Brooke Army Medical Center: A Case Study of Field Welding and Welding Inspection Practices on Structural Steel Moment Connections

by

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ABSTRACT

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With the failures of field welds on moment connections of several structural steel moment frames observed during the 1994 Northridge earthquake, an interest has developed in examining the ability of present codes, welding practices and welding quality control practices to insure installation of field welds of a quality commensurate with the assumptions made in the structural design of the moment connections. This report is a case study of field welding and welding quality control practices on moment connections on a large medical facility constructed in San Antonio, Texas, under a contract administered by the U.S. Army Corps of Engineers. The paper will include 1) a general description of the project; (2) a description of the project participants and their contractual relationships with regard to weld installation and welding quality control; (3) a description of field welded moment connection details and the role of these connections in the structural system; (4) a review of contract requirements for the welding and inspection of moment connections; (5) an evaluation of the compliance with contract requirements for the field welding and welding inspection; (6) an analysis of data collected from the weld inspection reports and other submittals; (7) a discussion of observed problems and successes in the quality control of project field welding; and (8) a discussion of suggested practices to help mitigate the observed problems and reinforce the observed successes. The written records and data which this case study used are from the U.S Army Corps of Engineers' project files which were made available to the author. The author also draws on his personal observations from his involvement with the project and on interviews with project participants and other professionals in the steel erection/welding inspection industry.

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INTRODUCTION

With the failures of field welds on moment connections of several structural steel moment frames observed during the 1994 Northridge earthquake, an interest has developed in examining the ability of present codes, welding practices and welding quality control practices to insure installation of field welds of a quality commensurate with the assumptions made in the structural design of the moment connections. This report is a case study of welding and welding inspection practices observed during the field welding of moment connections in the construction of Brooke Army Medical Center, a large medical facility at Fort Sam Houston, in San Antonio, Texas.

This project was constructed under a contract administered on behalf of the Army by the U.S. Army Corps of Engineers, Fort Worth District. The Corps maintained a dedicated field office, known as the Brooke Resident Office, at the site to monitor construction which began in 1992. With approximately two months of structural steel erection work remaining, the author joined the Brooke Resident Office as Lead Quality Assurance (QA) Civil Engineer. His responsibilities included overseeing the Corps of Engineers' monitoring of contract civil, structural, and architectural work. He served as the leader of a team of QA Inspectors, including the QA Inspector assigned to monitor structural steel work and the field welding of moment connections. The Brooke Resident Office project files relating to field welding of structural steel, including contract drawings and specifications, visual and ultrasonic weld inspection reports, submitted field welder and inspector qualifications, and other contractor submittals, generously have been made available to the author. This information along with the author's first hand observations and the author's interviews with an erector, two welding inspectors, the project structural Engineer of Record, and the American Welding Society's Director of Certification provide the data on which this study is based.

The statistical information contained in this report is derived from analysis of the data contained in the project weld inspection reports. Selected information for each field welded moment connection joint, including inspector, welder, and dates and results of visual and ultrasonic inspection, was transcribed by the author from the original welding inspection reports and organized in a master summary table. This master summary table is included in its entirety in Table A1, Appendix A.

This report is divided into eight sections. The first is a general description of the project. The second is a description of the project participants and their contractual relationships. The third is a description of field welded moment connection details and the role of these connections in the structural system. The fourth is a review of contract requirements for the welding and inspection of moment connections. The fifth is an evaluation of the compliance with contract requirements of the field welding and welding inspection. The sixth is an analysis of data from the weld inspection reports. The seventh is a discussion of observed problems and successes in the quality control of project field welding. The eighth is a discussion of suggested practices to help mitigate the observed problems and reinforce the observed successes.

SECTION 1: PROJECT DESCRIPTION

The project is a replacement hospital for the existing Brooke Army Medical Center located on Fort Sam Houston in San Antonio, Texas, constructed under a contract administered by the U.S. Army Corps of Engineers, Fort Worth District. The building and structure were designed by Harwood K. Smith and Partners, of Dallas, Texas, a well-established, nationally recognized Architectural/Engineering (A/E) firm under a separte A/E design contract also administered by the Corps of Engineers. The General Contractor, steel Fabricator and steel Erector were all companies with a nationwide presence, experienced in large building construction, and were among the largest U.S. contractors in their respective categories. Approximately 1.4 million square feet of total floorspace was provided for a contract price of $234 million. Approximately 10,000 tons of structural steel and 75,600 cubic yards of concrete were used . The value of the structural steel contract was approximately $17 million. 918 field welded moment connections were used in the structural steel framing. The General Contractor planned to complete the project using a very aggressive 38 month schedule, 10 months less than the time alotted by the Corps of Engineers.

The contract included construction of the main facility, which consisted of three distinct functional and structural elements separated by 2" wide expansion joints (See Figure 1.1): a three-story outpatient clinic of rectangular plan, a five-story ancillary building of rectangular plan, and a seven-story nursing tower of V-shaped "open arms" plan. It also included construction of two detached structures, a two-story research building of U-shaped plan and a one-story ambulance garage of rectangular plan. The interstory height was 19 feet in order to accomodate a 7-foot high interstitial floor above each occupied floor. The interstital floor system was hung from the structural steel framing the floor above. The interstitial floors were provided to allow for easier installation of the vast amount of mechanical and electrical distribution equipment, for ease of retrofit, and to provide the opportunity to conduct maintenance and repair operations without disruption to hospital operations.

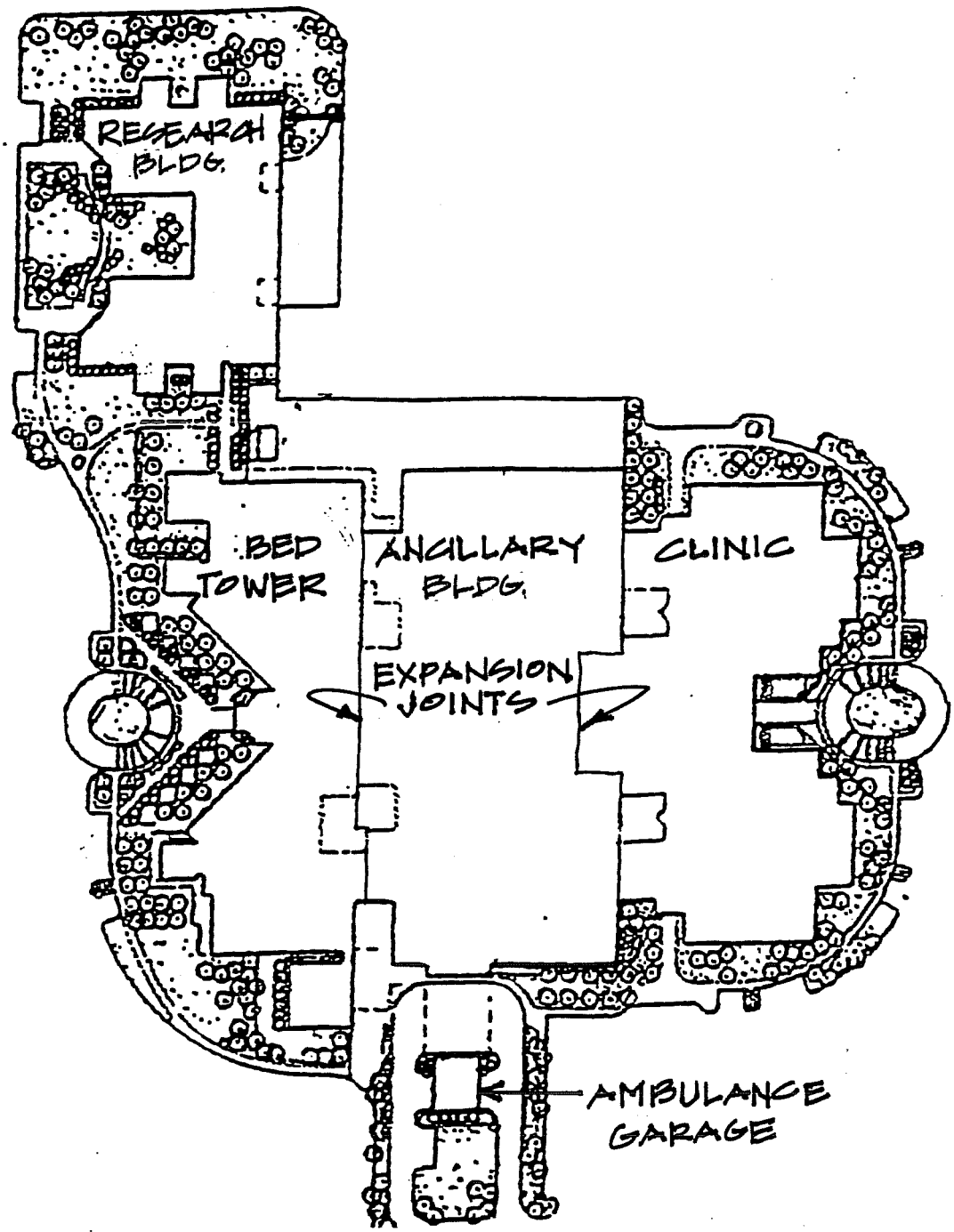


Figure 1.1: Descriptive Plan of Project

SECTION 2: CONTRACTUAL RELATIONSHIPS AND PROJECT PLAYERS

Overview of Contractual Organization of a Corps of Engineers' Project

This section begins by providing a brief background on how a typical building project involving the U.S. Army Corps of Engineers works. On behalf of a client agency who identifies the need for a particular project and provides funding for design and construction, the Corps of Engineers first develops a scope of work, solicits proposals for and selects an A/E firm for production of design, specifications and drawings. The selection of the A/E firm is competitive, based solely on the evaluated merits of the firms and their proposals. The Corps negotiates terms with the selected A/E firm and administers the design contract. Upon receipt of final plans and specifications, the Corps assembles a contract around the plans and specs and puts the job out for bid. Unlike many private sector contracts, the A/E has no say over which Contractor is awarded the job and the selection is solely on the basis of the lowest submitted bid which is verified as being responsive to all contract requirements. Again unlike private sector construction, the Corps of Engineers, not the A/E, administers the contract. In fact, after submission of final plans and specs, the A/E has no further active involvement in the project unless the Corps of Engineers has contracted with them for what are called Title II Services. These services include providing technical support and periodic site inspection and are typically included for large projects.

To insure that the General Contractor fulfills its responsibility to produce work conforming to the contract requirements the Corps of Engineers requires the General Contractor to develop and execute an adequate Quality Control (QC) Plan. This includes maintaining an adequate QC Staff, independent of the production side of the operation, the sole purpose of which is to insure on a daily basis that all work, including that done by subcontractors, is in accordance with requirements. To insure that its interests are protected and to give the General Contractor a tangible reason to maintain a good faith QC effort, the Corps of Engineers maintains a parallel Quality Assurance (QA) staff. The role of the QA staff is to monitor the work for compliance and insure that the QC Staff corrects any discovered nonconforming work. The intent is that the presence of government QA Inspectors creates the situation where the General Contractor will suffer a financial penalty in the form of tear-out and rework should he allow deficient work to be constructed. This presumably encourages the General Contractor to maintain an effective QC program and minimize deficient work. This system breaks down, of course, if the QA and QC inspection

is lax or if the QA inspector is not knowledgeable enough about contract requirements to know whether the Contractor is complying or not.

Project Participants

To monitor the construction of Brooke Army Medical Center the Corps of Engineers set up a dedicated field office, called the Brooke Resident Office, at the project site whose function was to provide QA inspection, to receive, review, and respond to contractor submittals and queries, to make progress payments, and to negotiate and execute contract modifications. At Brooke one Corps of Engineers QA inspector and one General Contractor QC inspector were assigned to monitor the structural steel work. For the remainder of this paper the Brooke Resident Office will be referred to as the Corps of Engineers.

