design control, evaluation of a sample of POs, and observation of fabrication and testing activities.

The NRC inspection team reviewed the following GERDAU design control documents:

- FQAM, Quality Assurance/Control Program for the Fabrication of Steel Products, Revision 17, dated July 15, 2011
- Mill QAM, Steel Mill Group, Quality Assurance/Control Program, Revision 26, dated July 15, 2011
- Routine Procedure #8300570003, Standard Work Procedure for Testing Merchant Products, dated June 30, 2008

- Routine Procedure #8300570004, Standard Work Procedure for Testing Deformed Products, dated June 30, 2008
- Routine Procedure #8300570-RP-002A, Spectrochemical Analysis of Steel, dated December 2, 2009

The NRC inspection team reviewed the following GERDAU POs:

- 132178-J400.00, Revision 0, dated May 25, 2011, to supply safety-related rebar to Shaw Group for use at V.C. Summer Unit 3
- 132175-J400A-00, dated December 24, 2009, to supply safety-related rebar to Shaw Group for use at Vogtle Units 3 and 4
- S54-85211, Revision 21, dated July 6, 2010, to supply safety-related rebar to Consolidated Power Supply (CPS) for use at the MOX facility

The NRC inspection team reviewed the following Westinghouse design control document, which was an attachment to the Shaw Group POs specified above:

- APP-CR01-Z0-011, "Furnishing of Safety Related Reinforcing Steel," Revision 2, dated December 21, 2009

The NRC inspection team reviewed the following ASTM standard specifications and test methods related to fabrication and testing of rebar:

- A370, "Standard Test Methods and Definitions for Mechanical Testing of Steel Products"
- A615, "Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement"
- A706/A706M, "Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement"
- A751, "Standard Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products"

The NRC inspection team reviewed the chemical and physical test reports for the following heats of ASTM A615 and A706/A706M rebar manufactured at the GERDAU Charlotte Melt Mill:

- C006418
- C900429
- C902535
- C011760
- C011761
- C011762
- C011763
- C011804
- C011805
- C011819

The NRC inspection team reviewed the following quality reports:

- GERDAU CAR No. CLT 2011-2, dated March 25, 2011
- GERDAU Failure Analysis Report No. 67430, dated March 31, 2011
- Duke Energy Metallurgy File #4243, dated December 15, 2009
- Duke Energy Metallurgy File #4492, dated January 16, 2011

b. Observations and Findings

Observations at the Charlotte Fabricating Facility

The NRC inspection team toured the Charlotte Fabricating Facility where rebar fabrication (shearing and/or bending) was performed. The NRC inspection team observed material arriving from the Charlotte Melt Mill, storage and labeling of fabricated rebar, and equipment used to perform shearing and bending. During the NRC inspection, team members observed fabrication shearing, bending, and inspection activities. The fabrication activities were completed in accordance with GERDAU procedures, with inspection by QC personnel for all safety-related work. The NRC inspection team observed independent inspection activities being performed by Shaw Group personnel on fabrication work for Shaw Group.

The NRC inspection team reviewed a sample of POs for safety-related rebar. Two of these POs were written by Shaw Group for the supply of safety-related rebar to Vogtle and V.C. Summer, respectively. A third PO was written by CPS for the supply of safety-related rebar to the MOX facility. Westinghouse Design Control Document APP-CR01--0-011 for the furnishing of safety-related rebar was integral to the Shaw POs, so the NRC inspection team reviewed that document as well. Both Shaw Group and CPS POs specify that rebar should conform to ASTM A706/A706M Grade 60 requirements. The Westinghouse design control document imposes an additional confirmatory chemical analysis per heat to be performed by a third party. When third party chemical analysis is required, the Charlotte Fabricating Facility complies with this requirement by sending product samples to Stork-Herron, which is an independent accredited testing laboratory located in Charlotte, NC.

The NRC inspection team also evaluated the policies and procedures for verification measures for procurement of software that is safety related or commercial grade. The NRC inspection team had observed the use of QMOS software at the Charlotte Melt Mill but observed that the software did not appear to perform a safety-related function. The NRC inspection team interviewed the Charlotte Fabrication Facility QA Manager and Lead Auditor regarding its implementation of NQA-1 requirements related to software. He stated that the NQA-1 requirements were written for software intended for operation of a nuclear power plant and that software at the GERDAU facilities, such as the Applied System Associate software, does not affect quality or have any control over quality. Within the limited scope of its review, the NRC inspection team did not make any findings that the verification measures for procurement of software were not compliant with NQA-1.

Observations at the Charlotte Melt Mill

The GERDAU Charlotte Melt Mill provides some of the safety-related rebar for fabrication at the GERDAU Charlotte Fabrication Facility. Part of the NRC inspection team visited the Charlotte Melt Mill to observe how the mill was meeting the procurement specifications. The NRC inspection team toured the facility and observed the overall fabrication process from the melting of the scrap, to the pouring of the ladles, to the manufacture of the billets (an intermediate step process), to the rolling of the final product. The NRC inspection team observed the chemical and physical testing of the product at the onsite laboratory. On the day of the team's visit, the Charlotte Melt Mill was not manufacturing rebar (which its staff terms "deformed product," consistent with ASTM standard terminology). Rather, the melt mill was manufacturing square "merchant bar," which does not have any safety-related nuclear applications. The NRC inspection team inspected the Charlotte Melt Mill quality processes and procedures, including its chemical testing procedure (which is identical for rebar) and its mechanical testing procedure (which is similar, but not identical, to the testing procedure for rebar).

The Charlotte Melt Mill performs chemical analysis of its product in accordance with Routine Procedure #8300570-RP-002A using an optical emission spectrometer. This procedure was posted near the spectrometer. The melt mill tests ladle samples and product samples. Ladle samples are taken from the ladle while the alloy is still molten, so that the melt mill can make in-process adjustments to chemistry. Product samples represent the final chemistry of the solidified product when further chemistry adjustments cannot be made. Results from both ladle and product samples are manually entered into a log at the spectrometer, but only product sample chemistries become part of the official record. Product sample chemistries are input into the QMOS software system and are documented in the chemical and physical test reports. During its visit, the NRC inspection team observed chemical analysis being performed on both ladle and product samples. The NRC inspection team interviewed both the technician on duty and the manager of metallurgical services. From its interviews, the NRC inspection team determined that the Charlotte Melt Mill uses National Institute of Standards and Technology (NIST)-traceable standards, and the spectrometer was standardized at approximately 7 a.m. and later at 11 a.m. on the day of its visit. The procedures observed and practices discussed during the interviews were consistent with Routine Procedure #8300570-RP-002A. The NRC inspection team concluded that the procedures and practices of the Charlotte Melt Mill were appropriate for the chemical analysis of rebar manufactured to ASTM base material specifications A615 and A706/A706M.

The Charlotte Melt Mill performs physical testing of its product in accordance with Routine Procedure #8300570003 for merchant products (tensile testing only) and in accordance with Routine Procedure #8300570004 for rebar (tensile testing and bend testing). Both procedures are posted near the tensile testing procedure. On the day of its visit, the NRC inspection team observed tensile testing being performed on merchant product in accordance with Routine Procedure #8300570003. For the product being tested, values for yield strength, tensile strength, and elongation were determined. These values were manually entered into a log, along with the heat number, physical dimensions required by the applicable specification, and the technician's initials. Information from the log was later entered into the QMOS software system and becomes part of the chemical and physical test report. Tensile testing is performed in accordance with the ASTM A370, which is a requirement of the rebar base material specifications.

The NRC inspection team observed that the procedure for testing of safety-related rebar is similar to that for testing merchant bar. The NRC inspection team interviewed the technician on duty and determined he was familiar with the requirements of Routine Procedure #8300570004 to perform tensile testing on rebar. Based on its observations and interviews, the NRC inspection team concluded that the procedures and practices of the Charlotte Melt Mill were appropriate for the tensile testing of rebar manufactured to ASTM base material specifications A615 and A706/A706M.

Routine Procedure #8300570003 does not require bend testing of merchant bar. Bend testing is an important physical test required by Routine Procedure #8300570004 for rebar. Bend testing is also required by ASTM rebar specifications A615 and A706/A706M. The NRC inspection team reviewed the policies and procedures of the Charlotte Melt Mill related to bend testing. The Charlotte Melt Mill uses an electrically powered bend test jig, which is located just outside the lab building but in a covered location partially enclosed by the walls of the adjacent building. Rebar to be tested is stored nearby in racks. In an interview with the Charlotte Fabricating Facility QA Manager, GERDAU confirmed that the bend test fixture and rebar stored nearby would be sheltered from the rain but not from variations in the outside ambient temperature.

The bend test jig is essentially a vise and a turntable with a removable pin in the center of the turntable and a fixed pin near the outer circumference of the turntable. When one end of the rebar is fixed in the vise and the machine is turned on, the turntable bends the rebar around the center pin. The bend radius is determined by the center pin diameter. This design is one of many that are allowed by ASTM A370. The Charlotte Melt Mill uses 10 interchangeable pins of various diameters, and each pin was clearly labeled with the specification and rebar size for which it was intended. The NRC inspection team measured the diameter of each pin and confirmed that each pin met the base materials specification requirements for each size (13 millimeter (mm), 16 mm, 19 mm, 22 mm, 25 mm) and base material specification (A615, A706/A706M) of rebar produced at the Charlotte Melt Mill. The NRC inspection team confirmed that the bend testing jig was in operating condition, that it was capable of producing 180-degree bends, and that the center pins were interchangeable. According to GERDAU policy, bend test results are manually entered into the same log that is used to document tensile test data. As with the tensile test data, bend test results are later transferred into the QMOS software system and become part of the chemical and physical test report. Based on its observations and interviews, the NRC inspection team concluded that the procedures and practices of the Charlotte Melt Mill were appropriate for the bend testing of rebar manufactured to ASTM base material specifications A615 and A706/A706M.

The NRC inspection team observed that ASTM A370, paragraph 14.3, requires the test facility to “Bend the test specimens at room temperature.” The Fabricating Facility QA Manager stated that the rebar is cooled to the ambient temperature of the semienclosed area where the bend test fixture is located. The Fabricating Facility QA Manager further stated that ASTM A370 does not define “room temperature” and that GERDAU defines “room temperature” to be the temperature of the semienclosed area where the bend test fixture is located. The NRC inspection team observes that ASTM A370 does not define “room temperature” and that the requirements of A370 regarding temperature of testing are vague and open to interpretation. Based on GERDAU policy, some heats of rebar may be tested in the summertime at high ambient temperatures, and some heats of rebar may be tested in the wintertime at low ambient temperatures. The NRC inspection team notes that testing at high ambient temperatures should not change the material

properties of the steel. At low temperatures, the steel rebar may transition from ductile behavior to brittle behavior. The NRC inspection team observes that GERDAU runs the risk of higher base material rejection rates by testing outside the laboratory building in the wintertime rather than by testing inside the laboratory building. Heats of rebar rejected in this manner would not be allowed to proceed to fabrication. This means that the GERDAU practice is more stringent than allowed by ASTM A370. The NRC inspection team observes that the GERDAU practice does not violate any explicit environmental requirements of the applicable quality specifications and does not degrade the quality of the rebar below what the quality would be if the bend test fixture were located inside the laboratory building. This is an observation.

The NRC inspection team reviewed chemical and physical test reports for various heats of ASTM A615 and A706/A706M rebar. For the sample of test reports evaluated, the chemical and physical properties documented on the test report met the requirements of the applicable base material specification (either ASTM A615 or A706/A706M). The sample of test reports also met the recordkeeping requirements of the applicable base material specification, with one exception. ASTM A615 (Revision 09b) and ASTM A706/A706M (all revisions applicable to the Charlotte Melt Mill product) require that the chemical analysis of each heat of steel be determined in accordance with ASTM A751. ASTM A751, Section 13, requires that chemistry test records contain the test method(s) or unambiguous description of the nonstandard method(s) used. The test method was not specified in the test reports as required by ASTM A751, Section 13. The NRC inspection team confirmed that the test method being used by GERDAU is a method allowed by ASTM A751, and the test method can be determined from the GERDAU records. This discrepancy is related to the documentation supplied with the rebar only and does not affect the quality of the rebar. Specifically, GERDAU failed to specify the test method on the chemical and physical test reports, as required by ASTM A751, Section 13. This is a performance example of why the GERDAU internal audit should include the applicable ACI requirements and applicable ASTM requirements as quality requirements. This issue is an example in a nonconformance in Section 15, “Internal and External Audits,” of this report.