For the Brooke Army Medical Center project a joint venture of two large, well-established General Contractors submitted the low bid and received the contract. Henceforth they shall be referred to as the General Contractor. The General Contractor in turn subcontracted all structural steel work to a large, well-established fabricator who shall henceforth be referred to as the Fabricator. The Fabricator in turn subcontracted the erection of the structural steel, including field welding, to a large, well-established erection company who shall henceforth be referred to as the Erector. To fulfill their contractual obligations for independent verification weld inspection, the General Contractor subcontracted with a large, well-established testing company who shall henceforth be referred to as the Testing Lab. The Testing Lab in turn subcontracted the actual inspection work to a small company who supplied three inspectors, all of whom were AWS Certified Welding Inspectors qualified to conduct visual inspection of welds and two of whom were ASNT Level II Ultrasonic Inspectors qualified to conduct ultrasonic inspection of welds. The two inspectors qualified for both visual and ultrasonic inspection will be referred to as Inspector #1 and Inspector #2 and the inspector qualified only for visual inspection will be referred to as Inspector #3. Inspector #1 served as the lead inspector, Inspector #2 served as a supplementary inspector, and Inspector #3 served as the primary visual inspector. This company shall be referred to henceforth as the Inspection Company. When referring to the Inspection Company in its specific role of providing visual inspection of welds the term VT Inspector may be used. When referring to the Inspection Company in its specific role of providing ultrasonic inspection of welds the term UT Inspector may be used. The Corps of Engineers had a contractual relationship only with the General Contractor and had no direct

control over nor privy of contract with the Fabricator, Erector, Testing Lab, or Inspection Company.

The U.S. Army Corps of Engineers' construction contracting is set up so that until they accept the final finished building from the General Contractor, the General Contractor is considered the "owner" of the project. Thus, code provisions which refer to the "owner" are in this case referring to the General Contractor. For the purposes of field welding, code provisions which refer to the "erector" or "welding contractor" or "contractor" are in this case referring to the Erector. For the purposes of field welding visual inspection, code provisions which refer to the "Inspector" are in this case referring to the Inspection Company in its role as VT Inspector and for the purposes of ultrasonic inspection of welds, code provisions which refer to "nondestructive testing personnel" or "ultrasonic testing personnel" are in this case referring to the Inspection Company in its role as UT Inspector.

SECTION 3: MOMENT CONNECTION DETAILS AND THEIR ROLE IN THE STRUCTURAL SYSTEM

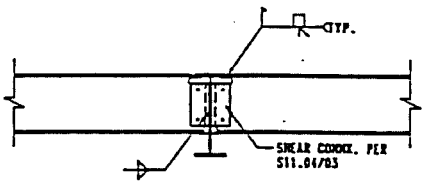
The structural Engineer of Record, who sealed the structural drawings for the project, indicated in an interview with the author that the structural system used composite concrete-on-metal-deck floor slabs on structural steel framing for gravity loads in all buildings. For the main facility concrete shearwalls were the lateral force resisting elements, except for the detached entry canopies which used moment frames. For the research building a combination of concrete shearwalls and steel moment frames utilizing field welded moment connections were used to resist lateral loads and for the ambulance garage steel moment frames utilizing field welded moment connections were the exclusive lateral load resisting elements. The building skin was a rather complicated multi-planar brick facade with both laid-in-place and precast panel elements which were supported by miscellaneous steel framing hung from the structural steel frame. The interstitial floors were of ultra-lightweight, low-density 300 psi compressive strength concrete on metal deck. The metal deck was supported by steel purlins which were supported by hanger rods attached to the structural steel above. A total of 918 field welded moment connections were used in the structural steel framing. The contract prescribed that all moment connection field welds would be both visually and ultrasonically inspected.

The Engineer of Record also indicated that field welded moment connections were used in the structure for four general purposes. Type 1 was a girder-to-column connection as part of a moment resisting frame. Type 2 was as a beam-to-girder connection opposite where small cantilevers supporting skin elements framed into the outboard side of a perimeter girder to prevent introduction of torsional stresses to the girder. Type 3 was as a girder-to-column connection opposite where a large load cantilever, typically picking up floor loads from the other side of a building expansion joint, framed into a column to counterbalance the effect of the cantilever and prevent introduction of excessive moment into the column. Type 4 was as a cantilever connection of cantilevered floor or spiral staircase support beams into column. The vast majority of moment connections were Type 2 and 3.

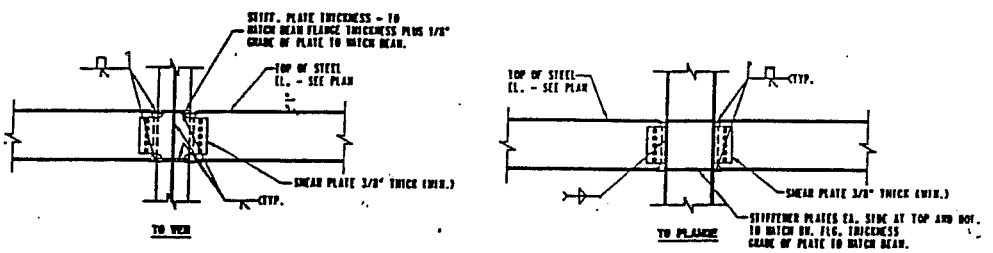
San Antonio, Texas, is in seismic zone 0, a region regarded as having negligible seismic risk so wind loading was the controlling factor in lateral force design (ASCE, 1990, 33). Despite the fact that seismic design played a small role in this project and that

moment-resisting frames were not the primary lateral force resisting system used in the project, this study is still relevant to the question of quality of moment connections for seismic applications since the large number of moment connections used in this project were subject to the same details, codes, construction practices, and level of inspection as would be expected for moment connections in a moment frame constructed in a higher-risk seismic zone.

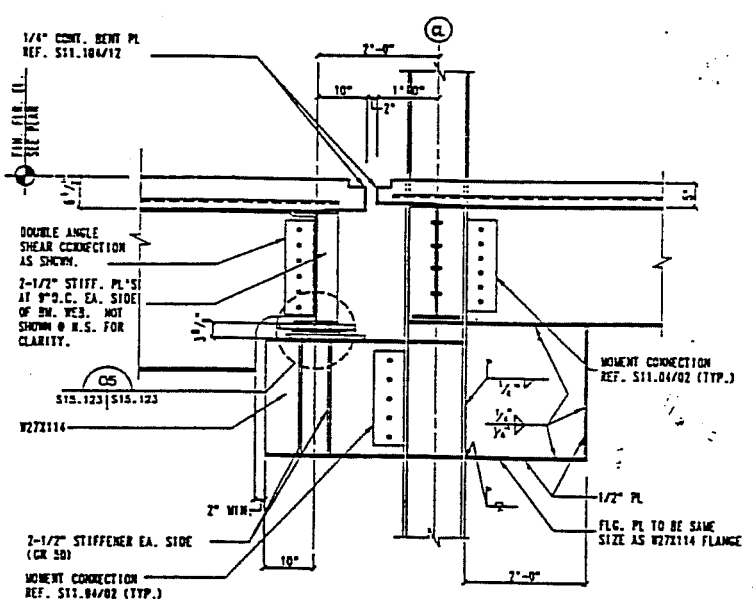
All field welded moment connections used the basic field-welded, field-bolted connection details shown in Figure 3.1, for beam-to-column and beam-to-beam connections. These details are in accordance with American Institute of Steel Construction (AISC) standard field-welded, field-bolted moment connections (AISC, 1989, *Manual of Steel Construction*, 4-106, 4-127 and 4-129). For all flange welds a full penetration single bevel groove weld with backing was specified. The typical field welded moment connection details in the Fabricator's shop drawings, shown in Figure 3.2, indicate that AISC/AWS prequalified joint details B-U4a, for butt joints at flange connections in beam-to-beam moment connections and beam-to-column-web moment connections, and TC-U4a, for T-joints at flange-to-web connections in beam-to-beam moment connections and flange connections in beam-to-column-flange moment connections, were used (AWS, 1992, *AWS D1.1*, Fig. 2.4). These prequalified joints use full penetration single bevel groove welds with backing. Weld access holes are cut at the top and bottom flanges of the beam to be welded so that backing can be placed under the flange joints and welding can be done from a position with the welder directly over the joint. This position is the easiest to weld from and is called the flat, or 1G, position (AWS, 1992, *AWS D1.1*, Fig. 5.3). The details in Figure 3.2 indicate that butt joints will be welded using a B-U4a-GF procedure specification and T-joints will be welded using a TC-U4a-GF procedure specification. A review of the Fabricator's welding procedure submittals from the Brooke Project Files shows that these procedures each use the Flux Cored Arc Welding (FCAW) process.



(a) Typical Beam-to-Beam Moment Connection



(b) Typical Beam-to-Column Moment Connection



(c) Typical Type 3 Application Detail at Expansion Joint

Figure 3.1: Typical Field-Welded Moment Connection Details

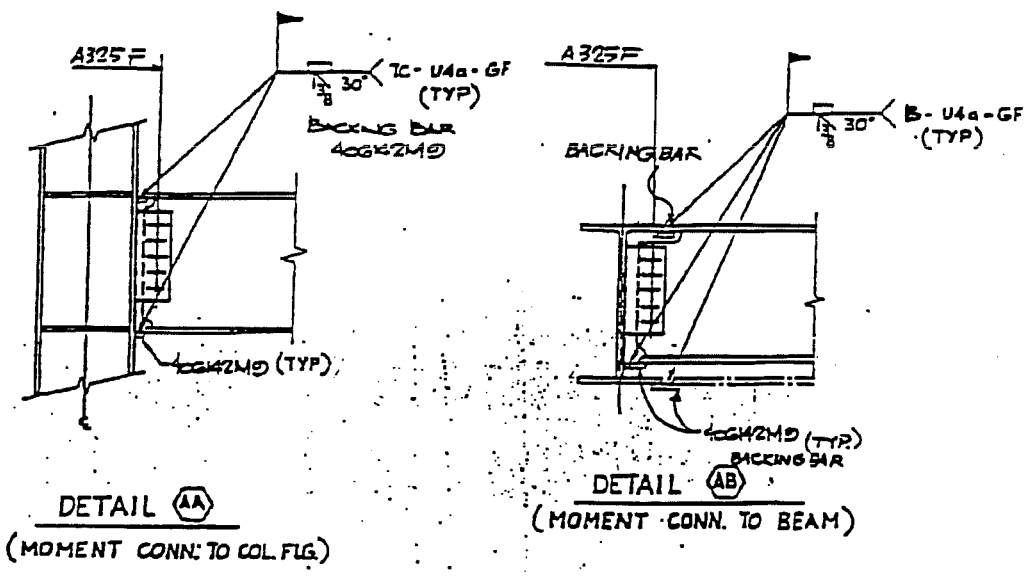


Figure 3.2: Moment Connection Details From Contractor's Shop Drawings

SECTION 4: REVIEW OF CONTRACT REQUIREMENTS

The contract requirements for field welding and inspection of field welding were included in the specifications, the codes incorporated within those specifications, and the drawings. Provisons for field welding were enumerated in contract specification sections "05120 - Structural Steel" and "05055 - Structural Welding" and in the General Structural Notes appearing at the beginning of the structural contract drawings. Provisons for inspection of field welding were enumerated in contract specification sections "05055 - Structural Welding" and "05061 - Ultrasonic Inspection of Weldments" and in the General Structural Notes. Henceforth , "05055 - Structural Welding" will be referenced as Spec 05055, "05061 - Ultrasonic Inspection of Weldments" will be referenced as Spec 05061, "05120 - Structural Steel" will be referenced as Spec 05120, and the General Structural Notes will be referenced as the General Notes. Copies of these three specification sections and the portion of the General Notes applicable to field welding and inspection of field welding are included in their entirety in Appendix E.

Contract Requirements for Field Welding of Moment Connections

The nine critical requirements applicable to field welding of moment connections are as indicated below.