Corrective Action for Fabrication Failures

The NRC inspection team found that GERDAU identified, in its CAP, a potential adverse quality trend, in that four heats of rebar experienced problems. GERDAU CAR No. CLT 2011-2 lists heats C006418, C900429, C902535, and C011819 as being part of a trend of material breaking during fabrication. GERDAU Failure Analysis No. 67430, which is invoked in the evaluation portion of CAR No. CLT 2011-2, added heat numbers C011804 and C011805 to this trend. The closeout evaluation of this CAR states that there is no indication that defective material was shipped to any nuclear customer and that all material met ASTM requirements. The NRC inspection team reviewed the records for the six heats documented above for compliance with the design and quality controls of the GERDAU Charlotte Melt Mill and Charlotte Fabricating Facility.

Heats C006418, C900429, C902535, C011804, C011805, and C011819 were all manufactured at GERDAU’s Charlotte Melt Mill. The NRC inspection team evaluated the chemical and physical test reports for these heats. The NRC inspection team observed that the chemical and physical test results were in accordance with the requirements of the applicable base material specification. Based on its review of the specific chemical and physical test reports, and based on its general observations, which

indicate that the Charlotte Melt Mill complies with the chemical and physical testing requirements of the applicable design control documents and base material specifications, the NRC inspection team concludes that heats C006418, C900429, C902535, C011804, C011805, and C011819 conform to the requirements of the applicable base material specification and that failures of these heats during fabrication were not attributable to nonconformance with the applicable base material specification.

Documentation reviewed at the Charlotte Fabrication Facility indicates that heat C006418 was rejected by the purchaser for rolled-in scrap rather than for failure by breaking in the area of mill marking while bending. The NRC inspection team observes that the inclusion of this heat in the CAR may have been unnecessary. The rejection of this heat is attributable to a problem with hot rolling at the Charlotte Melt Mill, and it is conservative to include suspect material in the documentation of potential trends. GERDAU found, for this heat, that the rolled-in material, although rejected by the purchaser, still met the ASTM code requirements. The NRC inspection team confirmed that GERDAU interpreted the code correctly. GERDAU replaced the rejected rebar and changed its inspection procedures to look for this problem. GERDAU applied corrective action, and the NRC inspection team found no evidence that this problem has recurred.

GERDAU failure analysis 67430 addresses the failure of heats C011804, C011805, and C011819. The breakages occurred at GERDAU's Charlotte Fabricating Facility (heat C011804) and Louisville Fabricating Facility (heats C011805 and C011819). The failure analysis identified that the failures occurred during fabrication bends at the branding marks (branding of rebar is required by the ASTM specifications). The failure of these three heats was attributable to the branding process, which occurs during the final stages of manufacture at the Charlotte Melt Mill. GERDAU identified an edge to the branding form that was causing a stress riser where the failures initiated. GERDAU noted that the rebar met the code requirements, even though it broke during fabrication, determined the extent of affected heats, and used the affected heats for nonnuclear orders. GERDAU replaced the branding form and took actions to prevent recurrence (inspection of the branding form when replaced). The NRC inspection team notes that heats C011804, C011805, and C011819 showed sufficient ductility during base material tensile and bend testing, and this would support the conclusion of failure analysis 67430. The NRC inspection team notes that corrective and preventative actions for the problem were taken.

Duke Energy Metallurgy Reports #4243 and #4492 address the failure of heats C900429 and C902535. Heats C900429 and C902535 were initially fabricated at the GERDAU Charlotte Fabricating Facility but broke during installation at the Oconee Nuclear Station. It should be noted that heats C900429 and C902535 failed under conditions that were outside the control of GERDAU's quality program. The failure analyses performed by Duke Energy indicate that these materials complied with the base material specification (ASTM A615) requirements but that the installation at Oconee was performed at low temperatures and that this material had low toughness (would fracture in a brittle manner) at low temperatures. Since ASTM A615 base material is not required to meet any toughness or impact strength requirements, it is the responsibility of the fabricator to impose appropriate engineering controls such that the material is not fabricated under conditions (e.g., temperature, loading rate) that would encourage brittle fracture. The GERDAU and Duke Energy failure analyses concluded that the material supplied by GERDAU met the PO requirements.

c. Conclusions

The NRC inspection team concluded that GERDAU's design control policies and procedures were consistent with the requirements of Criterion III in Appendix B to 10 CFR Part 50 and with the ASME requirements for rebar manufacturing and fabrication. The NRC inspection team determined that GERDAU's implementation of these processes and practices provide appropriate design controls. An issue with mill test report documentation is included in a nonconformance in Section 15, "Internal and External Audits," of this report. No findings of significance were identified.

4. Procurement Document Control

a. Inspection Scope

The NRC inspection team reviewed GERDAU QAM Article 4 and FQAM Article 4 that govern GERDAU's process for controlling documents used to procure material, equipment, and services to verify compliance with Criterion IV in Appendix B to 10 CFR Part 50. The NRC inspection team reviewed the only three safety-related GERDAU PO packages, which were blanket POs for ERICO rebar couplers being purchased for the Vogtle and Summer nuclear sites.

Specifically, the NRC inspection team reviewed the following GERDAU policies, procedures, audits, and supporting documentation:

- GERDAU Corporate QAM, Quality Assurance/Control Program for the Manufacture and Fabrication of Steel Products, Revision 26
- GERDAU FQAM, Revision 17
- GERDAU Blanket PO #ERICO-5677, Revision 0
- GERDAU Blanket PO #ERICO-5678, Revision 0
- GERDAU Blanket PO #ERICO-5678, Revision 1
- GERDAU Quality Control Internal Work Procedures for the Fabrication of Deformed and Plain Billet Steel Bars, Revision 11
- GERDAU Procedure for Inspections, Revision 4
- GERDAU Procedure for Inspections, Revision 5
- GERDAU Procedure for the Control of Procurement of Documents, draft document
- GERDAU Material Receiving Log, Form FQAM-20, Revision 16
- GERDAU Process Control Standard Procedure for Internal Audit, P82-2, Revision 4
- GERDAU Process Control Standard Procedure for Supplier Assessment, P74-1, Revision 2

b. Observations and Findings

The NRC inspection team reviewed the procurement documents and verified that these documents included design specifications; testing and inspection requirements; applicability to 10 CFR Part 21, ASTM, and ACI requirements; and required NQA-1 applicability. Other than the cover page, which was a GERDAU open PO to ERICO, the PO related documentation and requirements were contained in a Westinghouse

proprietary document titled, “Specification for Supply and Installation of Mechanical Splices for Reinforcing Steel.” The inspectors noted that GERDAU does not have any control or responsibility related to this proprietary document.

The NRC inspection team identified that GERDAU did not have a procedure for the development of procurement documents. This issue was discussed with GERDAU QA personnel. GERDAU took immediate corrective actions and provided the NRC inspection team with a draft procedure for the control of procurement documents prior to the NRC inspection team’s exit. Also related to the development of procurement documents, the NRC inspection team identified that the procurement documents failed to identify applicable inspection and testing records needed from ERICO for subsequent review by GERDAU and did not include any requirements for ERICO’s reporting and dispositioning of nonconformances during fabrication. At the time of the NRC vendor inspection, GERDAU had not received any material/couplers from ERICO. The lack of adequate procedural guidance for developing procurement documents is contrary to the requirements of Criterion IV in Appendix B to 10 CFR Part 50, and the PO did not contain all pertinent information, as required by FQAM Section 4.2.1.2. This issue has been identified as Nonconformance 99901407/2011-201-01.

c. Conclusions

The NRC inspection team identified Nonconformance 99901407/2011-201-01 associated with GERDAU’s failure to implement the requirements of Criterion IV in Appendix B to 10 CFR Part 50. Specifically, GERDAU failed to provide adequate procedural guidance for developing procurement documents associated with nuclear safety-related material. This resulted in procurement documents failing to identify applicable requirements for ERICO to provide test and inspection records and corrective action documents.

5. Instructions, Procedures, and Drawings

a. Inspection Scope

The NRC inspection team reviewed Article 5.0 of both the GERDAU FQAM and the GERDAU QAM, and PO packages from Shaw Nuclear for safety-related concrete reinforcement steel rebar. These POs from Shaw Nuclear were for safety-related steel rebar to be used at the Vogtle and V.C. Summer nuclear construction projects. The FQAM and QAM govern the methods and processes that GERDAU uses to manufacturer and fabricate safety-related rebar for use at nuclear power plant facilities.

The NRC inspection team reviewed drawings that GERDAU received from Shaw Nuclear for the Vogtle and V.C. Summer nuclear construction projects, and drawings that were developed for Shaw Nuclear in support of components being fabricated by GERDAU for use at Vogtle and V.C. Summer. The NRC inspection team also reviewed procedures used by the GERDAU Charlotte Mill for the production of the steel raw material that was and will be used to manufacture safety-related steel rebar for Shaw Nuclear for use at Vogtle and V.C. Summer nuclear construction projects.

Specifically, the NRC inspection team reviewed the following GERDAU policies, procedures, and supporting documentation:

Procedures:

- 1000138-RP-004-0, Procedure for 10 CFR 50.55(e), dated October 7, 2009
- 1000138-RP-005-1, DOE Order 414.1C and Nuclear Safety Related Work Procedure, dated October 21, 2009
- 3112600-RP-002-5, Procedure for Inspections, Revision 5, dated June 10, 2011
- 3112600-RP-003-4, Procedure for Handling, Shipping and Storage, Revision 4, dated June 10, 2011
- 3112600-RP-006-01, Procedure for Maintaining Bundle Heat Separation and Traceability, Revision 1, dated June 10, 2011
- 3112600-RP-007-01, Procedure for Maintaining Heat Traceability for Confirmatory Verification Analysis Samples, Revision 1, dated June 10, 2011
- 8300415-RP-009-D, Creating Bill of Lading
- 8300579-JA-013, Identifying Split Heat, dated September 11, 2009
- CHR-GMP-590-01-A, Document Control (for Charlotte Steel Mill), dated September 22, 2010

POs:

- Shaw Stone & Webster, Inc., PO No. 132175-J400A-00, NQA-1 Concrete Reinforcing Steel for Vogtle Project Units 3 and 4
- Shaw Stone & Webster, Inc., PO No. 132177-J400-00, NQA-1 Concrete Reinforcing Steel for V.C. Summer Units 2 and 3

Drawings:

- GERDAU Bar List No. CV9B, Nuclear Island Basemat Bottom Layer 3 (Radial), dated June 1, 2011
- GERDAU Bar List No. CV8Q, Nuclear Island Basemat Bottom Layer 2, dated May 9, 2011
- Westinghouse (WEC) Drawing (Dwg.) No. APP-1000-CR-002 (Shaw Dwg. No. SV3-1000-CR-002-R1), Nuclear Island Basemat Top Reinforcement, Revision 8, dated June 17, 2010
- WEC Dwg. No. APP-1010-CR-001 (Shaw Dwg. No. SV3-1010-CR-001-R0), Nuclear Island Basemat Dowel Plan at El. 66′-6″ Shield Building Northeast Quadrant, Revision 0, dated March 31, 2010
- WEC Dwg. No. APP-1010-CR-104 (Shaw Dwg. No. SV3-1010-CR-104-R0), Nuclear Island Basemat Concrete Reinforcement Area Below Containment Vessel Stud Pattern and Details, Revision 1, dated June 25, 2010
- WEC Dwg. No. APP-1210-CR-901 (Shaw Dwg. No. SV3-1210-CR-901-R0), Auxiliary Building Basemat Reinforcement Sections NS and Details El. 66′-6″, Revision 2, dated April 1, 2010
- WEC Dwg. No. APP-1210-CR-902 (Shaw Dwg. No. SV3-1210-CR-902-R0), Auxiliary Building Basemat Reinforcement Sections EW and Details El. 66′-6″, Revision 2, dated April 1, 2010
- WEC Dwg. No. APP-12010-CR-903 (Shaw Dwg. No. SV3-1210-CR-903-R1), Auxiliary Building Basemat Reinforcement Details Pit and Sump Area El. 66′-6″, Revision 3, dated June 22, 2010

Miscellaneous:

- ACI 117-06, "Specification for Tolerances for Concrete Construction and Materials and Commentary," dated August 15, 2006
- ACI 315-99, "Details and Detailing of Concrete Reinforcement," August 31, 1999
- CHR-MNU-590-01-C, GERDAU Ameristeel Charlotte Steel Mill Standardization Manual, dated March 4, 2011
- CRSI Manual of Standard Practice 2009, 28th Edition
- GERDAU Corporate QAM, Quality Assurance/Control Program for the Manufacture and Fabrication of Steel Products, Revision 26, dated July 15, 2011
- GERDAU Inspection & Test Plan (ITP) (V.C. Summer and Vogtle), ITP #3112600-RP-004-01, Revision 1, dated March 22, 2011
- GERDAU FQAM, Quality Assurance/Control Program for the Fabrication of Steel Products, Revision 17, dated July 15, 2011
- GG10-03-MNU-EN, GERDAU Standardization Manual, Review A, dated November 16, 2009
- 8300570-MS-001, GERDAU Management Standard

b. Observations and Findings

The NRC inspection team verified that the GERDAU Charlotte Fabrication Facility does not have specific policies or procedures established for the control of instructions, procedures, and drawings. Instead, GERDAU relies on use of its FQAM to control instructions, procedures, and drawings in the fabrication of safety-related steel rebar at its Charlotte, NC, fabrication plant. The NRC inspection team reviewed FQAM Article 5.0, "Instructions, Procedures, and Drawings," and verified that the requirements for instructions and procedures were adequately implemented. For control of drawings, FQAM Article 5.0 refers to FQAM Section 6.4, "Engineering Department Document Control." An issue with the drawings control program is included in a nonconformance in Section 6, "Document Control," of this report. The NRC inspection team verified that the procedures in use at the GERDAU Charlotte Mill for production of the raw steel material were adequate and met regulatory requirements.

The NRC inspection team reviewed Implementing Procedures 3112600-RP-002-5, which establishes the process for performing inspections; 3112600-RP-006-01, which establishes controls for maintaining heat traceability when using multiple bundles; and 3112600-RP-007-01, which establishes controls for maintaining heat traceability when cutting samples of reinforcing steel for verification. The NRC inspection team interviewed GERDAU personnel at both the GERDAU Charlotte Fabrication Facility and GERDAU Charlotte Mill who performed work and inspection activities associated with safety-related nuclear quality steel reinforcing rebar.

The NRC inspection team observed fabrication and inspection activities conducted on nuclear safety-related concrete steel rebar procured by Shaw Nuclear Services, Inc., for use on the AP1000 construction projects for Vogtle Units 3 and 4 and V.C. Summer Units 2 and 3. The fabrication and inspection activities that were witnessed by the NRC inspection team on nuclear safety-related steel rebar were the bending operations and QC inspections conducted by GERDAU QC personnel for materials associated with Shaw Stone & Webster, Inc., PO Nos. 32177-J400-00 and 132175-J400A-00. The NRC

inspection team verified that the bending and inspection activities were in conducted in accordance with GERDAU ITP #3112600-RP-004-01, Revision 1.

c. Conclusions

The NRC inspection team concluded that the GERDAU program for instructions, procedures, and drawings were consistent with the regulatory requirements of Criterion V in Appendix B to 10 CFR Part 50. Based on its review, the NRC inspection team determined that GERDAU instructions, procedures, and drawings conform to the requirements of Basic Requirement 5 of ASME NQA-1-1994 and the GERDAU QAM and are effectively implemented. An issue with the drawings control program is included in a nonconformance in Section 6, "Document Control," of this report. No findings of significance were identified.

6. Document Control

a. Inspection Scope

The NRC inspection team reviewed Article 6.0 of both the FQAM and QAM associated with document control. The NRC inspection team reviewed procedures, manuals, inspection plans, and records that are maintained and controlled in GERDAU's document control system at both the Charlotte Fabrication Facility and Charlotte Mill.

Specifically, the NRC inspection team reviewed the following GERDAU policies, procedures, and supporting documentation:

Procedures:

- 1000138-RP-004-0, Procedure for 10 CFR 50.55(e), dated October 7, 2009
- 1000138-RP-005-1, DOE Order 14.1C and Nuclear Safety-Related Work Procedure, dated October 21, 2009
- 3112600-RP-002-5, Procedure for Inspections, Revision 5, dated June 10, 2011
- 3112600-RP-003-4, Procedure for Handling, Shipping and Storage, Revision 4, dated June 10, 2011
- 3112600-RP-006-01, Procedure for Maintaining Bundle Heat Separation and Traceability, Revision 1, dated June 10, 2011
- 3112600-RP-007-01, Procedure for Maintaining Heat Traceability for Confirmatory Verification Analysis Samples, Revision 1, dated June 10, 2011
- 8300415-RP-009-D, Creating Bill of Lading
- 8300579-JA-013, Identifying Split Heat, dated September 11, 2009
- CHR-GMP-590-01-A, Document Control (for Charlotte Steel Mill), dated September 22, 2010

POs:

- Shaw Stone & Webster, Inc. PO No. 132175-J400A-00, NQA-1, Concrete Reinforcing Steel for Vogtle Project Units 3 and 4
- Shaw Stone & Webster, Inc. PO No. 132177-J400-00, NQA-1, Concrete Reinforcing Steel for V.C. Summer Units 2 and 3

Drawings:

- GERDAU Bar List No. CV9B, Nuclear Island Basemat Bottom Layer 3 (Radial), dated June 1, 2011
- GERDAU Bar List No. CV8Q, Nuclear Island Basemat Bottom Layer 2, dated May 9, 2011
- Westinghouse (WEC) Drawing (Dwg.) No. APP-1000-CR-002 (Shaw Dwg. No. SV3-1000-CR-002-R1), Nuclear Island Basemat Top Reinforcement, Revision 8, dated June 17, 2010
- WEC Dwg. No. APP-1010-CR-001 (Shaw Dwg. No. SV3-1010-CR-001-R0), Nuclear Island Basemat Dowel Plan at El. 66′-6″ Shield Building Northeast Quadrant, Revision 0, dated March 31, 2010
- WEC Dwg. No. APP-1010-CR-104 (Shaw Dwg. No. SV3-1010-CR-104-R0), Nuclear Island Basemat Concrete Reinforcement Area Below Containment Vessel Stud Pattern and Details, Revision 1, dated June 25, 2010
- WEC Dwg. No. APP-1210-CR-901 (Shaw Dwg. No. SV3-1210-CR-901-R0), Auxiliary Building Basemat Reinforcement Sections NS and Details El. 66′-6″, Revision 2, dated April 1, 2010
- WEC Dwg. No. APP-1210-CR-902 (Shaw Dwg. No. SV3-1210-CR-902-R0), Auxiliary Building Basemat Reinforcement Sections EW and Details El. 66′-6″, Revision 2, dated April 1, 2010
- WEC Dwg. No. APP-12010-CR-903 (Shaw Dwg. No. SV3-1210-CR-903-R1), Auxiliary Building Basemat Reinforcement Details Pit and Sump Area El. 66′-6″, Revision 3, dated June 22, 2010

Miscellaneous:

- ACI 117-06, Specification for Tolerances for Concrete Construction and Materials and Commentary, dated August 15, 2006
- ACI 315-99, Details and Detailing of Concrete Reinforcement, dated August 31, 1999
- CHR-MNU-590-01-C, GERDAU Ameristeel Charlotte Steel Mill Standardization Manual, dated March 4, 2011
- CRSI Manual of Standard Practice 2009, 28th Edition
- GERDAU Corporate QAM, Quality Assurance/Control Program for the Manufacture and Fabrication of Steel Products, Revision 26, dated July 15, 2011
- GERDAU Inspection & Test Plan (ITP) (V.C. Summer and Vogtle), ITP #3112600-RP-004-01, Revision 1, dated March 22, 2011
- GERDAU FQAM, Quality Assurance/Control Program for the Fabrication of Steel Products, Revision 17, dated July 15, 2011
- GG10-03-MNU-EN, GERDAU Standardization Manual, Review A, dated November 16, 2009
- 8300570-MS-001, GERDAU Management Standard

b. Observations and Findings

The NRC inspection team reviewed Article 6.0, “Document Control,” of the GERDAU FQAM, and Article 6.0, “Document Control,” of the GERDAU Corporate QAM. The NRC inspection team reviewed Procedure CHR-GMP-590-01-A, which establishes the quality

and management system requirements of document control at GERDAU's Charlotte Steel Mill.

The NRC inspection team verified that GERDAU does not have specific policies or procedures established for the control of documents or drawings at its Charlotte Fabrication Facility. Instead, GERDAU uses Article 6.0 of the FQAM to control documents and drawings. The NRC inspection team reviewed the FQAM and verified that the requirements of Article 6.0 were being adequately implemented, with one exception related to drawings. This exception relates to drawings received from Shaw Nuclear that were not stamped with the date of receipt, which is contrary to FQAM Section 6.4.2.1. This issue has been identified as Nonconformance 99901407/2011-201-02.

The NRC inspection team verified that the GERDAU Charlotte Fabrication Facility does not use a formal document control system; instead, the QA manager at the GERDAU fabrication facility serves and maintains the document control role and function. The GERDAU Charlotte Mill uses an electronic document control management system referred to as ePRISM. The NRC inspection team verified that, even though the GERDAU uses different methods for document control between its Charlotte Fabrication Facility and Charlotte Mill, its document control was adequate. The NRC inspection team interviewed GERDAU personnel at both the GERDAU Charlotte Fabrication Facility and the GERDAU Charlotte Mill who performed documentation activities associated with safety-related nuclear quality steel reinforcing rebar.

The NRC inspection team verified that the procedures in use at the GERDAU Charlotte Mill for production of the raw steel material were adequate; however, Standard No. 8300579-JA-013 was in the process of being revised into a new procedure (CHP-RP-579-?-?), "Identifying Split Bundle Heats," to make enhancements as a result of an external audit finding. This current job aid (JA), 8300579-JA-013, which is used by the Charlotte Mill to identify and control the splitting of heats to maintain separation of bundles when different heat numbers are used, was determined by an external audit to be inadequate. The NRC inspection team confirmed that the draft of the new procedure (CHP-RP-579-?-?) should address the external audit finding.

c. Conclusions

The NRC inspection team identified Nonconformance 99901407/2011-201-02 associated with GERDAU's failure to implement the requirements of Criterion VI in Appendix B to 10 CFR Part 50. Specifically, GERDAU failed to stamp the customer drawings received from Shaw Nuclear with the date of receipt, as required by GERDAU FQAM Section 6.4.2.1.

7. Control of Purchased Material, Equipment, and Services

a. Inspection Scope

The NRC inspection team reviewed the GERDAU QAM and FQAM that govern GERDAU's process for controlling purchased material, equipment, and services to verify compliance with Criterion VII in Appendix B to 10 CFR Part 50. The NRC inspection team reviewed the GERDAU supplier audit that placed ERICO on GERDAU's approved

supplier list. In addition, the NRC inspection team verified that GERDAU performs no commercial-grade dedication.

Specifically, the NRC inspection team reviewed the following GERDAU procedures, audit, and supporting documentation:

- GERDAU Corporate QAM, Quality Assurance/Control Program for the Manufacture and Fabrication of Steel Products, Revision 26
- GERDAU FQAM, Revision 17
- GERDAU Blanket PO #ERICO-5677, Revision 0
- GERDAU Blanket PO #ERICO-5678, Revision 0
- GERDAU Blanket PO #ERICO-5678, Revision 1
- NIAC Audit Checklist for Audit CHR RF 2011
- NIAC Audit Checklist for Audit Jax RF 2011
- NIAC Audit Checklist for Audit ERICO Products Incorp. 2011
- GERDAU Internal Audit Report GERDAU Ameristeel Jacksonville, issued September 2010
- GERDAU Internal Audit Report GERDAU Ameristeel Atlanta Reinforcing, issued May 2011
- GERDAU Internal Audit Report GERDAU Ameristeel Knoxville Reinforcing, issued February 2011
- GERDAU Internal Audit Report GERDAU Ameristeel Knoxville Reinforcing, issued February 2010
- GERDAU Internal Audit Report GERDAU Ameristeel Atlanta Reinforcing, issued March 2010
- GERDAU Internal Audit Report GERDAU Ameristeel Charlotte Reinforcing, issued March 2010
- GERDAU Internal Audit Report GERDAU Ameristeel Corporate Office, issued September 2010
- GERDAU Internal Audit Report GERDAU Ameristeel Jackson Mill, issued September 2010
- GERDAU Internal Audit Report GERDAU Ameristeel Beaumont, issued February 2010
- GERDAU Internal Audit Report GERDAU Ameristeel St. Paul, issued December 2010
- GERDAU Internal Audit Report GERDAU Ameristeel Sterling Reinforcing, issued October 2010
- GERDAU Internal Audit Report GERDAU Ameristeel Jacksonville Reinforcing, issued June 2011
- GERDAU Internal Audit Report GERDAU Ameristeel Charlotte Reinforcing, issued April 2011
- GERDAU Internal Audit Report GERDAU Ameristeel Charlotte Mill, issued September 2010
- GERDAU Internal Audit Report GERDAU Ameristeel Knoxville Mill, issued September 2010
- GERDAU Internal Audit Report GERDAU Ameristeel Knoxville Mill, issued June 2011
- GERDAU Internal Audit Report GERDAU Ameristeel Beaumont Mill, issued April 2011