1. **General Requirements** - Erection of the structural steel shall be in accordance with all applicable provisions of the American Institute of Steel Construction's (AISC) *Specification for Structural Steel Buildings: Allowable Stress Design and Plastic Design with Commentary (AISC-02)* and the welding will be in accordance with all applicable provisions of the American Welding Society's (AWS) *AWS D1.1 - 88: Structural Welding Code - Steel* (Spec 05120, para. 3.2 and para. 1.2). The General Notes also reference *AWS D1.1* as controlling all welded construction. Thus *AWS D1.1* is wholly incorporated within the contract. It is interesting to note that *AISC-02* also incorporates Sections 3, Workmanship, and 4, Technique, (and all referenced Sections therein) of *AWS D1.1* so that even if the specifier had failed to specifically incorporate *AWS D1.1* it would still have been a contract requirement by virtue of its inclusion in *AISC-02*, albeit a less obvious one (AISC, 1989, *AISC-02*, sec. M2.4).

2. **Submission of Certification of Welder Qualifications** - The General Contractor is required to submit to the Corps of Engineers certification that each welder is

qualified in accordance with the requirements of *AWS D1.1* (Spec 05120, para. 1.3). The information on which the General Contractor may base this certification would come from the Erector but it is the General Contractor who must assume responsibility for the certification. The certification shall state the name of each welder, process and welding positions for which the welder is qualified, the code and welding procedure under which the welder is qualified, the date of qualification, and the names of the firm and person certifying the qualification tests (Spec 05055, para. 1.6.2). It is the responsibility of the Erector to properly qualify all welders in its employ and this requirement was intended to gain written assurance that the General Contractor had made sure the Erector had accepted and fulfilled this responsibility (AWS, 1992, sec. 5.1.1).

Given the welding procedure specification that was used for field welded moment connections (Ref. Appendix C), an appropriately qualified welder would need at a minimum to have been qualified in the FCAW process, using a test plate or test pipe for groove welds welded in any position, and using E70T-X or E71T-X electrodes. Qualification on a test plate under 1" thick would result in the welder being limited in the thickness of materials he could weld.

3. **Submission of Welding Procedure Specifications and Welder Qualification Records Prior to Start of Welding** - Prior to the start of field welding all welding procedures and welders must have been qualified and copies of the procedure specifications, procedure qualification test records (unless a prequalified procedure), and welder qualification test records must have been submitted to the Corps of Engineers (Spec 05055, para. 1.3 and 1.4). This was intended to help insure that only proven, successful procedures and welders would be used and that the Erector has demonstrated a commitment to employ good practices in accordance with AWS requirements.

For this contract a prequalified procedure would be one that conformed in all aspects of joint design, workmanship, and welding technique to *AWS D1.1*, Sections 2, Design of Welded Connections, 3, Workmanship, 4, Technique and, since the structure was considered statically loaded, 8, Statically Loaded Structures (AWS, 1992, sec. 5.1.1). An adequate prequalified welding procedure specification for groove welded moment connection joints should address the joint configuration and preparation, surface preparation of base metal, alignment and fit-up tolerances, allowable ambient temperatures and other conditions, peening if it is contemplated, inprocess and completed weld cleaning

procedures, groove weld backing, welding process to be used, filler metal type and size requirements, preheat and interpass temperature requirements, shielding gas requirements if applicable, weld layer thicknesses, welding current, welding voltage, welding speed of travel, and welding positions to be used (AWS, 1992, App. H).

4. **Requirement for Welder Qualification Within Past 6 Months** - Each welder shall be or shall have been qualified by testing in accordance with applicable requirements of *AWS D1.1*. Welders who were qualified by test within the previous 6 months may be accepted without requalification if (1) copies of the welding procedure specifications and welder qualification test records have been submitted as elsewhere required, (2) the testing was performed by an approved testing agency, and (3) the procedure used in the qualification test conforms to the procedure specification used on this project (Spec 05055, para. 1.6). What constitutes an approved testing agency is not made clear in the specification since there was no specific requirement to submit a testing agency for approval or any guidance as to what authority may grant approval. By the language used it appears that the intent is to require requalification prior to beginning work on this project of any welder whose most recent qualification test is more than 6 months old. This is more stringent than *AWS D1.1* requirements wherein a welder's qualification remains in effect indefinitely unless the welder is not engaged in welding using the process for which he is qualified for a six month or longer period or if there is some specific reason to question the welder's ability (AWS, 1992, sec. 5.30). The intent of this provision was to lessen the risk to the Corps of Engineers of getting welders who were qualified before that date and who may not be well-practiced.

5. **Situations Requiring Welder Requalification** - Requalification of welders by test will be required if (1) it has been more than six months since the welder has used the process for which he was qualified, (2) there is some specific reason to question the welder's ability to make sound welds, or (3) the welder was qualified by an employer other than the Erector for this project and his most recent qualification test is more than 12 months old (Spec 05055, para. 1.6.3). Reasons (1) and (2) are identical to *AWS D1.1* requirements but reason (3) is a more stringent additional requirement of this contract. The intent here is to make it less expensive to qualify, and thus encourage the use of, welders for this project who have been previously qualified and have stayed with the same employer for an extended period. The assumption is that these welders present fewer unknowns,

more stability, and less risk. Continuity records are required to be submitted to the Corps of Engineers for any welder falling into this category. This provision presents something of a problem because the contract specifications also seem to indicate that requalification would be required for any welder whose test is more than 6 months old. Thus these two provisions appear to be in conflict unless the assumption is made that paragraph 1.6.3 is intended to apply only after the welder has been accepted (with a qualification within the previous 6 months) and worked for a time on this contract. Thus a welder who was qualified 3 months before beginning work on this contract by someone other than the Erector could be accepted but would have to requalify after 9 months while a similar welder qualified by the Erector would not need requalification for the duration of his work on this contract.

6. **Drawings to Reference Applicable Welding Procedure Specifications** - Welding procedure specifications were to be individually identified and referenced on the shop detail and erection drawings (Spec 05055, para. 1.5). The intent here is to make it very clear to reviewers, erection foremen and production welders what procedure is to be used for each field welded joint so that any question about the suitablilty of the procedure for a given joint may be addressed up front during submittal review and to insure that the joints are welded using proper procedures.

7. **Equipment and Materials** - The contract specifications indicate that all welding equipment, electrodes, welding wire, and fluxes shall conform to all applicable requirements of *AWS D1.1* (Spec 05055, para. 2.1). They also indicate that all welding electrodes shall conform to *AWS A5.1-81: Specification for Covered Carbon Steel Arc Welding Electrodes* and *AWS A5.5-81: Specification for Low Alloy Steel Covered Arc Welding Electrodes* (Spec 05120, para. 3.2.3). This is intended to insure that only satisfactory equipment and materials capable of producing sound welds will be used. This specification provision perhaps makes a poor choice of words since this could be construed as limiting all welding to the Shielded Metal Arc Weding (SMAW) process since only SMAW electrodes are specified in *AWS A5.1-81* and *AWS A5.5-81* (AWS, 1992, sec. 4.5.1). The General Notes further this conception by specifically echoing the AWS requirement that only low-hydrogen electrodes (peculiar to the SMAW process) be used for welding of ASTM A572 Grade 50 steel (AWS, 1992, Table 4.1). It is doubtful that so limiting a contractor is what was intended, particularly since Flux Cored Arc Welding (FCAW) is a successful and very widely used process in field welding of moment connections. The use of the term welding wire, as

distinguished from welding electrode, in the contract specifications seems to indicate that the specifier is using the term electrode in the specific sense of it being a SMAW electrode and that thus other processes using welding wire in lieu of an "electrode," FCAW for instance, would also be acceptable.

8. **Identification of Welds** - Welds shall be identified by either written records indicating the location and welder for each weld or by the marking of an identification symbol unique to each welder at the weld (Spec 05055, para. 3.1.2). This is intended to provide traceability and to enable the Corps of Engineers and the Inspection Company to identify both problem and stellar welders and more easily verify that the welders actually working agree with the list of accepted welders.

9. **Completion of Connections Before Load is Applied** - Field welded connections must be completed before load is applied (Spec 05120, para. 3.2.3). This means that no concrete floor slab or any other permanent load shall be applied until the welding is completed. The Corps of Engineers interpreted complete to mean fully welded as detailed, inspected, repaired if necessary and reinspected, and accepted by the Inspection Company.

Contract Requirements for Inspection of Field Welded Moment Connections

The eleven critical requirements applicable to the inspection of field welded moment connections are as indicated below.

1. **Extent of Required Inspection** - All moment connection field welds shall be visually inspected and ultrasonically inspected (Spec 05055, para. 3.3, and General Notes). It is interesting to note that while 100% visual inspection is the default, there is no minimum default level for ultrasonic or other nondestructive testing. If the specifier does not indicate a required level of nondestructive testing, none would be required to be performed (AWS, 1992, sec. 8.15.1 and 6.7). The project Engineer of Record indicated to the author that for field-welded moment connections involving beams he typically requires 100% ultrasonic inspection, as he did on this project. It should be noted that the *Uniform Building Code* requires 100% ultrasonic inspection of all full penetration welds in lateral force resisting framing in seismic zones 2 through 4 (ICBO, 1991, sec. 2710 (k)).

2. **Visual Inspector Qualifications** - The visual inspection of welds is to be performed by inspectors holding current certification as AWS Certified Welding Inspectors (CWI) in accordance with the provisions of *AWS QC-1-88: Standard and Guide for Certification and Qualification of Welding Inspectors.* Inspectors may be supported by AWS Certified Assistant Welding Inspectors (CAWI) who may perform specific tasks under the supervision of the CWI (AWS, 1992, sec. 6.1.3). The inspector qualification paragraph in Spec 05055 is somewhat confusing in that it refers to the necessary qualifications for ultrasonic inspectors but erroneously implies that those are also the required qualifications of the visual inspectors. This is a problem because qualified ultrasonic or other nondestructive testing personnel need not have any AWS certification and thus may not have the training, experience, or knowledge of welding technology that would make them competent to monitor welding practices and judge the visual adequacy of welds. Luckily this problem is eliminated by the incorporation of *AISC-02* into the contract. *AISC-02* incorporates *AWS D1.1,* Chapter 6, Inspection, and thus restores the visual inspector qualification requirements.

3. **Ultrasonic Inspector Qualifications** - The ultrasonic inspection is to be performed by nondestructive testing personnel qualified at Level II in accordance with The American Society for Nondestructive Testing (ASNT) *Recommended Practice No. SNT-TC-1A: Personnel Qualification and Certification in Nondestructive Testing.* Level II Inspectors may be supported by qualified Level I Operators who may perform specific tasks under the supervision of the Level II Inspector (Spec 05061, para. 2.1). This requirement is in accordance with *AWS D1.1.*

4. **Requirement for Independent Testing Lab for Welding Inspection** - All acceptance inspection is to be performed by an independent, established testing lab or consultant, i.e. not by General Contractor, Fabricator, or Erector personnel (Spec 05055, para. 3.2). This means that the inspection referred to in the contract specifications is verification inspection, above and beyond what would be required of the Erector, since the inspectors represent the interests of the General Contractor who is the "owner" until the Corps of Engineers accepts the building. The interests of the Corps of Engineers are also represented by virtue of the fact that the Testing Lab must be an established entity separate from the General Contractor. It should be noted, however, that the Testing Lab is paid by the General Contractor, not by the corps of Engineers. The Erector is required to maintain

a quality control program adequate, as determined by the Erector, to insure that all their work is in accordance with contract requirements (AISC, 1989, *AISC-01*, sec. 8.1.2).

5. **Ultrasonic Testing Procedures** - The requirements for reference standards, equipment qualification, equipment calibration, preparation of materials for inspection, and inspection prodedures for ultrasonic inspection are contained in Spec 05061, Appendix E, and will not be duplicated here. The Engineer of Record indicated to the author that this specification is derived from an older Military Standard and Navy Publication and is essentially independent of *AWS D1.1*. He said that typically he would specify ultrasonic testing to be in accordance with *AWS D1.1*, Section 6, Part C, but that for this project the U.S. Army Corps of Engineers, Fort Worth District, required that the older specifications be used. These older specifications are part of the established Corps of Engineers guide specifications which is why their use was required. Because of the bureaucratic difficulties encountered in changing Corps guide specs, many older specs which are different from industry standards are still used. The Testing Lab was required to submit through the General Contractor a detailed plan outlining ultrasonic testing procedures to be used to the Corps of Engineers (Spec 05061, para. 1.3).

6. **Acceptance Criteria for Visual Inspection** - Acceptance criteria for visual inspection shall be as stated in *AWS D1.1*, section 8.15.1 (General Notes). Welds shall have no cracks; there shall be full fusion between all layers of weld metal and between weld metal and base metal; there shall be no underfill; weld profiles shall exhibit no reinforcement more than 1/8", no overlap, no excessive convexity, and no undercut greater than 1/32" (except 1/16" allowed for up to 2 inches in any 12 lineal inches of weld for welds under 1" thick); and there shall be no porosity or inclusions (AWS, 1992, sec. 8.15.1 and 3.6).

7. **Acceptance Criteria for Ultrasonic Inspection** - Acceptance criteria for ultrasonic inspection shall be as stated in *AWS D1.1-92*, section 8.15.4 and Table 8.2 (General Notes). It should be noted that the General Notes refer to *AWS D1.1-88*, section 8.15.3. The author contacted Mr. Hardy Campbell, AWS Technical Director, who explained that after the 1988 version of *AWS D1.1*, under which this project was designed, the acceptance criteria for ultrasonic inspection of welds was moved from section 8.15.3 to 8.15.4.

Welds having any indication of a Class A discontinuity, regardless of length, shall be rejected. Welds having any indication of a Class B discontinuity of length greater than 3/4" shall be rejected. Welds having any indication of a Class C discontinuity of length greater than 2" shall be rejected. Welds with Class B or C discontinuities may be acceptable if the discontinuities are each less than the prescribed maximum allowable length and they are separated by at least 2 times the length of the longer discontinuity or if the total length of the discontinuities and their separation distance is less than the prescribed maximum allowable length. For moment connections welds having Class B or Class C discontinuities within a distance of twice the length of the discontinuity from the ends of the weld shall be rejected. Welds having any indication of a Class D discontinuity shall not be rejected unless they also contain some other rejectable defect (AWS, 1992, Table 8.2). The ultrasonic acceptance criteria specified in the General Notes are different from those specified in Spec 05061 (Spec 05061, para. 3.4). It should be noted that the UT Inspector used the criteria from the General Notes. Since these criteria were in accordance with *AWS D1.1* and the Engineer of Record's wishes, their use could be considered acceptable.

8. **Weld Inspection Reports** - The independent testing lab is to submit certified reports of all visual and ultrasonic inspections (Spec 05055, para. 1.4 and Spec 05061, para. 1.3). Ultrasonic test reports are to include the identification and location of each inspected weld, sufficient detail of the methods of inspection to allow later duplication, locations and details of rejectable defects, and a record of repaired welds (Spec 05061, para. 3.5). Copies of all reports should be provided to the Erector and, in this case, the Fabricator since the Erector was the Fabricator's subcontractor (AWS, 1992, sec. 6.1.1).

9. **Access, Timeliness of Inspection, and Furnishing of Complete Documents to Inspectors** - In order to satisfactorily conduct verification field weld inspection, the Inspection Company, General Contractor, and Erector incur certain obligations relative to the inspection. The Inspection Company is required to complete its inspections in a timely manner so as not to unduly disrupt progress of the work and the Erector is required to provide the Inspection Company a minimum of 24 hours notice that inspectable work will be going on and to provide the inspectors with safe access to the work (AISC, 1989, *AISC-01*, sec. 8.5). The VT and UT Inspectors are to be provided with complete detailed drawings of all welds and with the parts of the contract documents that describe material and quality requirements (AWS, 1992, sec. 6.1.5 and 6.8.4). In this case this would be the General

Contractor's responsibility. The Inspection Company should be provided with all updated or changed drawings as such changes occur.

10. **Repair of Rejected Welds** - All rejected welds must be repaired in accordance with *AWS D1.1*, Section 3.7, Repairs, and be visually and ultrasonically reinspected as if they were new welds (Spec 05055, para. 3.5).

11. **Responsibilities of Visual Inspector** - It is the responsibility of the field welding VT Inspector to ascertain that all field welding is performed in accordance with the requirements of the contract documents. This would include, in addition to visual examination of completed welds, verifying that correct materials are used, reviewing all welding procedure specifications to be used and verifying that they conform to code, verifying that all welding equipment is set in accordance with the procedure specifications and is in proper working order, verifying that all welders are properly qualified and requesting requalification or dismissal of those who are not, verifying that the welding is done in accordance with the welding procedure specifications, verifying that joint preparation and fit-up are in conformance with code, and identifying with a clear mark all parts that have been inspected (AWS, 1992, sec. 6.1, 6.2, 6.3, 6.4, and 6.5).

SECTION 5: EVALUATION OF COMPLIANCE WITH CONTRACT REQUIREMENTS

The Brooke Resident Office project files relating to field welding of structural steel were generously made available to the author by the Corps of Engineers. Information in these files includes contract and shop drawings, contract specifications, submitted visual and ultrasonic weld inspection reports, submitted field welder and inspector qualifications, submitted welding procedure specifications, submitted work and quality control plans, and other contractor submittals and miscellaneous correspondence. This information, the author's first hand observations during his involvement with this project, and interviews with Inspector #1, the lead inspector for the Testing Lab, provide the data upon which this review is based.

The author collected all weld inspection reports submitted by the Inspection Company and transcribed selected information about each field welded moment connection into a spreadsheet so that the information from the weld inspection reports could be better analyzed. The information transcribed included connection identifier, location, welder, visual inspector, visual inspection date, report number for visual inspection, visual inspection result, visual defects noted, ultrasonic inspector, ultrasonic inspection date, report number for ultrasonic inspection, result of ultrasonic inspection, and ultrasonic rejectable indications noted for each field welded moment connection. This information, with the exception of location, is contained in Table A1: Summary of Visual and Ultrasonic Weld Inspection Reports for Field Welded Moment Connections, Appendix A. The vast majority of the statistical information contained in this report and all of the tables in Appendix B are derived in whole or in part from analysis of the data contained in the project weld inspection reports and Table A1.

Compliance With Contract Requirements for Field Welding of Moment Connections

1. **Submission of Certification of Welder Qualifications** - All of the 18 welder qualification test records submitted were certified as having been conducted under the requirements of *AWS D1.1.* In some cases the certification was by the employer, in some by the testing lab administering the test. All the submitted welder qualifications indicate the welder's name, process and positions qualified, information about the welding procedure used, the date of qualification, and the names of the firm and person certifying the qualification tests. However, there is an additional requirement that, beyond providing

certified qualification test records, the General Contractor must provide a certification statement that all welders are qualified as specified and that certification must be kept current for the duration of the contract. It would seem that the intent here was for the General Contractor to provide a certified summary of all welders, including the specified information for each welder, to be kept by the General Contractor and modified as new welders came on board or as information changed. There is no record in the project files of any submittals on field welder qualifications other than the test records. Since so many of the welder qualifications were not in accordance with contract requirements, particularly with regard to age, and since many qualifications were not received by the Corps of Engineers until after welding was complete, the General Contractor clearly did not meet its obligations in this area.

2. **Submission of Welding Procedure Specifications and Welder Qualification Records Prior to Start of Welding** - The welding procedure specifications for field welding of moment connections were submitted and approved prior to the start of field welding. The procedure was prequalified so procedure qualification tests were not necessary. A review of the information provided in the submitted welding procedure specification indicates that it addressed and complied with all applicable code provisions for joint design, workmanship and technique.

A review of Table B10, Appendix B, a summary of the moment connection field welder qualification data in the Corps of Engineers' files, shows that of the 19 different welders identified who did work on moment connections, 10 had qualifications which were not submitted until 16 months after welding operations were completed. Two of those had qualification dates after welding was completed, and one never had welding qualifications submitted at all. Six of the 18 welders for whom qualification tests were provided were not qualified in the FCAW process. Of those six, one also was not qualified to weld groove welds and one welded materials outside the thickness range he was qualified for in the process in which he was qualified. Of the 18 qualifications submitted, 10 were not acknowledged by the Corps of Engineers as being acceptable. 10 of the 18 qualificatons received were older than 6 months when received, with ages ranging from 8 months to 11 years. Of the 7 qualifications acknowledged by the Corps of Engineers as being acceptable for FCAW welding when submitted, 6 were more than 6 months old by the time those

welders began welding. No evidence that those welders had had no breaks in employment as welders using the FCAW process longer than 6 months was ever requested or furnished.

In summary, none of the 19 identified welders was qualified and had submitted qualification records in full accordance with the contract requirements. The Erector and General Contractor QC Inspector were clearly somewhat less than diligent in assuring that only qualified welders were used. It appears that the Corps of Engineers' QA Inspector did not monitor welder qualifications at all, for there is no record of the Corps having raised any objection about improperly qualified welders or missing welder qualifications until 1995, long after welding operations had been completed. For their part, the Inspection Company did not detect this problem either, although it did not have access to the welder qualification records.

3. **Requirement for Welder Qualification Within Past 6 Months** - Review of Table B10, Appendix B, shows that only 7 of the 18 welder qualifications submitted have a date within six months of when they were submitted. All others would have been required to requalify. There is no record in the project files of any of those welders having been requalified. Of the seven whose qualification date was within six months of submittal of cerdentials, only one actually began welding on the project within 6 months of qualification. There is no record in the project files that additional information indicating that the other six welders' qualifications had not lapsed was ever requested or submitted. For all of those seven welder qualifications the procedure used in the testing closely follows that of the submitted procedure specification. Review of the submitted qualification test records shows that all seven of those welders were qualified by a union local using the same testing lab which, by the specifications, must be an "approved" lab. What constitutes an "approved" testing lab or technical consultant for the purpose of conducting welder qualification tests is not made clear in the specifications. The contract, then, conceivably could be construed to mean anything from a sole-proprietorship run by a newly certified CWI, as appears was perhaps the case with welders qualified through the union local, to a large, well-established testing lab. Therefore, 11 of the 18 welders who had qualifications submitted, had qualifications which unquestionably did not meet this contract requirement. Because of the gap between when their qualifications were submitted and when they began welding, the qualifications of six others are in some doubt of having met this contract requirement.

4. **Situations Requiring Welder Requalification** - There is no record in the project files of any welder having been requalified during the course of the project. As mentioned above, after acknowledgement of acceptable qualifications by the Corps of Engineers, there were six welders who did not begin welding until more than six months after their qualification dates. No information indicating they had during that time been using the welding procedure for which they were qualified was provided. Thus, they technically should have been requalified. One welder, 17F, whose qualifications were not submitted to the Corps of Engineers until after welding operations were complete and were never acknowledged, was requested to be requalified by Inspector #3 in weld report #162, dated 7/16/93, for exhibiting a consistent pattern of rejectable defects. There is no record of this welder having been requalified and a review of Table A1, Appendix A, indicates that he continued welding for a short time after that report. There were two situations where a welder with accepted qualifications, who was qualified by someone other than the Erector, was welding on the project more than 12 months after his qualification date without having been requalified. Those two cases, where the time interval was 12 months and 10 days, are hardly worth considering.

5. **Drawings to Reference Applicable Welding Procedure Specifications** - The moment connection details in the Fabricator's shop drawings referenced procedure specification B-U4a-GFfor butt joint connections and TC-U4a-GF for T-joint connections. Procedure B-U4a-GF used the AWS/AISC prequalified joint configuration B-U4a, single bevel butt joint with backing, and procedure TC-U4a-GF used the AWS/AISC prequalified joint configuration TC-U4a, single bevel corner joint with backing. Both procedures used the FCAW process with welding in the flat (1G) position. Both procedure specifications had been submitted and approved prior to the start of field welding. Thus, this contract requirement was unquestionably met.