- GERDAU External Audit Report Supplier Audit Report, ERICO Products Inc., issued February 2011
- GERDAU Response to Shaw Audit V2011-06, Revision 01
- Duke Energy Supplier Verification Supplier Evaluation Report of GERDAU Ameristeel, issued April 2009
- Shaw Commercial Grade Survey Report of GERDAU Ameristeel, CGS-11-004, issued May 2011
- The Steam Generating Team Audit Report #14111, Revision 1, of the GERDAU Charlotte Fabrication Facility, issued February 2009
- GERDAU Quality Control Internal Work Procedures for the Fabrication of Deformed and Plain Billet Steel Bars, Revision 11
- GERDAU Procedure for Inspections, Revision 4
- GERDAU Procedure for Inspections, Revision 5
- GERDAU Procedure for the Control of Procurement of Documents, draft document
- GERDAU Material Receiving Log, Form FQAM-20, Revision 16
- GERDAU Process Control Standard Procedure for Internal Audit, P82-2, Revision 4
- GERDAU Process Control Standard Procedure for Supplier Assessment, P74-1, Revision 2

b. Observations and Findings

The NRC inspection team verified that guidance has been established in the QAM and FQAM for the control of purchased material, equipment, and services. The QAM and FQAM are consistent with the requirements of NQA-1 and Criterion VII in Appendix B to 10 CFR Part 50. The NRC inspection team noted that the FQAM specifies that the "Quality Manager" is responsible for developing procedures and administrating the process of commercial-grade dedication for safety-related materials and that there is no procedure for the process of commercial-grade dedication. Discussions with GERDAU personnel indicate that GERDAU has not developed procedures because GERDAU has not performed any commercial-grade dedication. The NRC inspection team review did not identify any commercial-grade dedication. The NRC inspection team observes that GERDAU has not developed procedures for commercial-grade dedication in accordance with the FQAM. This is an observation.

The NRC inspection team verified that guidance has been established to qualify vendors supplying basic components. The only supply vendor audit (ERICO) was properly conducted in accordance with the GERDAU QA manual. It was performed as part of a Nuclear Industry Assessment Committee (NIAC) audit. The inspectors noted that the audit used the NIAC checklist, and the inspectors confirmed that it met the requirements of NQA-1, Basic Requirement 7. The NRC inspection team noted that the purchased material from ERICO was being shipped to Shaw Nuclear at the Summer and Vogtle construction sites. Discussions with GERDAU personnel indicated that GERDAU did not have responsibility for the receipt inspection. No other material, equipment, or services were purchased by GERDAU. Discussions with GERDAU QA personnel indicated that an audit of ERICO was planned in the near future to verify proper implementation of the QA and code requirements.

The NRC inspection team reviewed the GERDAU procedural requirements for receipt inspection of bar stock at the GERDAU fabrication facility. The bar stock is produced at a GERDAU mill facility and transferred to the fabrication facility as ordered. The procedure was recently revised to include verification of bar heats when inspection for identification tags, removal of damaged bar when performing visual examination for bent or damaged material, use of a scanner to document acceptance/rejection of the material, and addition of requirements that rejected material be segregated, tagged, and documented in a nonconformance report. The NRC inspection team noted that receipt inspection procedure requirements met the NQA-1 Basic Requirement 7 and Supplement 7S-1 supplementary requirements for the control of purchased material. The NRC inspection team also noted that the FQAM-20 (Material Receiving Log) had recently been revised to include an accept/reject block and a block for signature of the receiving official/inspector.

c. Conclusions

The NRC inspection team concluded that the GERDAU Charlotte Fabricating Facility and Melt Mill control of purchased material, equipment, and services processes were consistent with the requirements of Criterion VII in Appendix B to 10 CFR Part 50. Based on its review, the NRC inspection team determined that GERDAU's control of purchased material, equipment, and services is effectively implemented in accordance with the applicable GERDAU policies and procedures, in support of nuclear safety-related work. No findings of significance were identified.

8. Control of Special Process

a. Inspection Scope

The NRC inspection team reviewed the GERDAU QAM and procedures that govern GERDAU's control of special processes.

Specifically, the NRC inspection team reviewed the following GERDAU procedures, audit, and supporting documentation:

- GERDAU Corporate QAM, Quality Assurance/Control Program for the Manufacture and Fabrication of Steel Products, Revision 26, dated July 15, 2011.
- GERDAU QAM Fabricated Products Group, Quality Assurance/Control Program for Fabrication of Steel Products, Revision 17, dated July 15, 2011
- GERDAU Mill QAM, Steel Mill Group, Quality Assurance/Control Program, Revision 26, dated July 15, 2011

b. Observations and Findings

The NRC inspection team reviewed the GERDAU corporate, Mill shop, and fabrication shop QAMs and found that special processes are not used in the production and fabrication of safety-related steel and rebar. The NRC inspection team found that special processes such as welding, heat treating, quenching, and nondestructive examinations do not apply to the GERDAU QAM program; therefore, no inspection findings were identified related to the control of special processes.

c. Conclusions

The NRC inspection team concluded that control of special processes does not apply to the GERDAU QA Program for the production and fabrication of safety-related carbon or alloy steel and rebar for nuclear power plants.

9. Inspection and Test Control

a. Inspection Scope

The NRC inspection team reviewed GERDAU's QA procedures (QAP) for inspection and control of test programs designed to demonstrate that items will perform satisfactorily in service to assess compliance with the requirements of Criterion X and Criterion XI in Appendix B to 10 CFR Part 50.

Specifically, the NRC inspection team reviewed the following GERDAU policies, procedures, and industry standards:

- GERDAU Mill QAM, Revision 26, dated July 15, 2011, Article 10.0, Inspection, page 31, In-Process Inspections
- GERDAU Corporate QAM, Revision 26, dated July 15, 2011, Article 11.0, Test Control, page 29, Section 11.1, Test Requirements, Chemical and Physical Testing
- GERDAU Mill QAM, Revision 26, dated July 15, 2011, Article 11.0, Test Control, page 33, Chemical and Physical Testing
- GERDAU Routine Procedure Document Number: 8300570001, Task: Billet Yard Recorder, dated June 23, 2008
- GERDAU Routine Procedure Document Number: 8300520-RP-019-F, Task: Sequence New Heat, dated January 18, 2011
- GERDAU Routine Procedure Document Number: 8300570-RP-002-A, Task: Spectro-Chemical Analysis of Steel, dated December 2, 2009
- GERDAU Routine Procedure, Standard Number: XHR-RP-550-01-A, Title: "Inspecting Entry and Delivery Guides," dated October 8, 2010
- GERDAU Routine Procedure Document Number: 8300570003, Task: Standard Work Procedure for Testing Merchant Products, dated August 20, 2008
- GERDAU Routine Procedure Document Number: 8300570004, Task: Standard Work Procedure for Testing Deformed Products, dated June 30, 2008
- GERDAU Job Aid Document Number: 830540-JA-005, Process: Measuring Pass Deformation, Equipment: Deformation Gauge, Objective: Minimize bar being out of Spec, dated September 24, 2009
- GERDAU Document Number P72-1, Process Control Standard: ISO Level 2 Procedure, Process: Production Scheduling, Revision 0, dated May 1, 2006
- GERDAU Document Number P74-4, Process Control Standard: ISO Level 2 Procedure, Process: Receiving Inspection, Revision 1, dated January 9, 2009
- GERDAU Document Number P75-4, Process Control Standard: ISO Level 2 Procedure, Process: Identification, Traceability and Test Status, Revision 0, dated May 1, 2006
- GERDAU Document Number P82-3, Process Control Standard: ISO Level 2 Procedure, Process: Inspection, Revision 1, dated January 9, 2009

- GERDAU Charlotte Mill, Procedure Number: CHR-550-JA-002, Mill Operation Check, Revision C, dated April 13, 2011
- GERDAU Charlotte Mill, Procedure Number: 8300550-JA-003, Revision C, Mill Section and Roll Parting, dated April 13, 2011
- GERDAU Charlotte Mill, Procedure Number: 830550-JA-004, On-Line Final Production Inspection, dated June 9, 2010
- GERDAU Inspection & Test Plan (ITP) (V.C. Summer and Vogtle), Customer PO No. 132177-J1400-00 and PO No. 132175-J400A-00, Revision 1, dated March 22, 2011
- ASTM A370, "Standard Test Methods and Definitions for Mechanical Testing of Steel Products"
- ASTM A751, "Standard Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products"
- ASTM A615/A615M, "Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement"
- ASTM A706/A706M, "Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement"

The NRC inspection team reviewed the following chemical and physical test reports:

- Jackson Steel Mill, GERDAU Straight Bill of Material, Shipping Number V-694217, Chemical and Physical Test Report, Shape and Size: X43MM Rebar #14, Grade A706 GR 420, ASTM A706-09, -01, Heat NO: V911776, 5 Bundles, Length: 60 feet (ft), Weight: 45,900 pounds (lb), Shipment Compliance with 10 CFR Part 50, Appendix B; 10 CFR Part 21, NQA-1,1994, Ship Date: April 25, 2011
- Jackson Steel Mill, GERDAU Straight Bill of Material, Shipping Number V-694218, Chemical and Physical Test Report, Shape and Size: X43MM Rebar #14, Grade A706 GR 420, ASTM A706-09, -01, Heat NO: V911774, 5 bundles, Length: 60 ft, Weight: 45,900 lb, Shipment Compliance with 10 CFR Part 50, Appendix B; 10 CFR Part 21; NQA-1 1994, Ship Date: April 25, 2011
- Jackson Steel Mill, GERDAU Straight Bill of Material, Shipping Number V-694374, Chemical and Physical Test Report, Shape and Size: X43MM Rebar #14, Grade A706 GR 420, ASTM A706-09, -01, Heat NO: V911778, 5 Bundles, Length: 60 ft, Weight: 44,523 lb, Shipment Compliance with 10 CFR Part 50, Appendix B; 10 CFR Part 21; NQA-1 1994, Ship Date: April 27, 2011
- Jackson Steel Mill, GERDAU Straight Bill of Material, Shipping Number J-651925, Chemical and Physical Test Report, Shape and Size: X29MM Rebar #9, Grade A706 GR 420, ASTM A706 A706M-09B, Heat NO: J111826, 5 Bundles, Length: 60 ft, Weight: 44,880 lb, Shipment Compliance with 10 CFR Part 50, Appendix B; 10 CFR Part 21, NQA-1 1994, Ship Date: June 17, 2011
- Jackson Steel Mill, GERDAU Straight Bill of Material, Shipping Number V-698107, Chemical and Physical Test Report, Shape and Size: X43MM Rebar #14, Grade A706 GR 420, ASTM A706-09, -01, Heat NO: V911772, 5 Bundles, Length: 60 ft, Weight: 45,900 lb, Shipment Compliance with 10 CFR Part 50, Appendix B; 10 CFR Part 21; NQA-1 1994, Ship Date: June 27, 2011
- Knoxville Steel Mill, GERDAU Straight Bill of Material, Shipping Number K-547988, Chemical and Physical Test Report, Shape and Size: X36MM Rebar #11, Grade A706 GR 420, ASTM A706-09, -01, Heat NO:

K107072, 5 Bundles, Length: 60 ft, Weight: 48,453 lb, Shipment Compliance with 10 CFR Part 50, Appendix B; 10 CFR Part 21; NQA-1 1994, Ship Date: June 17, 2011