6. **Equipment and Materials** - There is no record in the weld inspection reports of there having been equipment or materials used in the welding of moment connections which did not meet contract requirements. There is also no record of the Corps of Engineers' QA Inspector or of the General Contractor's QC Inspector having reviewed electrodes, electrode storage, or welding equipment for compliance.

7. **Identification of Welds** - A review of Table B11, Appendix B, shows that 357 of the 2057 attributable welds (17%) had no welder ID stencil. Thus this contract requirement

was not fully met. An interesting observation is that, while one might assume these welds as being ones no one wanted to claim, the overall reject rate for this group was in fact lower than for eight of the moment connection field welders.

8. **Completion of Connections Before Load is Applied** - Since some welds have no record of inspection and some have no record of repair, load would have been applied to some connections before they were complete by the Corps of Engineers' definition. Also, since an arrangement had been made between the Erector, Inspection Company and General Contractor whereby ultrasonic inspection would be done from below after the interstitial floor was placed, it is likely that the concrete floor slab was placed over several connections before their inspection was complete.

Compliance With Contract Requirements for Inspection of Field Welded Moment Connections

1. **Extent of Required Inspection** - Table B1, Appendix B, indicates that all field welded moment connections were completely visually inspected except for two which had no record of any visual or ultrasonic inspection (a total of four welds). Table B1 also shows that 7 connections, including the two mentioned above, had no ultrasonic inspection at all (15 welds total) and 3 connections had ultrasonic inspection on only one weld. This means 2060 of 2064 welds (99.8%) were visually inspected, 1972 of 1990 ultrasonically inspectable welds (99.1%), i.e. those not failing visual inspection, were ultrasonically inspected, 916 of 918 moment connections (99.8%) received complete visual inspection, and 908 of 918 moment connections (99.1%) received complete ultrasonic inspection. The Engineer of Record for the project indicated he was pleased with that amount of coverage. Inspector #1 indicated that those numbers seemed in line with what he remembered and explained that the missed inspections were due to access problems. He indicated that he had notified the General Contractor of the missed inspections. There is no record of the General Contractor having notified the Corps of Engineers of the possibility of having field welded moment connections with missed inspections. It should be noted that in the Quality Control Work Plan submitted by the Testing Lab it was indicated that a marked-up set of plans indicating the status of all welded connections would be kept. This was not done. When asked about this Inspector #1 said that item had not been in their subcontract with the Testing Lab. Having such a set of plans would have made it much easier to track the status

of welded connections and conceivably would have eliminated the missed inspections and missed repairs, or at least made their presence known to the Corps of Engineers.

The fact that a weld was not inspected is certainly no indication that a defect exists. However, let us review the uninspected welds to see if there is good reason for heightened concern in any of the cases. Table B3, Appendix B, shows probable welder and moment connection application type for the two completely uninspected connections. The probable welder was determined by reviewing the weld inspection reports for which welders were welding in the area adjacent to the connection in question. In each case the probable welders had comparatively low reject rates (See Table B11, Appendix B) and the connections were the less critical application type 2. Consequently, there seems to be little reason for worry there. Table B4, Appendix B, shows welder and moment connection application type for the eight connections with missing ultrasonic inspections. Given the critical nature of the moment connections MC496, MC518, and MC519 (application types 3 and 4) and the high ultrasonic reject rate of welder 19F shown in Table B11, some concern about these connections might be justified.

2. **Visual Inspector Qualifications** - Numbered certificates endorsed by AWS indicating that the inspector had satisfied all AWS requirements for registration as a Certified Welding Inspector (CWI) and resumes indicating extensive experience with welding technology and the visual inspection welds were submitted for Inspectors #1, #2, and #3. The certificates alone satisfy the contract requirement for qualification. Since all three inspectors held CWI certification, each was qualified to conduct visual inspection without supervision. A review of Table A1, Appendix A, indicates that only these three inspectors performed visual inspection. Therefore, all visual inspection was done by qualified individuals. As further corroboration of the competence of the visual inspectors, the project files indicate that on four occasions the Corps of Engineers brought in another testing company to review work previously visually inspected by the Inspection Company. In all cases the VT Inspector's work was verified.

3. **Ultrasonic Inspector Qualifications** - For both Inspector #1 and Inspector #2, certifications by an officer of the Inspection Company that each inspector was qualified at Ultrasonic Level II in accordance with *ASNT No. SNT-TC-1A* were provided. Certifications by an ASNT NDE Level III that each inspector had completed the necessary academic and practical requirements for Ultrasonic Level II certification as required by AWS (AWS, 1992,

sec. 6.7.8.2), and resumes indicating extensive experience in nondestructive testing of moment connections were provided. Thus the two inspectors appeared to be well qualified and their submitted qualifications were in accordance with all requirements. A review of Table A1, Appendix A, indicates that only Inspectors #1 and #2 performed ultrasonic testing. Consequently, the records indicate that all ultrasonic testing was performed by qualified personnel. As further corroboration of the competence of the ultrasonic inspectors, the project files indicate that on four occasions the Corps of Engineers brought in another testing company to review work previously ultrasonically inspected by the Inspection Company. In all cases the UT Inspector's work was verified.

4. **Requirement for Independent Testing Lab for Welding Inspection** - The Testing Lab was a well-established firm which, although a subcontractor of the General Contractor, was an entity independent of all other parties performing work under the contract. The Inspection Company was also an independent entity. Thus this contract requirement was unquestionably met.

5. **Ultrasonic Testing Procedures** - The Fabricator submitted a detailed ultrasonic testing procedure which was in strict accordance with the requirements of *AWS D1.1*, Section 6C. There is no record of the Testing Lab having submitted an ultrasonic testing procedure other than in their Quality Control Work Plan in which they said ultrasonic testing would be done in accordance with Spec 05061 and *AWS D1.1-88*, paragraph 8.15.3. It appears from the welding reports, however, that ultrasonic testing by the UT Inspector was completed wholly under the provisions of *AWS D1.1-92*. While this is in technical violation of the contract specifications, such ultrasonic testing procedures are generally recognized as sound practice.

6. **Acceptance Criteria for Visual Inspection** - About all that can be said regarding adherence to acceptance criteria for visual inspection is that a review of Table B5, Appendix B, a summary of visually rejected welds, shows welds being rejected for reasons in accordance with criteria.

7. **Acceptance Criteria for Ultrasonic Inspection** - A review of Table A1, Appendix A, shows that all noted discontinuities were Class A, except one which was Class D. In accordance with AWS criteria, the Class D discontinuity was accepted and all welds

with Class A discontinuities were rejected. A summary of ultrasonically rejected welds appears in Table B6, Appendix B.

8. **Weld Inspection Reports** - The weld inspection reports appeared to meet contract requirements quite well. Reports were written and submitted on a daily basis and each report was certified in that it was signed and dated by the qualified inspector who did the inspection. Both visual and ultrasonic inspection reports include the identification and location of each inspected weld, the welder identification observed, the inspection results, and descriptive details for both visual and ultrasonic inspections. The ultrasonic inspection reports all contain information about the equipment used and calibration and testing parameters in sufficient detail to recreate the test. Reinspections of repaired welds are clearly identified on the reports. Copies of all reports were routed to the Erector and Fabricator as required. A copy of a typical inspection report is contained in Appendix D.

9. **Access, Timeliness of Inspection, and Furnishing of Complete Documents to Inspectors** - Access to inspect work was a problem according to Inspector #1. He indicated that the Erector was initially quite cooperative until the Inspection Company began finding larger numbers of rejectable welds. After that point the relationship soured and, according to Inspector #1, the Erector actually limited access for the Inspection Company by such methods as removing ladders or scaffolding as soon as welding operations were complete and placing metal deck soon after an area was welded. Inspector #1 indicated that, while it is not uncommon for erectors and inspectors to find themselves at odds over rejected work and provision of access, the Erector was much less cooperative than is typical. Another contributing factor was the pressure of the construction schedule on the Erector. The General Contractor was working on a highly accelerated schedule and the Erector was under tremendous pressure to put as much steel up in as short a time as was possible, particularly between June and October of 1993. Inspector #1 reports that the Erector felt it just didn't have time to wait for the inspectors. The Inspection Company was able to solve its access problem in a rather ingenious way, however. Inspector #1 said that in exchange for many cases of beer over the course of the job, the electrical contractor allowed them to use their ladders and scissor lifts after hours and on weekends. Whatever access problems were encountered, the final result was quite good. Table B1, Appendix B shows that of 918 total field welded moment connections, only 10, or about 1.1%, received less than full visual and ultrasonic inspection.

The welding reports indicate only the dates of visual and ultrasonic inspections; not the date the welds were actually completed. Without knowing when the welds were completed it was difficult to judge for certain whether inspection was timely or not. However, since the Erector was moving so quickly, it would be a reasonable course to assume that visual inspection probably took place very soon after welding was finished. Thus a measure of inspection timeliness would be to consider the time difference between visual and ultrasonic inspection for each weld. The author consulted Mr. James L. Willson, Vice President of L. R. Willson and Sons, a steel erector from Gambrills, Maryland, Mr. Hilton Holcomb, Metals Department Manager for SM&E, of Raleigh, North Carolina, a testing lab who performs extensive welding inspection, and Inspector #1 as to what time intervals they felt would constitute timely, marginally timely, late, very late and incredibly late inspection. Their answers were fairly close, with general agreement that 3 days would be the outer limit of timely, that 7 days would constitute the outer limit of marginally timely, and that beyond 10 working days the ability to control and maintain any kind of schedule is severely compromised. With this informaton the timeliness categories used in Table B8, Appendix B, were developed.

Table B8 indicates that 72.2% of the welds were visually and ultrasonically inspected the same day, 78.9% fall within the timely range, and 21.1% fall within the late range. A rather curious result was that of that 21.1%, 19% fell in the incredibly late category. After looking more closely at the inspection date data it became apparent that in this group the time interval was typically in the 40 to 90 day range. Also, a large number of these incredibly late inspections occurred between June and October, 1993. When asked about this Inspector #1 explained that in order to move faster the Erector had asked if the UT Inspector would be willing to do the ultrasonic testing from underneath, after the interstitial floor had been placed. The Inspection Company agreed to this on condition that the Erector acknowledged that any discovered defects would have to be repaired, no matter how inconvenient. The Erector indicated to Inspector #1 that it felt if the top flange weld passed visual inspection, any ultrasonically rejectable indication would almost certainly be in the weld root area which could be repaired from underneath by removing the backing bar, gouging, and rewelding. The General Contractor was apprised of this and raised no objection. This explanation seems credible, given the Erector's preoccupation with speed, given that the period from June to October, 1993, was one where the General Contractor put great pressure on the Erector to step up production and make the schedule date for

topping out the main facility, and given that the 40 to 90 day range was in in line with how far installation of the interstital floor would typically follow behind the main steel erection. Thus, considering the inspections other than in the incredibly late category, it appears that the Inspection Company adequately fulfilled its obligations for timely inspection.

Inspector #1 indicated that getting current drawings from the General Contractor was a problem. He said that the Inspection Company would have to request drawings well in advance of the beginning of welding in an area or it would often not receive them in time. When this occurred the inspectors would have to refer to the Erector's field drawings which they could not, of course, carry with them. Inspector #1 also indicated that often the drawings they did receive were outdated, which they would discover when discrepancies occurred between what they were seeing and what was on the drawings. He also indicated that, although requested to do so by the Inspection Company, the General Contractor did not provide a copy of the welding procedure specifications. From this information it appears that the General Contractor was lax in its responsibility to provide the Inspection Company with complete information about the welding to be inspected and thus made it more difficult to achieve adequate inspection.

10. **Repair of Rejected Welds** - Review of Table B1, Appendix B, indicates that there were 185 rejected welds on 141 different moment connections. Review of Table B2, Appendix B, indicates that there were four rejected welds, one each on four different connections, which had no record that could be found in the weld inspection reports of having been repaired and reinspected. Three of these four welds are top flange welds and would always be in tension. The fourth is a bottom flange weld in a moment frame connection which could also be in tension. The possibly missing weld in connection MC-286-T is of greatest concern since without a weld there the connection could not function as intended. It is somewhat unlikely, although certainly possible, that an inspector would have checked the bottom flange connection, which was also rejected in the same initial report and reinspected several days later, and not noticed a missing weld at the top flange. When asked about this Inspector #1 indicated that he remebered "one or two" rejected welds which they were unable to reinspect because of access problems, that he had notified the General Contractor of this, and that the General Contractor had responded that that was to be expected on a job of this size. Inspector #1 also indicated that he could not remember any missing welds and that it was possible a few reinspections of repaired welds did not get

noted in the reports because there were some days devoted exclusively to such reinspection, where the inspectors were accompanied by Erector personnel, which were very hectic. Only one of the four welds noted in Table B2 should have presented any access problems and the other three conceivably could still be checked from the interstital level with a minimum amount of tear out. In terms of gross numbers, to have four of 918 connections (about 0.4%) of the connections with missed repairs may not be too bad but one would certainly be concerned about having a defective weld in a moment frame connection or a missing weld in any moment connection. There is no record in the Corps of Engineers' project files of the General Contractor having notified the Corps of Engineers of the possibility of a small number of unrepaired rejected welds or of a missing weld.

11. **Responsibilities of Visual Inspector** - Inspector #1 indicated the Inspection Company was able to conduct fit-up inspections on about 40% of the moment connection welds. The author observed in the field that inspected connections were being clearly marked by the Inspection Company. There is no record in the welding reports of noted deiciencies in equipment or materials used for welding moment connections so one may conclude that either the VT Inspector did not look closely at these items or that these items were generally in compliance with requirements. Given the level of diligence displayed by the VT Inspector, the latter seems more likely. The Inspection Company appears to have fulfilled its obligations in these areas.

There is some question, however, as to how well the Inspection Company fulfilled its obligations in the areas of verification of welder qualifications and verification of welding procedure specifications. Inspector #1 indicated that although the Inspection Company had requested the General Contractor to provide it with copies of the welder qualifications and welding procedure specifications, the General Contractor had declined to do so on the grounds that the Corps of Engineers had already approved them and that, therefore, the Inspection Company did not need to review them. While the welding procedure specifications were in good order and had been approved by the Corps of Engineers, that did not relieve the VT Inspector of the code-mandated responsibility to verify that the procedure specification was in full conformance with all code requirements, nor did it relieve the General Contractor of its responsibility to provide the VT Inspector with the necessary information to make that verification.

With regard to welder qualifications, it seems clear that some unqualified welders were assigned to field weld moment connections on this project. A review of the project submittal register indicates that welder qualifications were to be submitted "For Information Only" to the Corps of Engineers, meaning that while the Corps could acknowledge apparent acceptability or raise objections, the full responsibility for approval of welder qualifications lay with the General Contractor. Thus the General Contractor's premise behind declining to provide the Inspection Company with copies of the welder qualifications was in error on two counts. First, no qualifications had actually been approved by the Corps of Engineers and second, not all welder qualifications had even been submitted to the Corps of Engineers. Again, whether the Corps of Engineers approves a welding qualification or not, there is still a code-mandated responsibility for the VT Inspector to verify that all welders are properly qualified and the General Contractor should be obligated to provide the VT Inspector the necessary information to make such a verification.

It is far less probable that unqualified welders would have been permitted to begin welding on the project had the VT Inspector been allowed to review welder qualifications. The question arises as to how far the Inspection Company's responsibility goes when it requests but is not provided with information necessary to carry out its code-mandated responsibilities. In this case the Inspection Company was in a difficult position because the only way for it to get information officially was through the General Contractor. Whether the Inspection Company had at this point an obligation to somehow get that information unofficially or to notify the Corps of Engineers is not for this study to answer. To the VT Inspector's credit, requalification of welder 17F was requested because, in the professional opinion of the VT Inspector, the welder's skills were questionable. This request was based solely on observing the welder's work because the Inspection Company had no way of knowing that this welder's qualifications were in the wrong process and were over 9 years old (Ref. Table B10, Appendix B).

SECTION 6: ANALYSIS OF DATA FROM WELD REPORTS

Overall Quality of Welders

The author consulted Mr. Hilton Holcomb, Mr. James L. Willson, and Inspector #1 and asked each of them what reject rate they might expect for someone who would be considered a "good," "average," "marginal," and "poor" welder. Mr. Willson indicated that he felt a good welder would have a reject rate of up to 2%, an average welder of 3% to 4%, and a marginal welder of 5%. He indicated that if 5% or more of a welder's work has to be torn out and redone, there is a severe cost penalty to the erector. Mr. Holcomb felt that less than 5% rejects would be indicative of a good welder, 5% to 7% of an average welder, and 8% to 10% of a marginal welder. Inspector #1 felt that 3% or less rejects would be indicative of a good welder, 4% to 7% of an average welder, and 8 to 10% of a marginal welder. Taking average values from the three sources gives a range of up to 3% for a good welder, up to 6% for an average welder, and up to 8% for a marginal welder.

From Table B11, Appendix B, it is seen that the overall reject rate for all welders was 8.85% which puts the overall welder performance just into the "poor" category. Welders 5F, 7F, 9F, 12F, 13F, 17F, 19F, and 28F had particularly bad reject rates, ranging from 16.67% to 31.25%. Table B10, Appendix B, indicates that welders 5F, 7F, 9F, and 17F were not qualified in the FCAW process used to field weld moment connections and had outdated qualifications. It is no great surprise that they would perform poorly. Welders 12F, 13F, 19F, and 28F were all qualified in the FCAW process but when they began welding on the project their qualifications were all more than 6 months old. No information that they had remained active in FCAW since their qualification was ever provided. The other item these four welders have in common is that they all were qualified by the same union local using the same testing lab. This testing lab was mentioned earlier as being operated by a CWI who had been so certified for less than 16 months when the qualifications were performed. This, of course, may mean nothing, particularly since welders 18F and 20F, who were two of the best welders, also were qualified by that testing lab, but it is a common thread. The reason this point is mentioned is to illustrate that it is important when evaluating welder qualifications to also consider the credentials of the testing agency conducting and interpreting the qualification test.

Table B11 shows that of the 19 identified welders, 9 were in the "poor" category, 2 were in the "marginal" category, 3 were in the "average" category, and 5 were in the "good" category. Given that none of the eighteen welder qualifications submitted were in full accordance with the specifictions, it is not surprising that the overall welder performance was not good.

Overall Quality of Welding

Judging by the finished product, the overall quality of field welded moment connections on this project would probably have to be considered good. As shown in Table B1, Appendix B, 99.8% of the welds made in 99.8% of the moment connections were visually inspected, 99.1% of the ultrasonically inspectable welds in 98.9% of the connections were ultrasonically inspected. Only 4 welds (0.19% of total welds) in 4 connections (0.44% of total moment connections) were not certified to be satisfactorily repaired and only 18 welds (0.87% of total welds) in 10 connections (1.1% of total moment connections) were not completely inspected. Thus there is a certainty that 904 of the 918 connections are in accordance with requirements and there is relative certainty (applying the average failure rate of 8.85% to the 10 not fully inspected connections) that 913 of the 918 moment connections are acceptable. That is due more than anything else to a contract which required extensive independent verification inspection of the field welding and to the diligence of the Inspection Company.

This is a very interesting result, given that a number of the welders were apparently unqualified and that the overall performance of the welders was considered to be poor. Thus, it appears that even when those doing the welding are subpar as a group, as long as some competent welders are present and as long as there is thorough, good, independent verification inspection, an acceptable final product can still be achieved. This underscores the central importance of verification inspection to getting satisfactory field welded moment connections.

Visual and Ultrasonic Rejectable Defects

Tables B5 and B6, Appendix B, provide a summary of visually and ultrasonically rejected welds, respectively. There were a total of 74 visually rejected welds in 62 different connections (6.8% of total moment connections) and 111 ultrasonically rejected welds in 80 different connections (8.7% of total moment connections). It is not surprising that there

would be more ultrasonic rejects because visual inspection only allows a view of the weld surface while ultrasonic inspection allows inspection of the entire weld volume. Of the 74 visually rejected welds, there were an equal number of top and bottom flange welds. Of the 111 ultrasonically rejected welds, 46 were top flange and 65 were bottom flange. Because of the increased difficulty in making bottom flange welds, due to interference from the beam webs, one would expect there to be a greater number of bottom flange welds rejected. The even split between top and bottom flange welds visually rejected is somewhat of a surprise. Perhaps the differences in difficulty between top and bottom flange welding are less pronounced for face passes or perhaps this is simply a function of poor welders having problems everywhere.

Table B12, Appendix B, gives a frequency distribution for visual defects. Underfill, not completely filling the joint with weld, was far and away the most common defect, occurring in 50 of the 74 rejected welds and occurring ten times as frequently as any other defect. Of the 60 defects attributable to a known welder, 22 (37%) are attributable to welder 17F alone and 41 (68%) are attributable to the welders not qualified in the FCAW process. Table B6, Appendix B, indicates that all ultrasonically rejected welds had Class A indications. The weld reports did not include comment on the type of defect those indications represented.

Welding Inspector Rejection Rates

Table B7, Appendix B, shows rejection rates for each welding inspector. The overall reject rates for the three inspectors are within 1.5% of each other, which suggests that there was no inspector bias, i.e. one inspector interpreting requirements differently and finding significantly more or significantly less to reject than the others. Inspector #1 had a higher ultrasonic rejection rate than Inspector #2 and a lower visual rejection rate than Inspectors #2 and #3 who had similar visual rejection rates. Tables B11 and B5, Appendix B, may help explain this. These tables indicate that Inspector #1 had much less visual inspection exposure to welders 7F, 9F, and 17F (high visual reject rate welders) than did the other inspectors and in the one high reject group that Inspector #1 had much more exposure to, the "No Stencil" group (i.e. the group of welds where no welder ID stencil was recorded), Inspector #1 only had half of the group's rejected welds. These tables also show that Inspector #1 had much higher ultrasonic inspection exposure to welders 1F, 10F, 16F,

17F, and the "No Stencil" group (contributors of larger numbers of UT rejects) than did Inspector #2.

SECTION 7: OBSERVED PROBLEMS AND SUCCESSES IN PROJECT FIELD WELDING QUALITY CONTROL

There were five problems on this project with regard to quality control of field welded moment connections which seem to stand out :

1. **Unqualified welders were assigned to and allowed to weld moment connections.** This happened for several reasons. First, the General Contractor did not provide welder qualification test records for a number of welders, as was required before beginning welding, to the Corps of Engineers for review until after welding was completed. A number of these qualification records turned out to be in violation of contract and, in some cases, code requirements. It is unclear whether or not the General Contractor had possession of this information earlier or not. Second, the VT Inspector was not given access to the welder qualification records by the General Contractor so he could not verify whether the welders were qualified or not. Third, while the weld inspection reports clearly indicate the welder identification stencils for each moment connection weld, the General Contractor QC Staff and the Corps of Engineers QA Inspector apparently did not properly monitor these reports and check the noted weld stencils against qualifications on file. If they had, the fact that many of the welders had no qualifications on file, or that they were not properly qualified for the welding procedure used for moment connection welds should have been easily detected and corrected.

The data from the welding reports shows that, not surprisingly, these unqualified welders had very high reject rates indicative of poor welding. This should not have happened with proper execution and enforcement of the contract provisions, which were clear and rather stringent with respect to welder qualification requirements. In this case the contract specifications and codes appeared able to provide for the use of properly qualified welders, but those provisions were not followed or adequately enforced by the General Contractor and Corps of Engineers.

2. **Overall welder performance was poor.** The use of unqualified welders obviously was the primary contributor to this result. Some doubts were also raised concerning the experience level of the testing lab which conducted welder qualification testing for the union local on several welders whose qualifications were acknowledged by the Corps of Engineers. By the time several of the union local qualified welders began

welding on the project their qualifications may have been lapsed. Inspector #1 also indicated that the welding procedure specifications were not made available to the welders and that several of the welders had little idea what the proper welding procedure was supposed to be. If welders are unfamiliar with the procedure specifications or choose not to follow them, a principal goal of the welding code - to assure the use of procedures which have previously been shown to produce good welds - is defeated. This can have a quite detrimental effect on final wled quality.