- Charlotte Steel Mill, GERDAU Straight Bill of Material, Shipping Number C-557237, Chemical and Physical Test Report, Shape and Size: X19MM Rebar #6, Grade A706 GR 420, ASTM A706-01, -09, Heat NO: C0013110, 5 Bundles, Length: 60 ft, Weight: 45,960 lb, Shipment Compliance with 10 CFR Part 50, Appendix B; 10 CFR Part 21; NQA-1-1994, Ship Date: July 29, 2011
- Charlotte Steel Mill, GERDAU Straight Bill of Material, Shipping Number C-552628, Chemical and Physical Test Report, Shape and Size: X25MM Rebar #8, Grade 420 (60), ASTM A615-08B, -09B, Heat NOs: C011819, C011827, 5 Bundles, Length: 60 ft, Weight: 44,855 lb, Ship Date: March 23, 2011
- Charlotte Steel Mill, GERDAU Straight Bill of Material , Shipping Number C-552631, Chemical and Physical Test Report, Shape and Size: X25MM Rebar #8, Grade 420 (60), ASTM A615-08B, -09B, Heat NOs: C011819, C011820, 5 Bundles, Length: 60 ft, Weight: 44,696 lb, Ship Date: March 23, 2011
- Charlotte Steel Mill, GERDAU Straight Bill of Material , Shipping Number C-549259, Chemical and Physical Test Report, Shape and Size: X25MM Rebar #8, Grade 42 A706, ASTM A706-08, -08a, -09, -09b, -00, Heat NOs: C000434, C006415, C006418, 5 Bundles, Length: 40 ft, Weight: 44,856 lb, Ship Date: December 14, 2010
- Charlotte Steel Mill, GERDAU Straight Bill of Material, Shipping Number C-532025, Chemical and Physical Test Report, Shape and Size: X25MM Rebar #8, Grade 420 (60), ASTM A615-08B, Heat NO: C902535, 5 Bundles, Length: 60 ft, Weight: 44,855 lb, Ship Date: July 7, 2009
- Charlotte Steel Mill, GERDAU Straight Bill of Material, Shipping Number C-532031, Chemical and Physical Test Report, Shape and Size: X25MM Rebar #8, Grade 420 (60), ASTM A615-08B, Heat NOs: C902528, C902530, C902534, C902535, C902536, 5 Bundles, Length: 60 ft, Weight: 44,855 lb, Ship Date: July 7, 2009
- Charlotte Steel Mill, GERDAU Straight Bill of Material, Shipping Number C-532027, Chemical and Physical Test Report, Shape and Size: X25MM Rebar #8, Grade 420 (60), ASTM A615-08B, Heat NOs: C902534, C902535, 5 Bundles, Length: 60 ft, Weight: 44,855 lb, Ship Date: July 7, 2009
- Charlotte Steel Mill, GERDAU Straight Bill of Material, Shipping Number C-529015, Chemical and Physical Test Report, Shape and Size: X19MM Rebar #6, Grade 420 (60), ASTM A615-08B, Heat NOs: C900425, C900426, C900429, C900430, 5 Bundles, Length: 60 ft, Weight: 47,132 lb, Ship Date: March 24, 2009
- Charlotte Steel Mill, GERDAU Straight Bill of Material, Shipping Number C-528970, Chemical and Physical Test Report, Shape and Size: X19MM Rebar #6, Grade 420 (60), ASTM A615-08B, Heat NOs: C900428, C900429, 5 Bundles, Length: 60 ft, Weight: 45,960 lb, Ship Date: March 23, 2009
- Charlotte Steel Mill, GERDAU Straight Bill of Material , Shipping Number C-529010, Chemical and Physical Test Report, Shape and Size: X19MM Rebar #6, Grade 420 (60), ASTM A615-08b, Heat NOs: C900428, C900429, 5 Bundles, Length: 60 ft, Weight: 45,960 lb, Ship Date: March 24, 2009

b. Observations and Findings

b.1 Process Control Documents

The NRC inspection team reviewed GERDAU Mill QAM Article 10.0, “Inspection,” which provides guidance for inspection of steel and rebar that meets the regulations in Criterion X in Appendix B to 10 CFR Part 50. The NRC inspection team also reviewed GERDAU routine procedures and mill and fabrication shop procedures used to perform QC inspections of steel billet and rebar being manufactured at the mill and fabrication shop. The NRC inspection team verified that the GERDAU procedures contained hold points for recording steel and rebar inspection data that must meet certain acceptance criteria before the steel or rebar can be shipped to the customer.

The NRC inspection team also reviewed GERDAU Mill QAM Article 11.0, “Test Control,” which provides guidance for test control activities that meet the regulations in Criterion XI in Appendix B to 10 CFR Part 50. Specifically, chemical tests shall be performed by QC personnel, under the supervision of the Metallurgical Services Manager, in an environment suitable for chemical testing. A final chemical test shall be made by the QC technician from a sample secured from each heat of steel. The final analysis becomes the chemistry of record and shall be posted for later inclusion in chemical and physical test reports. The QC technician shall perform all physical tests of record. These tests shall be performed in accordance with the applicable ASTM standards, including ASTM A370.

b.2 Inspection and Testing of Rebar

In the GERDAU mill and fabrication shop, the NRC inspection team observed bend fabrication of rebar to proper dimensions measured in the field. The NRC inspection team interviewed Shaw QA and GERDAU Level I and II QC inspectors who recorded hold point inspection data (e.g., rebar dimensions, deformation, chemical and physical testing, measurement of thread depth, thread length) on rebar in the mill and fabrication shop. The NRC inspection team observed Shaw QA and GERDAU QC inspectors record dimension and deformation data and verify that the data were within acceptable limits in GERDAU procedures. The NRC inspection team also observed a GERDAU machine operator and QC inspector use calibrated gauges to measure rebar threads in the field. The NRC inspection team found that GERDAU QC personnel properly performed hold point activities and recorded inspection data using calibrated end and thread gauges. No inspection findings related to GERDAU inspection of rebar were identified.

The NRC inspection team found that the GERDAU fabrication shop does not perform bend tests or tensile tests but performs shaping and bending activities for final rebar fabrication. The GERDAU mill facility performs bend tests and tensile tests and spectrograph analysis. The NRC inspection team observed two tensile tests on merchant bar while at the GERDAU mill facility. The NRC inspection team also checked calibrations of test equipment used on the spectrograph and tensile test machines. Section 10, “Control of Measuring and

Test Equipment," of this report provides additional details on the calibration of test equipment.

The NRC inspection team found that the Mill QAM requires documentation of chemical and physical test reports, and it documents heat numbers in numerical sequence, final heat chemistry, billet length, billet count, signature/initials of the QC technician making the final chemical analysis and the date heat was tapped. Upon rolling of the heat, the rolling mill records the identification number (if different from the melt shop number), bar size, grade rolled, physical test results, the appropriate melt shop heat number, other information as appropriate, and the signature/initials of the QC technician performing the test. Mill QAM Step 6.4.2.2 states that "no shipments of safety related steel will be made without the proper Chemical and Physical Test Reports."

The NRC inspection team reviewed 23 chemical and physical test reports and found seven shipments that were for Shaw POs sent to Vogtle Units 3 and 4 and V.C. Summer Units 2 and 3. The shipments must meet ASTM A706/A706M-01, Section 6.5, "Product Check," where finished bars must meet maximum percent specifications for carbon (0.33 percent) magnesium (1.56 percent), phosphorus (0.043 percent), sulfur (0.053 percent) and silicon (0.55 percent). The NRC inspection team found that the chemical test data in third party Stork-Herron Testing Laboratories test reports met the limits described in ASTM A706/A706M-01, Section 6.5.

The NRC inspection team also found that chemical and physical test reports for another nine nuclear orders were identified as nonsafety-related but still met ASTM A615 and ASTM A706/A706M. The NRC inspection team also reviewed a number of chemical and physical test reports for rebar delivered to Oconee. The reports contained information related to heat identifications (IDs) with chemical composition of rebar for carbon, magnesium, phosphorous, sulfur, silicon, copper, nickel, chromium, molybdenum, and vanadium. A material test report with a certification of inspection was also provided. The specifications for chemical composition must meet ASTM A615 or ASTM A706/A706M. The NRC inspection team also reviewed mechanical test data for tensile strength, yield strength, elongation, and bend test results. The specifications for mechanical properties must meet ASTM A615 and ASTM A706/A706M. No inspection findings related to GERDAU test control activities were identified.

c. Conclusions

The NRC inspection team concluded that GERDAU implementation of inspection activities for steel and rebar were consistent with the inspection requirements in Criterion X in Appendix B to 10 CFR Part 50. The NRC inspection team also concluded that seven Shaw safety-related nuclear shipments to Vogtle Units 3 and 4 and V.C. Summer Units 2 and 3 and nine nuclear nonsafety-related shipments were consistent with the test controls requirements in Criterion XI in Appendix B to 10 CFR Part 50 and ASTM A706/A706M. Based on its review, the NRC inspection team determined that GERDAU is effectively implementing its policy and procedures in support of inspections and test control. No findings of significance were identified.

10. Control of Measuring and Test Equipment

a. Inspection Scope

The NRC inspection team reviewed the GERDAU QAM and procedures that govern GERDAU's controls for MTE. The NRC inspection team also reviewed calibration data for end and thread gauges to verify compliance with calibration requirements in NQA-1, Basic Requirement 12, and Criterion XII in Appendix B to 10 CFR Part 50.

Specifically, the NRC inspection team reviewed the following GERDAU procedures, audits, and supporting documentation:

- GERDAU Corporate QAM, Quality Assurance/Control Program for the Manufacture and Fabrication of Steel Products, Revision 26, dated July 15, 2011
- GERDAU FQAM, Quality Assurance/Control Program for Fabrication of Steel Products, Revision 17, dated July 15, 2011
- GERDAU Mill QAM, Steel Mill Group, Quality Assurance/Control Program, Revision 26, dated July 15, 2011
- GERDAU Routine Procedure 3112600-RP-005-01, "Procedure for Lenton Threading," dated June 10, 2011
- GERDAU Routine Procedure 3112600-RP-009-01, "Procedure for the Control of Measuring and Test Equipment," dated June 10, 2011
- INSTRON Calibration Laboratory, Certification of Calibration, Certificate Number 018032510103353, dated March 25, 2010
- INSTRON Calibration Laboratory, Certification of Calibration, Certificate Number 018032411090556, dated March 24, 2011
- INSTRON Calibration Laboratory, Certification of Calibration, Certificate Number 018032510122341, dated March 25, 2010
- INSTRON Calibration Laboratory, Certification of Calibration, Certificate Number 018032411103311, dated March 24, 2011

b. Observations and Findings

b.1 End and Thread Gauge Compliance with NQA-1, Basic Requirement 12

Before July 2011, Lenton gauges were not calibrated. GERDAU uses Lenton end and thread gauges (go/no go gauge) to evaluate the acceptability of fabricated threads on safety-related rebar. The thread gauge must meet NQA-1, Basic Requirement 12, for calibration and training for GERDAU staff using this device. The NRC inspection team reviewed GERDAU Routine Procedure 3112600-RP-005-00, "Procedure for Lenton Threading," and GERDAU Routine Procedure 3112600-RP-009-01, "Procedure for the Control of Measuring and Test Equipment." GERDAU QC personnel recently updated these procedures to train and qualify GERDAU personnel to control and calibrate Lenton end and thread gauges for measuring rebar thread in the field. GERDAU QC personnel calibrate, adjust, and maintain end and thread gauges at prescribed intervals. The gauge instrument accuracy is checked using a known NIST traceable standard. The NRC inspection team reviewed the following end and thread gauges in the Master Log:

- End Gauges: BEG0002, BEG0018, BEG0019, BEG0020 BEG0021, BEG0023, BEG0033, BEG0034, BEG0035, BEG0036, BEG0011, BEG0014, BEG0015 and BEG0016

- Thread Gauges: ELM0001, ELM0003, ELM0004, ELM0005, ELM0006, ELM0007, ELM0008, ELM0040

The NRC inspection team found that all end and thread gauges are calibrated annually with calibration due dates between April 25 and June 1, 2012. The NRC inspection team found no gauges past their calibration due dates. The NRC inspection team also found that Micro Laboratories provides calibration services for MTE equipment. The NRC inspection team found that Micro Laboratories is an approved supplier of calibration services with A2LA accreditation received on January 8, 2009. GERDAU Routine Procedure 3112600-RP-005-00, Section 4.2, "Checking LENTON Threads," states "Bars with thread that do not conform to the inspection requirements shall be tagged as nonconforming and placed on hold. After checking threads, the QC inspector will verify that all threaded ends have caps installed."