3. **There were "misunderstandings" about contract obligations.** The General Contractor was under the mistaken impression that the Corps of Engineers had approved welding procedure specifications and welder qualifications, thus making it unnecessary for the Inspection Company to verify them. Consequently, the General Contractor declined to provide that information to the Inspection Company which prevented it from fulfilling its responsibility to verify that all procedure specifications are in accordance with requirements and that all welders are properly qualified. Had the Inspection Company been in possession of this information, it is less likely that unqualified welders would have been allowed to weld and more likely that the proper welding prodedures would have been followed.

In the Quality Control Work Plan submitted by the Testing Lab it was indicated that a set of status plans would be kept (presumably by the Inspection Company) that would show the completion and inspection status of all field welded moment connections. This apparently got lost in the cracks and did not make it into the Inspection Company's subcontract with the Testing Lab so the status plans were never kept. Had these plans been kept up it is less likely that repairs and inspections would have been missed, since there would have existed a clear graphic picture of where inspection stood at any time. This information in this form, rather than being parceled across several weld inspection reports, would have made the status of welding completion and inspection more readily apparent to everyone, including the Corps of Engineeers' QA Inspectors.

4. **The Erector was not cooperative in providing access for the inspectors.** The Erector apparently became uncooperative in providing the Inspection Company access to inspect the welding. The Inspection Company informed the General Contractor who was not helpful in resolving this problem. The Inspection Company successfully took it upon itself to solve the access problem and was thus able to complete thorough inspections. Had

the Inspection Company not been so resourceful and aggressive, it is possible that a great deal of the specified inspection might not have been completed.

5. **There was ineffective General Contractor and Corps of Engineers QC/QA oversight.** With the number of contract requirements that were not met and the lack of objection raised during the course of work, it suggests that both the QC and QA Inspectors were somewhat lax in monitoring the work. Required submittals were not received, unqualified welders were welding, several welders had excessively high rejection rates, the General Contractor failed to supply the Inspection Company with current drawings and necessary information about welding procedures and welder qualifications , some rejected welds were unrepaired, and the Erector was not complying with its responsibility to provide the inspectors with access to the work. The Quality Control Staff is in theory not supposed to allow any of this to happen and the Quality Assurance inspector is supposed to note and demand correction where contract requirements are not being met.

In the case of the Corps of Engineers QA inspector, the person assigned to monitor structural steel erection did not have a background in structures and had had little or no prior experience with structural steel. The inspector did not carry drawings in the field, did not have copies of the applicable AWS or AISC codes, did not keep a list of submitted qualified welder names and stencils, did not keep a checklist of submittals, and did not until late in the job begin to keep a list of rejected welds to be repaired. It is quite possible that the QA Inspector had very little idea what the contract requirements were with respect to the field welding of moment connections and was thus in no position to enforce them.

There were two successes which seem to stand out:

1. **Despite poor overall welder performance, good overall welding quality was achieved.** The final state of the field welded moment connections would have to be described as good. Thorough and diligent independent inspection identified the many defective welds and verified that repairs had been made. The data from the weld reports indicates that 99% of the moment connections were fully inspected and verified as being in compliance with contract requirements. This level of inspection was acheived despite difficulties in getting access to the work and in getting complete information.

2. **The contract was written with good provisions for level of inspection, inspector qualifications, and submittal requirements.** The contract specified extensive

inspection requirements - 100% visual and ultrasonic inspection of all moment connection welds. This compensated for the problems with welder quality by allowing for complete, independent scrutiny of the finished product. The contract provisions requiring AWS and ASNT certification of visual and ultrasonic inspectors, respectively, helped assure that competent inspectors were looking at the welds. The contract requirement for an independent testing agency to conduct acceptance inspection got that critical role away from the possibly conflicting interests of the Erector and General Contractor. The contract requirements for identification of welds and for detailed daily reporting of inspections provided for the recording of a great deal of useful information about each weld. The requirements to submit work plans, certifications, and procedure specificatons, to the extent that they were followed, forced the Erector to lay out how it planned to execute and control the work before starting. This would normally allow the QC/QA Inspectors a chance to prepare better for inspecting the work and to have a written plan to which the Erector could be held during the course of work.

SECTION 8: SUGGESTED PRACTICES TO MITIGATE OBSERVED PROBLEMS AND REINFORCE OBSERVED SUCCESSES

Options to increase the probabilty of getting good verification inspectors

The experience of this project has shown that to get good quality it is absolutely necessary to have a good verification inspector. As a minimum, the contract should specify AWS Certified Welding Inspector certification for all visual inspectors and ASNT Level II certification for all ultrasonic inspectors. However, as will be discussed below, these certifications are not necessarily unqualified assurance that the inspector is sufficiently knowledgeable and experienced to provide thorough, high-quality inspection. While AWS and ASNT inspector certification programs have been successful at producing competent weld inspectors, for certain types of projects requiring a high level of confidence in welding quality owners might wish to consider augmenting the AWS and ASNT inspector qualification requirements in their specifications in order to increase their confidence of getting top-flight weld inspectors. Such projects might include critical facilities such as hospitals or energy-producing facilities, multi-story buildings in zones of high seismic risk where welded connections are critical parts of the lateral force resisting system, or buildings housing commercial operations whose disruption would result in severe economic loss. Large Corps of Engineers' projects such as Brooke Army Medical Center would fall into this category. Three areas of possible concern are the use of "apprentice" inspectors, AWS visual inspector certification criteria, and ASNT ultrasonic inspector certification criteria.

While the importance of apprenticeship of inspectors cannot be denied, it is recommended that for quality critical projects owners consider tighter restriction or even deletion of the code allowance for AWS Certified Associate Welding Inspectors (CAWI) working under the "supervision" of a CWI and for ASNT Level I operators working under the "supervision" of a Level II inspector. This will eliminate the possibility of the word "supervision" being stretched so that the lesser qualified personnel are effectively working independently. If the allownace is not deleted altogether it is recommended that the specifications require the Inspection Company to submit a detailed plan outlining the exact duties a CAWI or Level I operator will perform and the exact nature, extent, and frequency of their supervison.

Also, there could be some concern that AWS CWI certification may not necessarily be a categorical indication of competence. To qualify to take the CWI exam one needs to file an education and experience affidavit, signed only by one's present supervisor, indicating the proper education level and length of experience in a welding related field. Mr. Jeff Huffsey, Director of Certification for AWS, confirmed to the author that, due to the great volume of applications and due to the limitations of available staff, the experience affidavits are seldom checked unless there is a glaring incongruity in them. Having submitted the experience listing and having passed an eye examination, one may sit for the CWI exam. The exam consists of three parts: (1) Fundamentals, which tests general knowledge of welding technology, (2) Practical, which tests facility with actual inspection tools and practices, and (3) Code, which tests facility with the welding code. One passes and receives the CWI certification if they score 71% or above on each of the three parts. If someone scores in the 50% to 70% range on any or all of the three parts, they qualify as a CAWI (AWS, 1988, *AWS QC-1-88*, sec. 6.1). Mr. Huffsey also indicated the passing rate is about 75% of examinees. It is not so difficult to envison someone with some stretched experience scoring straight seventy-two's and thus becoming a CWI. This arguably does not constitute an confidence-inspiring command of welding technology. Such a person would be have been as qualified to be a visual inspector on the Brooke Army Medical Center project as would have an inspector who scored perfectly on all parts. Inspector #1 volunteered to the author that his scores were in the 90's on all three parts of the most recent CWI exam he took.

Again, for quality-critical projects it may be worth considering some methods to gain higher assurance that the visual inspector is truly knowledgeable. One possible tactic is to require that the visual inspector also submit his CWI exam test grades and that minimum acceptable grades on each part would be something well above 71%, perhaps 85% on Fundamentals and 90% on Code and Practical. This could provide more confidence that the inspector is in good command of the subject. Another possibility is to require that the visual inspector be approved subject to the satisfactory results of an interview with the Engineer of Record, or some other suitable authority, where the inspector's knowledge of the AWS Code and of welding technology could be verified. A third option is to require that, in addition to having AWS CWI certification, the inspector will have passed the welding inspector's test administered by the International Conference of Building Officials (ICBO).

Inspector #1, who has taken and passed this test, indicates that it is much more difficult and much more comprehensive than the AWS CWI exam.

There is also a concern that certification as an ASNT Level II Ultrasonic inspector alone may not be sufficient guarantee that the inspector has the necessary skill level to give each weld a thorough inspection. Depending on a candidate's education level, the ASNT recommended training for Level II Ultrasonic certification ranges from 64 to 120 hours and the level of recommended experience is 12 months. Of that 12 months, it is possible that as little as 25% of it may be spent actually doing ultrasonic inspection and some lesser part of that 25% may be actual scope time (ASNT, 1984, Table 6.3.1). Inspector #1 indicated that he felt it took about a year of using the ultrasonic testing equipment full-time before one really becomes familiar enough with the nuances of it and with how to approach different joint configurations to be able to consistently get a good look at the whole weld. With this in mind it may be a good idea to consider specifying that the ultrasonic inspector should have a minimum of one year of full-time experience at the ASNT Level II certification prior to beginning work on the project and be able to demonstrate that he has logged a sufficient number of hours of scope time, perhaps 750 to 1000, prior to beginning work on the project. Inspector #1 estimated that he had logged approximately 1500 hours of scope time prior to beginning work on the Brooke Army Medical Center project.

Options to increase the probability of getting properly qualified welders

While it has been shown on this project that with good inspection quality welding can still be achieved, even if the welders are not so good, the odds of getting quality welding dramatically increase if the welders used are also good. The AWS code requirements for qualifying welders are well-established and well-tested. If followed properly, the welder qualification procedures should produce competent welders. This project showed that the code requirements are always in danger of not being followed properly. Welder certifications may not be reviewed properly, contractors may hire welders who have qualifications which are lapsed, and the VT Inspector may not be given copies of the qualification test records to review. Given this it would seem prudent to take as much of the uncertainty as possible out of qualifying welders, particularly for large, complex jobs. It is recommended that all welders simply be required to pass a qualification test, either administered by or witnessed by the verification VT Inspector for the project, within 10 days prior to beginning welding on the project. The only exception would be for welders who have

been last qualified by the welding contractor and have remained in the welding contractor's employ as a welder for at least two years. They could be accepted provided a copy of a certified qualification test record and records certified by an officer of the welding contractor showing that the welder has been continuously engaged in the type of welding for which qualified since the date of qualification are submitted.

To help make sure that the qualified welders are familiar with the procedures to be used it is also recommended that it be specified that copies of all welding procedure specifications be kept by each welding crew foreman and be made readily available to the welders. To make it easier to verify that only properly qualified welders are being used it is recommended that it be specified that the welding contractor is to submit a report on a weekly basis indicating the names and stencils of all welders who welded during that week, the type of connections they worked on, and the procedure specifications they used.

Options for increasing the probability of having a competent QA Inspector/Owner's Representative for structural welding

The ability to achieve good quality field welding suffers greatly when the QA Inspector or, for a private sector job, the Owner's Representative is not familiar enough with the contract requirements to enforce them. It is recommended that anyone who will be directly monitoring the contractor's field welding performance, particularly on a large project, be provided with the AWS week-long CWI training. This course is generally provided as a review for taking the CWI exam but, even for someone not qualified to sit for the exam, it is a valuable course providing excellent coverage of basic welding technology, the *AWS D1.1* code, and visual inspection tools and techniques. Someone who has gone through this training may not necessarily be a competent welding inspector, but they will have an understanding of the importance of and details of welding procedure specifications and welder qualifications, welding processes, welding positions, joint types, inspector qualifications, and inspector responsibilities. With this knowledge and understanding the QA Inspector/Owner's Representative is in a better position to confidently monitor the welding work and to vigorously enforce contract requirements. Should the QA inspector happen to obtain the CWI certification, the added advantage of having increased technical authority when dealing with the contractor and the verification inspector can be gained.