While GERDAU staff threaded rebar in the GERDAU Fabrication Shop, the NRC inspection team observed a GERDAU thread machine operator, a Shaw QA inspector, and a GERDAU QC inspector use end gauge BEG0011 and thread gauge ELM008 in the field. The GERDAU thread machine operator performs a 100-percent check of all rebar being threaded in the thread machine. The NRC inspection team also observed a Shaw QA inspector and a GERDAU QC inspector perform a 10-percent independent sample at the front and back end of production of rebar being shipped to V.C. Summer Unit 2 (Cooling Tower) to ensure that all rebar thread met specifications before shipment. The NRC inspection team verified that GERDAU staff used an end and thread gauge with calibration tags within calibration due dates. The two gauges met the calibrations requirements in NQA-1, Basic Requirement 12, and Criterion XII in Appendix B to 10 CFR Part 50. No inspection findings related to the calibration of gauges were identified.

b.2 Calibration of Tensile Test and Spectrometer Test Devices at the GERDAU MILL

The NRC inspection team checked calibrations and the calibration logs for 2010 and 2011 for tensile tests and spectrograph devices used on the GERDAU MILL quality control laboratory. The NRC inspection team found the following laboratory tools in the calibration log and in the field at the tensile test station:

- tensile machine
- five micrometers (0–1, 1–2, 2–3 inch)
- depth gauge
- elongation gauge
- 15-inch steel scale
- 8-inch steel scale
- 1/10-inch ruler
- electronic scale

In Mill QAM, Section 7.2, "Purchased Services," states "the tensile testing machine and electronic recorder shall be verified by a calibration service outlined by ASTM Methods E4, Verification of Testing Machines. The extensometer and electronic recorder shall be verified by a calibration service as outlined by ASTM Method E83, Verification and Classification of Extensometers. The calibration service shall provide a certificate attesting to the calibration of the test equipment. The calibration service shall also provide documentary evidence that the equipment which is used for verification is traceable to an accepted nationally recognized standard." The NRC inspection team reviewed certificates of calibration for calibration equipment used in the GERDAU Mill QC laboratory for the following instruments and devices:

- Starret Weber VLD 17 gauge blocks
- INSTRON Transducer ID: 600KLB/1037—Calibration Type—Force—ASTM E4
- NSTRON Transducer ID: 600HVLC1037—Calibration Type—Force—ASTM E4
- INSTRON Extensometer Strain Transducer ID: T3M/I454—Calibration Type—Strain—ASTM E83

The NRC inspection team found that the transducers met the ASTM E4 and E83 calibration standards. The NRC inspection team also found that measuring devices used in the tensile machine, spectrometer, extensometer, gauges, and scales were calibrated within accuracy limits, scheduled calibration due dates were established, and actual calibration measurements were posted in the log book. The NRC inspection team found that no devices were past their calibration due dates or had been segregated due to being out of tolerance. The NRC inspection team also found that calibrated devices are compared to calibration standards traceable to NIST standards. No inspection findings related to control of MTE were identified.

c. Conclusions

The NRC inspection team concluded that the GERDAU process and procedures for control of MTE were consistent with NQA-1, Basic Requirement 12, and Criterion XII in Appendix B to 10 CFR Part 50. Based on its review, the NRC inspection team determined that the measuring devices used at the GERDAU Mill QC testing shop (i.e., extensometers, gauges, micrometers, scales, and transducers) and end/thread gauges used at the GERDAU fabrication shop meet the GERDAU process and procedures for control of MTE. No findings of significance were identified.

11. Handling, Storage, and Shipping Program

a. Inspection Scope

The NRC inspection team reviewed the GERDAU QAM and FQAM as well as implementing procedures that govern the fabrication facility's measures to control the handling, storage, shipping, cleaning, and preservation of material and equipment to prevent damage or deterioration to verify compliance with Criterion XIII in Appendix B to 10 CFR Part 50. Additionally, the NRC inspection team conducted interviews and

reviewed material receipt logs and internal inspection plans. Further, the NRC inspection team inspected the fabrication facility and mill storage areas and observed marking, labeling, and shipping procedures.

Specifically, the NRC inspection team reviewed the following GERDAU policies, procedures, and supporting documentation:

- GERDAU Corporate QAM, Quality Assurance/Control Program for the Manufacture and Fabrication of Steel Products, Revision 26, dated July 15, 2011
- GERDAU Reinforcing Steel, "QC Internal Work Procedures for the Fabrication of Deformed and Plain Billet Steel Bars," Revision 11, dated June 10, 2011
- GERDAU FQAM, Quality Assurance/Control Program for Fabrication of Steel Products, Revision 17, dated July 15, 2011
- GERDAU Mill QAM, Steel Mill Group, Quality Assurance/Control Program, Revision 26, dated July 15, 2011
- "Shaw Audit of GERDAU Reinforcing Steel," dated May 6, 2011
- "GERDAU Reinforcing Steel response to Shaw Audit," dated June 10, 2011
- GERDAU Reinforcing Steel Material Receipt Log for calendar year 2011

b. Observation and Findings

The NRC inspection team reviewed the GERDAU QAM, GERDAU FQAM, and QA implementing procedures. Personnel responsible for receipt inspections were interviewed and material receipt logs were inspected. Material receipt logs accurately reflected received materials. Additionally, inspections of shipping and tagging were conducted with no deficiencies noted.

The NRC inspection team determined that GERDAU Reinforcing Steel does not purchase any rebar from entities outside GERDAU mills. Therefore, to better understand interdependent procedures between GERDAU fabrication and mill facilities, the GERDAU steel mill in Charlotte was also visited. This mill is considered representative of the 19 GERDAU mills in North America and is one of four mills that normally supply safety-related rebar to the Charlotte Fabrication Facility.

The NRC inspection team inspected the entire Charlotte mill process from scrap receiving to final bar bundling for shipment. The inspection included observing handling, storage, and shipping. Storage of steel billet purchased by Shaw to produce rebar for the Vogtle and V.C. Summer plants was specifically inspected. Additionally, mill QA implementing procedures were reviewed.

A recent external audit identified the outside storage of safety-related coiled rebar as a concern, as the rebar was stored in contact with the ground (and in some cases sunk into the ground), which could promote deterioration of the product. Subsequent to that audit, GERDAU poured a new concrete laydown pad for segregated storage of safety-related coiled rebar. In the response to the external audit, GERDAU committed to inspecting that safety-related rebar storage at least quarterly. However, the FQAM only commits to inspections "periodically." Further, it was noted that this audit finding was never entered into the CAP to ensure tracking and correction. Consequently, although personnel stated that storage inspections are being performed, there is no clear

documentation to support that claim. The failure to enter external audit issues into the CAP is addressed separately in Section 13, "Corrective Actions," of this report.

Despite the fact that storage inspections were not clearly documented, the NRC inspected areas that support handling, storage, and shipping sufficiently prevent damage and deterioration of materials and equipment.

c. Conclusions

The NRC inspection team concluded that the GERDAU program for handling, storage, and shipping was consistent with the requirements of Criterion XIII in Appendix B to 10 CFR Part 50. Based on its review, the NRC inspection team determined that GERDAU is effectively implementing the procedures for handling, storage, and shipping. No findings of significance were identified.

12. Control of Nonconforming Materials, Parts, or Components

a. Inspection Scope

The NRC inspection team reviewed the GERDAU QAM, GERDAU FQAM, and the procedure associated with nonconformances. The NRC inspection team reviewed how customer complaints are handled to ensure the complaints that involved nonconformances or conditions adverse to quality were properly put into the nonconformance or corrective action processes. The NRC inspection team also reviewed the nine 2011 nonconformances (there were none for 2010). The NRC inspection team reviewed the list of customer complaints related to the fabrication facility from 2010 and 2011. The NRC inspection team reviewed three customer complaints related to nuclear work. The NRC inspection team interviewed the QA Manager and one QC Inspector about the nonconformance process, and the acting Production Scheduler, QA Manager, and Shop Superintendent about the customer complaint process.

Specifically, the NRC inspection team reviewed the following GERDAU policies, procedures, CARs, and supporting documentation:

- GERDAU Corporate QAM, Quality Assurance/Control Program for the Manufacture and Fabrication of Steel Products, Revision 26, dated July 15, 2011
- GERDAU FQAM, Quality Assurance/Control Program for Fabrication of Steel Products, Revision 17, dated July 15, 2011
- GERDAU Routine Procedure 3112600-RP-008-00, "Non Conforming in Process Material Procedure," dated June 10, 2011
- GERDAU Routine Procedure 1000138-RP-006, "Failure Analysis Procedure," dated May 23, 2011
- GERDAU Charlotte Rebar Facility, Shaw Nonconformance Log 2011
- GERDAU Charlotte Rebar Facility Customer Complaint Log 2011
- GERDAU Corporate Corrective Action Log 2010
- GERDAU Corporate Corrective Action Log 2011
- GERDAU Charlotte Rebar Facility Corrective Action Log 2010
- GERDAU Charlotte Rebar Facility Corrective Action Log 2011
- GERDAU Atlanta Mill Corrective Action Log 2009–2011
- GERDAU Charlotte Mill Corrective Action Log 2009–2011

- GERDAU Tennessee Mill Corrective Action Log 2009–2011
- GERDAU Corporate CAR No. CLT 2010-3, dated April 12, 2010
- GERDAU Corporate CAR No. CLT 2011-4, dated March 28, 2011
- GERDAU Corporate CAR No. CLT 2011-8, dated May 9, 2011
- GERDAU Charlotte Rebar Fabrication CAR No. CLT 2010-1, dated March 2, 2010
- GERDAU Charlotte Rebar Fabrication CAR No. CLT 2010-2, dated March 2, 2010
- GERDAU Charlotte Rebar Fabrication CAR No. CLT 2010-3, dated March 2, 2010
- GERDAU Charlotte Rebar Fabrication CAR No. CLT 2010-4, dated April 22, 2010
- GERDAU Charlotte Rebar Fabrication CAR No. CLT 2010-5, dated May 5, 2010
- GERDAU Charlotte Rebar Fabrication CAR No. CLT 2010-6, dated May 13, 2010
- GERDAU Charlotte Rebar Fabrication CAR No. CLT 2010-7, dated May 13, 2010
- GERDAU Charlotte Rebar Fabrication CAR No. CLT 2010-8, dated May 17, 2010
- GERDAU Charlotte Rebar Fabrication CAR No. CLT 2011-1, dated February 18, 2011
- GERDAU Charlotte Rebar Fabrication CAR No. CLT 2011-2, dated March 25, 2011
- GERDAU Failure Analysis Report No. 67430, dated March 31, 2011

b. Observations and Findings

The NRC inspection team reviewed QAM Section 15, FQAM Section 15, and GERDAU Routine Procedure 3112600-RP-008-00. The GERDAU process for nonconformances applies to nuclear safety-related material. The NRC inspection team verified that the GERDAU processes and procedures implement an adequate program to assess and control nonconforming items, including the identification, documentation, segregation, evaluation, and disposition of these items. This process also properly applies the principles of accepted, rework, scrap, on-hold, or use-as-is and provides for the applicable justifications to be adequately supported and properly documented. The process ties to the CAP for significant conditions adverse to quality, and for shipped nonconforming items. The NRC inspection team notes that the CAP, in accordance with the QAM, is used for conditions adverse to quality as well as significant conditions adverse to quality. The NRC inspection team observes that the nonconformance procedure does not specify using the CAP for conditions adverse to quality, as required by the corrective action process and Criterion XVI in Appendix B to 10 CFR Part 50. This will be discussed further in Section 13, “Corrective Actions,” of this report. The procedure requires the QA manager to verify that 10 CFR Part 21 does not apply and approve the nonconforming item disposition. The form used for the nonconforming items has been recently revised to not document the 10 CFR Part 21 review. This was discussed further in the 10 CFR Part 21 section of this report. The process provides for documenting on the form the initiating inspector, the disposition approval, and QC Manager review. The procedure to implement the nonconformance process is new, and the NRC inspection team verified that all QC inspectors had training and the GERDAU personnel had familiarization training. The NRC inspection team verified through

interview that the QC inspectors know how to use the nonconformance process and place material on hold. The NRC inspection team confirmed that GERDAU currently did not have any material on hold.

The NRC inspection team observed that one nonconformance report involved a documentation problem on a shipped order and had a failure analysis being performed. This nonconformance report had been dispositioned on July 1, 2011, and was not in the CAP as required by the GERDAU procedure. The NRC inspection team addresses this further in Section 13, "Corrective Actions," of this report.

The NRC inspection team verified that the customer complaint process is being correctly tied to the corrective action process. Three of the customer complaints after 2009 involved nuclear orders, and the one that was a condition adverse to quality was properly entered into the CAP. None of the customer complaints met the requirements to be in the nonconformance process. The NRC inspection team verified through interviews that GERDAU does review the customer complaints for entrance into the nonconformance process.

c. Conclusions

The NRC inspection team concluded that the GERDAU program for the control of nonconforming materials, parts, or components were consistent with the requirements of Criterion XV in Appendix B to 10 CFR Part 50. Based on its review, the NRC inspection team determined that GERDAU is effectively implementing the policies and procedures for nonconforming material in accordance with GERDAU's QAM, FQAM, and applicable implementing procedure. One nonconformance that was shipped is included in a nonconformance in Section 13, "Corrective Actions," of this report. No findings of significance were identified.

13. Corrective Actions

a. Inspection Scope

The NRC inspection team reviewed the GERDAU QAM, the GERDAU FQAM, and the GERDAU failure analysis procedure, which are the procedural guidance for the GERDAU CAP. The NRC inspection team reviewed how customer complaints are handled to ensure the complaints that involved conditions adverse to quality were properly put into the CAP. The NRC inspection team reviewed the corrective action logs from the GERDAU corporate office, the Charlotte Rebar Fabrication Facility, and the Charlotte, Tennessee and Atlanta mills. The NRC inspection team also reviewed the 13 CAR packages from 2010 and 2011 related to the GERDAU Charlotte Rebar Fabrication Facility. The NRC inspection team reviewed the list of customer complaints related to the fabrication facility from 2010 and 2011. The NRC inspection team reviewed the three customer complaints related to nuclear work. The NRC inspection team interviewed the QA Manager about the CAP, and the acting Production Scheduler, QA Manager, and Shop Superintendent about the customer complaint process. The NRC inspection team also reviewed the corrective action sections of the GERDAU Annual Review of the Quality Assurance/Control Program.

Specifically, the NRC inspection team reviewed the following GERDAU policies, procedures, CARs, and supporting documentation:

- GERDAU Corporate QAM, Quality Assurance/Control Program for the Manufacture and Fabrication of Steel Products, Revision 26, dated July 15, 2011
- GERDAU FQAM, Quality Assurance/Control Program for Fabrication of Steel Products, Revision 17, dated July 15, 2011
- GERDAU Routine Procedure 3112600-RP-008-00, "Non Conforming in Process Material Procedure," dated June 10, 2011
- GERDAU Routine Procedure 1000138-RP-006, "Failure Analysis Procedure," dated May 23, 2011
- GERDAU Charlotte Rebar Facility, Shaw Nonconformance Log 2011
- GERDAU Charlotte Rebar Facility Customer Complaint Log 2011
- GERDAU Corporate Corrective Action Log 2010
- GERDAU Corporate Corrective Action Log 2011
- GERDAU Charlotte Rebar Facility Corrective Action Log 2010
- GERDAU Charlotte Rebar Facility Corrective Action Log 2011
- GERDAU Atlanta Mill Corrective Action Log 2009–2011
- GERDAU Charlotte Mill Corrective Action Log 2009–2011
- GERDAU Tennessee Mill Corrective Action Log 2009–2011
- GERDAU Corporate CAR No. CLT 2010-3, dated April 12, 2010
- GERDAU Corporate CAR No. CLT 2011-4, dated March 28, 2011
- GERDAU Corporate CAR No. CLT 2011-8, dated May 9, 2011
- GERDAU Charlotte Rebar Fabrication CAR No. CLT 2010-1, dated March 2, 2010
- GERDAU Charlotte Rebar Fabrication CAR No. CLT 2010-2, dated March 2, 2010
- GERDAU Charlotte Rebar Fabrication CAR No. CLT 2010-3, dated March 2, 2010
- GERDAU Charlotte Rebar Fabrication CAR No. CLT 2010-4, dated April 22, 2010
- GERDAU Charlotte Rebar Fabrication CAR No. CLT 2010-5, dated May 5, 2010
- GERDAU Charlotte Rebar Fabrication CAR No. CLT 2010-6, dated May 13. 2010
- GERDAU Charlotte Rebar Fabrication CAR No. CLT 2010-7, dated May 13, 2010
- GERDAU Charlotte Rebar Fabrication CAR No. CLT 2010-8, dated May 17, 2010
- GERDAU Charlotte Rebar Fabrication CAR No. CLT 2011-1, dated February 18, 2011
- GERDAU Charlotte Rebar Fabrication CAR No. CLT 2011-2, dated March 25/11
- GERDAU Failure Analysis Report No. 67430, dated March 31, 2011
- GERDAU Annual Review of the Quality Assurance/Control Program for 2010

b. Observations and Findings

The NRC inspection team observed that the GERDAU CAP is implemented through the GERDAU QAM, with no separate implementing procedure for corrective action, although there is a separate procedure to perform a failure analysis. QAM 16.1.3 requires a failure analysis to be performed for all significant condition adverse to quality CARs on nuclear orders. The manual includes a form, QAM 21, which is used by GERDAU

facilities (each facility process is separate) for documenting items in the CAP. The NRC inspection team verified that the CAP provides an effective interface to GERDAU's 10 CFR Part 21 program. The GERDAU CAP provides a program to assess and correct conditions adverse to quality, including the identification, documentation, and disposition of corrective action items, to include a description, cause, current status, and corrective actions taken to prevent recurrence. The GERDAU CAP does not require identification or documentation if an issue identified in a CAR is a condition adverse to quality or a significant condition adverse to quality. This is an observation.

The NRC inspection team observed that there is no specific requirement in the GERDAU CAP to identify if an issue is a repeat of a significant condition adverse to quality. For significant condition adverse to quality CARs on nuclear orders, there is a requirement to perform a failure analysis, but there is no requirement in the failure analysis procedure, 1000138-RP-006 to identify if an issue is a repeat issue. The NRC Inspection Team observed that for all the CARs reviewed it was not documented if the issue was a significant condition adverse to quality and it was not documented if the issue was a repeat of a significant condition adverse to quality. The NRC considers determination if a significant condition adverse to quality is a repeat occurrence is required for implementation of Criterion XVI in Appendix B to 10 CFR Part 50. This issue is one example of not adequately establishing measures to ensure full compliance with Criterion XVI in Appendix B to 10 CFR Part 50.

The NRC inspection team observed that there is no requirement in the GERDAU CAP to perform a review of trends for conditions adverse to quality. NQA 1, Nonmandatory Appendix 16A-1, "Guidance on Corrective Action," section 301, "Identification and Documentation," in part states," Conditions adverse to quality should be reviewed to determine the existence of trends." The NRC inspection team reviewed an annual management review of the Quality Assurance/Control Program, which included a review of the items in the CAP. This management review is required by the GERDAU QAM Section 2.6. Not clearly documenting a review of corrective action for the existence of trends is an observation.

The NRC inspection team observed that internal audit quality deficiencies are not required to be entered into the CAP. For internal audits, QAM Section 18.8.2.5 states, "The auditor shall document the identified quality deficiency and, if necessary, a Corrective Action Request (refer to 16.1 and 16.3) will be generated." Review of the GERDAU Charlotte Fabrication Facility and the GERDAU corporate corrective action logs for 2010 and 2011 shows that not all internal audit quality deficiencies are being entered into the CAP. Audit quality deficiencies against any of the criteria in Appendix B to 10 CFR Part 50, against any of the procurement requirements for nuclear orders, or affecting the quality of nuclear orders, are conditions adverse to quality and should be entered into the CAP in accordance with QAM Section 16.1.2. This issue is identified as another example of not adequately establishing measures to ensure full compliance with Criterion XVI in Appendix B to 10 CFR Part 50.

The NRC inspection team noted that there is no direction in the GERDAU Corporate QAM for external audit quality deficiencies. A recent external audit identified the outside storage of safety-related coiled rebar as a concern. GERDAU took corrective action and established a concrete laydown pad for segregated storage of safety-related coiled rebar. In the response to the external audit, GERDAU committed to inspecting that safety-related rebar storage at least quarterly. However, Revision 17 to the FQAM only

commits to inspections “periodically.” This audit quality deficiency was not entered into the CAP to ensure tracking and correction. Audit quality deficiencies against any of the criteria in Appendix B to 10 CFR Part 50, against any of the procurement requirements for nuclear orders, or affecting the quality of nuclear orders are conditions adverse to quality and should be entered into the CAP in accordance with QAM Section 16.1.2. This issue is identified as another example of not adequately establishing measures to ensure full compliance with Criterion XVI in Appendix B to 10 CFR Part 50.

In accordance with GERDAU QAM Section 15.3, “Externally Shipped Nonconforming Materials,” and FQAM Section 15.5, “Externally Shipped Nonconforming Materials,” direct use of QAM Section 16.5, “Corrective Action—Externally Shipped Nonconformance (10 CFR Part 21),” for a nonconformance on a shipped order. GERDAU QAM Section 16.5 requires a 10 CFR Part 21 review to be performed. The decision to perform a 10 CFR Part 21 review is documented on Corrective Action Form QAM 21 and not on the Nonconforming Form FQAM 19. Implicit in this program logic is that externally shipped nonconformances should be handled under the CAP. The NRC inspection team observed that one nonconformance report involved a documentation problem on a shipped order: the item was dispositioned on July 1, 2011, a failure analysis is being performed, and this item was not in the CAP. The QA Manager indicated that this particular issue was still open and would be entered into the CAP. Criterion XVI in Appendix B to 10 CFR Part 50 requires the prompt identification of conditions adverse to quality. This issue is identified as another example of not adequately establishing measures to ensure full compliance with Criterion XVI in Appendix B to 10 CFR Part 50.

The NRC inspection team identified that internal audits of Beaumont Mill (2011), Knoxville Mill (2011 and 2010), and Charlotte Mill (2010), which all produce products for nuclear work, all had findings of the mills missing ASTM requirements (sometimes the same requirement at different mills). Most of these particular findings were in each mill’s CAP but not in the CAP for the Charlotte Rebar Facility (which runs all GERDAU audits except the corporate-run audit of Charlotte Rebar Facility). The repetitive findings constitute a quality deficiency trend, which the NRC inspection team considers a condition adverse to quality. When discussed with the GERDAU QC Manager, he agreed that it should be considered a condition adverse to quality. This condition adverse to quality (negative trend) has not been identified in the CAP as required by QAM Section 16.1.2. This issue is identified as another example of not adequately establishing measures to ensure full compliance with Criterion XVI in Appendix B to 10 CFR Part 50. The NRC inspection team observes that a contributor to this may be the separation of the CAP by facility.

The NRC inspection team observed that a 2011 internal audit of the Charlotte Fabrication Facility identified a finding with keeping the nuclear log book up to date. This was a repeat finding from a previous internal audit. Both this finding and the previous finding were entered into the GERDAU CAP at the corporate level, not at the Charlotte Fabrication Facility. The NRC inspection team observed that the placement of this CAR in the corporate CAP may have contributed to not effectively resolving the problem the first time. The NRC inspection team observed that the separation of the GERDAU CAP by facility may decrease the effectiveness of the GERDAU CAP.

The NRC Inspection team found that GERDAU has not effectively implemented Criterion XVI in Appendix B to 10 CFR Part 50, which in part states, “Measures shall be

established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and nonconformances are promptly identified and corrected. In the case of significant conditions adverse to quality, the measures shall assure that the cause of the condition is determined and corrective action taken to prevent recurrence." Specifically, as noted above, some conditions adverse to quality were not identified in the CAP, and there is inadequate guidance to ensure that significant conditions adverse to quality are not recurring, as required by QAM Section 16. The GERDAU procedure guidance currently in place is not adequate to establish measures to ensure full compliance with Criterion XVI in Appendix B to 10 CFR Part 50. This issue has been identified as Nonconformance 99901407/2011-201-03.

c. Conclusions

The NRC inspection team identified Nonconformance 99901407/2011-201-03 associated with GERDAU's failure to implement the requirements of Criterion XVI,in Appendix B to 10 CFR Part 50. Specifically, GERDAU procedural guidance currently in place is not adequate to establish measures to ensure conditions adverse to quality are identified in the CAP and to ensure that significant conditions adverse to quality are not recurring.

14. Quality Assurance Records

a. Inspection Scope

The NRC inspection team reviewed the GERDAU Corporate QAM, FQAM, the mill QAM, and implementing procedures that ensure sufficient records are maintained to furnish evidence of activities affecting quality in accordance with Criterion XVII in Appendix B to 10 CFR Part 50. Additionally, the NRC inspection team conducted interviews and observed QA records retrieval and archiving activities and verified corrective actions from a recent external audit.

Specifically, the NRC inspection team reviewed the following GERDAU policies, procedures, and supporting documentation:

- GERDAU Corporate QAM, Quality Assurance/Quality Control Program for the Manufacture and Fabrication of Steel Products, Revision 26, dated July 15, 2011
- GERDAU Reinforcing Steel, "QC Internal Work Procedures for the Fabrication of Deformed and Plain Billet Steel Bars," Revision 11, dated June 10, 2011
- GERDAU FQAM, Quality Assurance/Control Program for the Fabrication of Steel Products, Revision 17, dated July 15, 2011
- GERDAU Mill QAM, Steel Mill Group Quality Assurance/Control Program," Revision 26, dated July 15, 2011
- "Shaw Audit of GERDAU Reinforcing Steel," dated May 6, 2011
- "GERDAU Reinforcing Steel Response to Shaw Audit," dated June 10, 2011

b. Observation and Findings

The NRC inspection team reviewed the salient QAMs and implementing procedures to verify their efficacy. It was noted that, following a recent external audit, each of these

documents had been updated to be consistent with commitments. It was particularly noted that the GERDAU retention requirements in the implementing procedure were now consistent with NRC Regulatory Guide 1.28, "Quality Assurance Program Criteria (Design and Construction)."

The NRC inspection team identified that GERDAU has migrated to digital QA recordkeeping. All QA record documents are being maintained acceptably on a local server. Additionally, all digital QA documents are also being archived to an offsite server as a further measure of security. Rapid retrieval of archived data was demonstrated for the NRC inspection team.

Following the recent external audit, the NRC inspection team verified that GERDAU also implemented a procedure to establish unique control numbers, specifications, heat numbers, and other characteristics on nonconforming material reports.

c. Conclusions

The NRC inspection team concluded that the GERDAU program for QA records was consistent with the requirements of Criterion XVII in Appendix B to 10 CFR Part 50. Based on its review, the NRC inspection team determined that GERDAU is effectively implementing the procedures for QA records. No findings of significance were identified.

15. Internal and External Audits

a. Inspection Scope

The NRC inspection team reviewed the GERDAU policies and procedures for external and internal audits to verify compliance with Criterion VII and Criterion XVIII in Appendix B to 10 CFR Part 50. The NRC inspection team reviewed 17 internal audits conducted in 2010 and 2011. The audits included both audits of various GERDAU milling and fabrication facilities. The NRC inspection team also reviewed the only external vendor audit conducted by GERDAU (Audit #16011 of ERICO), a supplier of rebar couplers.

Specifically, the NRC inspection team reviewed the following GERDAU policies, procedures, audits, and supporting documentation:

- GERDAU Corporate QAM, Quality Assurance/Control Program for the Manufacture and Fabrication of Steel Products, Revision 26, dated July 15, 2011
- GERDAU FQAM, Quality Assurance/Control Program for Fabrication of Steel Products, Revision 17, dated July 15, 2011
- GERDAU Mill QAM, Steel Mill Group, Quality Assurance/Control Program, Revision 26, dated July 15, 2011
- GERDAU Blanket PO #ERICO-5677, Revision 0
- GERDAU Blanket PO #ERICO-5678, Revision 0
- GERDAU Blanket PO #ERICO-5678, Revision 1
- NIAC Audit Checklist for Audit CHR RF 2011
- NIAC Audit Checklist for Audit Jax RF 2011
- NIAC Audit Checklist for Audit ERICO Products Incorp. 2011

- GERDAU Internal Audit Report GERDAU Ameristeel Jacksonville, issued September 2010
- GERDAU Internal Audit Report GERDAU Ameristeel Atlanta Reinforcing, issued May 2011
- GERDAU Internal Audit Report GERDAU Ameristeel Knoxville Reinforcing, issued February 2011
- GERDAU Internal Audit Report GERDAU Ameristeel Knoxville Reinforcing, issued February 2010
- GERDAU Internal Audit Report GERDAU Ameristeel Atlanta Reinforcing, issued March 2010
- GERDAU Internal Audit Report GERDAU Ameristeel Charlotte Reinforcing, issued March 2010
- GERDAU Internal Audit Report GERDAU Ameristeel Corporate Office, issued September 2010
- GERDAU Internal Audit Report GERDAU Ameristeel Jackson Mill, issued September 2010
- GERDAU Internal Audit Report GERDAU Ameristeel Beaumont, issued February 2010
- GERDAU Internal Audit Report GERDAU Ameristeel St. Paul, issued December 2010
- GERDAU Internal Audit Report GERDAU Ameristeel Sterling Reinforcing, issued October 2010
- GERDAU Internal Audit Report GERDAU Ameristeel Jacksonville Reinforcing, issued June 2011
- GERDAU Internal Audit Report GERDAU Ameristeel Charlotte Reinforcing, issued April 2011
- GERDAU Internal Audit Report GERDAU Ameristeel Charlotte Mill, issued September 2010
- GERDAU Internal Audit Report GERDAU Ameristeel Knoxville Mill, issued September 2010
- GERDAU Internal Audit Report GERDAU Ameristeel Knoxville Mill, issued June 2011
- GERDAU Internal Audit Report GERDAU Ameristeel Beaumont Mill, issued April 2011
- GERDAU External Audit Report Supplier Audit Report, ERICO Products Inc., issued February 2011
- GERDAU Response to Shaw Audit V2011-06, Revision 1
- Duke Energy Supplier Verification Supplier Evaluation Report of GERDAU Ameristeel, issued April 2009
- Shaw Commercial Grade Survey Report of GERDAU Ameristeel, CGS-11-004, issued May 2011
- Steam Generating Team Audit Report #14111, of the GERDAU Charlotte Fabrication Facility, Revision 1, issued February 2009
- GERDAU Quality Control Internal Work Procedures for the Fabrication of Deformed and Plain Billet Steel Bars, Revision 11
- GERDAU Procedure for Inspections, Revision 4
- GERDAU Procedure for Inspections, Revision 5
- GERDAU Procedure for the Control of Procurement of Documents, draft document

- GERDAU Material Receiving Log, Form FQAM-20, Revision 16
- GERDAU Process Control Standard Procedure for Internal Audit, P82-2, Revision 4
- GERDAU Process Control Standard Procedure for Supplier Assessment, P74-1, Revision 2

b. Observations and Findings

The NRC inspection team verified that the audits met the requirements of 10 CFR Part 50, Appendix B, and NQA-1 Basic Requirement 18. The NRC inspection team verified that the audits were conducted in accordance with the FQAM and the Corporate QAM requirements contained in Section 18 of both manuals. The review noted that the audits included reviews of implementing procedures, in process records, interviews with personnel, and observations of materials and ongoing work at the facilities. For the vendor audit, the NRC inspection team noted that the audit verified that the ERICO QAM properly implemented the requirements in Appendix B to 10 CFR Part 50. The NRC inspection team also noted that audit results were properly documented and reported to and reviewed by responsible management, and the audit reports appropriately contained the audit description, identified the auditor, identified persons contacted, provided a summary of results, and provided a description of adverse conditions. The NRC inspection team confirmed that the audits were being conducted annually, as specified by the corporate QA program and that the audits were being performed by properly qualified personnel.

NQA-1 Basic Requirement 18, Supplement 18S-1, Section 5e, requires that each reported adverse finding be described in sufficient detail to enable corrective action to be taken by the audited organization. The NRC inspection team reviewed the audit findings documented in audit reports for the years 2010 and 2011, including external audit report 16011. The inspectors verified that all observations, findings, and recommendations were in sufficient detail to enable corrective actions to be taken by the audited organization. The NRC inspection team noted that the GERDAU Corporate QAM was recently revised to include definitions for what issues constituted observation, findings, and/or recommendations. The revision was considered to an improvement to the QAM by the NRC inspection team.

The NRC inspection team noted that the audit reports did not adequately document all of the necessary quality requirements to ensure that these requirements were included within the scope of the audit. The inspectors noted that the applicable ACI requirements and applicable ASTM requirements were not included as quality requirements and therefore did not ensure that these requirements would be verified during the audit. However; the NRC inspection team found that several audits identified problems with ASTM requirement implementation, so it appeared that these requirements were being audited. The NRC inspection team also identified (Section 3, “Design Control,” of report) where GERDAU Charlotte Mill failed to specify the test method on the Chemical and Physical Test Reports as required by ASTM A751, Section 13, and Mill QAM Section 11. Contrary to the requirements of Criterion XVIII in Appendix B to 10 CFR Part 50 and QAM Section 18.8.2, the GERDAU QA audits did not list or document necessary quality requirements contained in applicable ASTM and ACI codes. This issue has been identified as Nonconformance 99901407/2011-201-04.

The NRC inspection team noted that the audits were conducted using the NIAC Audit Checklist. Three selected completed checklists were reviewed and found to meet requirements for documenting the criteria to be inspected and the results of the review. However, the NRC inspection team observed that, in many cases, the checklists did not document or provide any reference to the basis document that was used/reviewed/evaluated to conclude that the inspected criteria were acceptable. For example, the NIAC checklist stated, "Verify that nonconforming items are reviewed and dispositoned such that closeout is adequate." The results were listed as "Satisfactory." However; the assessment/summary only stated that "Closeout is adequate," without any reference to those documents reviewed to verify this attribute. Discussions with GERDAU QA personnel indicated that the issue had previously been identified and that future audits would include objective evidence, along with detailed narrative to support the assessment summary. The lack of clear documentation or reference to basis documents was considered to be an observation.

c. Conclusions

The NRC inspection team identified Nonconformance 99901407/2011-201-04 associated with GERDAU's failure to implement the requirements of Criterion XVIII in Appendix B to 10 CFR Part 50. Specifically, GERDAU internal audits did not list applicable ASTM and ACI codes in the audit checklist and the audits conducted failed to identify where GERDAU Charlotte Mill failed to specify the test method on the chemical and physical test reports, as required by ASTM A751, Section 13.

16. Entrance and Exit Meetings

On August 1, 2011, the NRC inspection team discussed the scope of the inspection with Mr. Walter Lee Knox, GERDAU QA Manager, and Mr. Bob Grich, GERDAU Director, Nuclear Construction Solutions. On August 4, 2011, the NRC inspection team presented the inspection results and observations during an exit meeting with Mr. Bob Grich, GERDAU Director, Nuclear Construction Solutions, and GERDAU's management and staff. Lists of entrance and exit meeting attendees are listed in the attachment to this report.

ATTACHMENT 1

1. ENTRANCE/EXIT MEETING ATTENDEES

Name	Title	Affiliation	Entrance	Exit	Interviewed
Bob Grich	Director, Nuclear Construction Solutions	GERDAU	X	X	X
Walter Lee Knox	QA Manager/Lead Auditor	GERDAU	X	X	X
Gary Peters	Manager, Systems	GERDAU		X	X
Kerry Carrington	Manager, Metallurgical Services	GERDAU			X
Tom McDowell	Regional Production Manager/Shop Superintendent	GERDAU			X
Fred Clark	Engineering Manager	GERDAU			X
Paul Than	Second Shift Supervisor/Production Scheduler	GERDAU			X
Brian Bowen	Management Systems Facilitor	GERDAU			X
Steven Fisher	QC Technician	GERDAU			X
Pat Robinson	Level II QC Inspector	GERDAU			X
Darryl Connelly	Level I QC Inspector	GERDAU			X
Randell Burton	Welder & Bending Machine Operator	GERDAU			X
Robert Falby	Senior Detailer	GERDAU			X
Hank Flaherty	Senior Detailer	GERDAU			X
Par Yang	Thread Machine Operator	GERDAU			X
Mark Ludewig	QA Inspector	Shaw			X
Don Blankenship	QA Inspector	Shaw			X
Fred Smith	QA Manager	Shaw		X	

2. INSPECTION PROCEDURES USED

Inspection Procedure 43002, “Routine Inspections of Nuclear Vendors”

Inspection Procedure 36100, “Inspection of 10 CFR Part 21 and 50.55(e) Programs for Reporting Defects and Nonconformance”

3. LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

The U.S. Nuclear Regulatory Commission has not previously conducted an inspection at GERDAU’s facility in Charlotte, NC.

The following items were found during this inspection:

Item Number	Status	Type	Description
99901407/2011-201-01	Open	NON	10 CFR Part 50, App. B, Criterion IV
99901407/2011-201-02	Open	NON	10 CFR Part 50, App. B, Criterion VI
99901407/2011-201-03	Open	NON	10 CFR Part 50, App. B, Criterion XVI
99901407/2011-201-04	Open	NON	10 CFR Part 50, App. B, Criterion XVIII

ENTRANCE MEETING

NAME	COMPANY / AGENCY	TITLE
FRANCIS TALBOT	NRC	REACTOR ENGINEER
BRENT CLARKE	NRC	REACTOR OPS ENG.
Joel Jenkins	NRC	Materials Eng.
John Bartleman	U.S. NRC	Sr. Construction Inspect
Bob Grich	GEDDAU	DIRECTOR NUCLEAR CONST.
LEE KNOX	GERDAU	QA MANAGER
Thomas Kendzia	NRC	Reactor Ops Eng.
Robert Pratt	NRC	Team Leader

Name	Title	Org
Joel Jenkins	Materials Eng	NRC/NRO
Lee Knox	QA MANAGER	Gerdau
Bob Grich	Nuclear Inspector	"
Gary Peters	Manager - Systems	"
John Bartleman	Sr. Construction Inspector	NRC/CCI
Frances X. Talbot	Reactor Engineer	NRC/NRO
BRENT CLARKE	REACTOR OPS ENGINEER	NRC
FRED SMITH	QA MANAGER	SHAW
TOM KENDZIA	REACTOR OPS ENGINEER	NRC
ROBERT PRATO	SR RX OPS ENGINEER	NRC