Options for insuring good tracking of the status of welding

It was evidenced on this project that no one other than the Inspection Company appeared to be keeping track of the status of inspections and no one was keeping track of welder qualifications. This exhibits the possibility that unless a tracking or reporting practice is specifically mentioned in the contract specifications it may not get done. Consequently, it is recommended that it be specified that a marked-up set of plans showing the status of all welded connections be maintained and kept current by someone, preferably the independent verification inspector, and be made available to the QA Inspector/Owner's Representative on demand. This will provide a well-organized, graphic, easily monitored means of tracking the status of welds and should reduce the possibility of missed inspections, unrepaired welds, and placing concrete over incomplete areas. It should also be specified that the independent verification inspector maintain a list of all qualified welders and of all rejected welds.

Providing for independent verification inspection

Contractors get paid for putting it up, not necessarily for putting it up right. Particularly when schedules and budgets are tight, the contractor will be less concerned with providing adequate inspection of their own work. The independent verification inspector is the lynchpin of field welding quality control. The independent inspector is the only knowledgeable party whose interests are unaffected by schedule, cost of production, or expediency concerns in the pursuit of welding in conformance with the contract requirements. Acceptance inspection responsibility should always be assigned to an independent inspector. Any reliance by the contracting entity on contractor personnel inspection for acceptance of welded moment connections is risky and may not result in satisfactory quality.

Providing a safety net with full nondestructive inspection

Because of the potential for a breakdown in one or more areas of the QC/QA system, as was evidenced in this project, it is recommended that the inspection coverage be as wide as possible to compensate for that possibility. Consequently, for all beam full-penetration welds in moment connections, whether in moment frames or not, it is recommended that 100% nondestructive testing by ultrasound be specified.

Options for QA/Owner control of information without confusion about approval responsibility

Because the more information the QA Inspector/Owner's Representative has, the stronger his position will be, and the better he will be able to monitor compliance, it is recommended that the specifications require the contractor to submit all pertinent information, including quality control work plans, welding procedure specifications, welder qualification test records, qualified welder lists with assigned stencils, welding detail drawings, inspector qualifications, inspection procedures, inspection reports, and repair lists. So that there will not be any confusion on the General Contractor's part about approval responsibilities, it is recommended that all submittals be specified to be "For Information Only." This leaves the General Contractor with full responsibility for approval of submittals but gives the QA staff the opportunity to point out noncomforming items which the General Contractor is still obligated to correct.

Options to help eliminate problems regarding inspector access

It is recommended that the mutual obligations for the Inspector to provide timely inspection and the Erector to provide the independent inspector with access to the inspectable work be specifically mentioned in the contract specifications. This will get that important point into the record. Also, it is recommended that the independent inspector's work plan be required to include a section on how timely inspection will be accomplished and that the Erector's work plan be required to include a section on how access will be provided for the independent inspector. This will force each party to formulate a written plan to which they can be held.

APPENDIX A - Tabularized Summary of Moment Connection Weld Inspection Reports

Key Notes to Table A1:

Connection Notes: Characters to the left of the hyphen are sequential identifiers. An "R" to the left of the hyphen indicates the connection was in the Research Building. To the right of the hyphen T and B indicate top and bottom flanges. Type 3 moment connections had a middle joint which is indicated by M. An "R#" to the right of the hyphen indicates a repaired weld and the number of the repair attempt.

Visual Remarks Notes: Abbreviations were used for visual rejects as noted below.

UC = Undercut

S = Slag Inclusion

UF = Underfill

FG = Flange Gouge

ER = Excessive Reinforcement

FM = Flange Misalignment

INC = Incomplete/Missing Weld

P = Porosity

UP = Unacceptable Profile

CL = Cold Lap

EWB = Excessive Weld Bead

IRO = Insufficient Root Opening

LOF = Lack of Fusion

Ultrasonic Result Notes: NRI indicates No Rejectable Indications

TABLE A1: SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC1-T	1F	1	11/13/92	7	Pass	OK	1	11/13/92	7	NRI	OK	
MC1-B	1F	1	11/13/92	7	Pass	OK	1	11/13/92	7	NRI	OK	
MC2-T	1F	1	11/16/92	8	Pass	OK	1	11/16/92	8	NRI	OK	
MC2-M	1F	1	11/16/92	8	Pass	OK	1	11/16/92	8	NRI	OK	
MC2-B	1F	1	11/16/92	8	Pass	OK	1	11/16/92	8	NRI	OK	
MC3-T	1F	1	11/16/92	8	Pass	OK	1	11/16/92	8	Reject	Class A	
MC3-TR1	1F	1	11/23/92	9	Fail	UC,S	No UT Inspection - Failed Visual Inspection					
MC3-TR2	24F	1	11/11/93	251	Pass	OK	1	11/11/93	251	NRI	OK	
MC3-M	1F	1	11/16/92	8	Pass	OK	1	11/16/92	8	Reject	Class A	
MC3-MR1	24F	1	11/11/93	251	Pass	OK	1	11/11/93	251	NRI	OK	
MC3-B	1F	1	11/16/92	8	Pass	OK	1	11/16/92	8	Reject	Class A	
MC3-BR1	1F	1	11/23/92	9	Pass	OK	1	11/23/92	9	Reject	Class A	
MC3-BR2	24F	1	11/11/93	251	Pass	OK	1	11/11/93	251	NRI	OK	
MC4-TE	1F	1	11/16/92	8	Pass	OK	1	11/16/92	8	Reject	Class A	
MC4-TER1	1F	1	11/23/92	9	Pass	OK	1	11/23/92	9	Reject	Class A	
MC4-TER2	1F	3	12/15/92	15	Pass	OK	1	12/15/92	15	NRI	OK	
MC4-TW	1F	1	11/16/92	8	Pass	OK	1	11/16/92	8	Reject	Class A	
MC4-TWR1	1F	1	11/23/92	9	Pass	OK	1	11/23/92	9	Reject	Class A	
MC4-TWR2	1F	3	12/15/92	15	Pass	OK	1	12/15/92	15	NRI	OK	
MC4-BE	1F	1	11/23/92	9	Pass	OK	1	11/23/92	9	NRI	OK	
MC4-BW	1F	1	11/23/92	9	Pass	OK	1	11/23/92	9	NRI	OK	
MC5-T	1F	1	11/23/92	9	Pass	OK	1	11/23/92	9	NRI	OK	
MC5-M	1F	1	11/23/92	9	Pass	OK	1	11/23/92	9	NRI	OK	
MC5-B	1F	1	11/23/92	9	Pass	OK	1	11/23/92	9	NRI	OK	
MC6-T	1F	3	12/07/92	13	Pass	OK	1	12/07/92	13	NRI	OK	
MC6-M	1F	3	12/07/92	13	Pass	OK	1	12/07/92	13	NRI	OK	
MC6-B	1F	3	12/07/92	13	Pass	OK	1	12/07/92	13	NRI	OK	
MC7-T	1F	3	12/07/92	13	Pass	OK	1	12/07/92	13	NRI	OK	
MC7-M	1F	3	12/07/92	13	Pass	OK	1	12/07/92	13	NRI	OK	
MC7-B	1F	3	12/07/92	13	Pass	OK	1	12/07/92	13	NRI	OK	
MC8-T	1F	3	12/07/92	13	Pass	OK	1	12/07/92	13	NRI	OK	
MC8-M	1F	3	12/07/92	13	Pass	OK	1	12/07/92	13	NRI	OK	
MC8-B	1F	3	12/07/92	13	Pass	OK	1	12/07/92	13	NRI	OK	
MC9-TE	1F	3	12/07/92	13	Pass	OK	1	12/07/92	13	NRI	OK	
MC9-BE	1F	3	12/07/92	13	Pass	OK	1	12/07/92	13	NRI	OK	
MC9-TW	1F	3	12/07/92	13	Pass	OK	1	12/07/92	13	NRI	OK	
MC9-BW	1F	3	12/07/92	13	Pass	OK	1	12/07/92	13	NRI	OK	
MC10-T	1F	3	12/07/92	13	Pass	OK	1	12/07/92	13	NRI	OK	
MC10-B	1F	3	12/07/92	13	Pass	OK	1	12/07/92	13	NRI	OK	
MC11-TN	1F	3	12/15/92	15	Pass	OK	1	12/15/92	15	NRI	OK	
MC11-BN	1F	3	12/15/92	15	Pass	OK	1	12/15/92	15	NRI	OK	
MC11-TS	1F	3	12/15/92	15	Pass	OK	1	12/15/92	15	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC11-BS	1F	3	12/15/92	15	Pass	OK	1	12/15/92	15	NRI	OK	
MC12-T	1F	3	12/15/92	15	Pass	OK	1	12/15/92	15	NRI	OK	
MC12-B	1F	3	12/15/92	15	Pass	OK	1	12/15/92	15	NRI	OK	
MC13-T	1F	3	12/15/92	15	Pass	OK	1	12/15/92	15	NRI	OK	
MC13-B	1F	3	12/15/92	15	Pass	OK	1	12/15/92	15	NRI	OK	
MC14-T	3F	1	12/28/92	17	Pass	OK	1	12/28/92	17	NRI	OK	
MC14-B	3F	1	12/28/92	17	Pass	OK	1	12/28/92	17	NRI	OK	
MC15-T	3F	1	12/28/92	17	Pass	OK	1	12/28/92	17	NRI	OK	
MC15-B	3F	1	12/28/92	17	Pass	OK	1	12/28/92	17	NRI	OK	
MC16-TN	NS	3	12/31/92	20	Pass	OK	1	12/31/92	20	NRI	OK	
MC16-BN	NS	3	12/31/92	20	Pass	OK	1	12/31/92	20	NRI	OK	
MC16-TS	NS	3	12/31/92	20	Pass	OK	1	12/31/92	20	NRI	OK	
MC16-BS	NS	3	12/31/92	20	Pass	OK	1	12/31/92	20	NRI	OK	
MC17-TS	1F	3	12/31/92	20	Pass	OK	1	12/31/92	20	NRI	OK	
MC17-BS	1F	3	12/31/92	20	Pass	OK	1	12/31/92	20	NRI	OK	
MC17-TN	1F	3	12/31/92	20	Pass	OK	1	12/31/92	20	NRI	OK	
MC17-BN	1F	3	12/31/92	20	Pass	OK	1	12/31/92	20	NRI	OK	
MC18-T	1F	3	12/31/92	20	Pass	OK	1	12/31/92	20	NRI	OK	
MC18-B	1F	3	12/31/92	20	Pass	OK	1	12/31/92	20	NRI	OK	
MC19-T	1F	3	12/31/92	20	Pass	OK	1	12/31/92	20	NRI	OK	
MC19-B	1F	3	12/31/92	20	Pass	OK	1	12/31/92	20	NRI	OK	
MC20-T	1F	3	12/31/92	20	Pass	OK	1	12/31/92	20	NRI	OK	
MC20-B	1F	3	12/31/92	20	Pass	OK	1	12/31/92	20	NRI	OK	
MC21-T	1F	3	12/31/92	20	Pass	OK	1	12/31/92	20	NRI	OK	
MC21-B	1F	3	12/31/92	20	Pass	OK	1	12/31/92	20	NRI	OK	
MC22-TN	1F	3	12/31/92	20	Pass	OK	1	12/31/92	20	NRI	OK	
MC22-BN	1F	3	12/31/92	20	Pass	OK	1	12/31/92	20	NRI	OK	
MC22-TS	1F	3	12/31/92	20	Pass	OK	1	12/31/92	20	NRI	OK	
MC22-BS	1F	3	12/31/92	20	Pass	OK	1	12/31/92	20	NRI	OK	
MC23-TN	1F	3	12/31/92	20	Pass	OK	1	12/31/92	20	NRI	OK	
MC23-BN	1F	3	12/31/92	20	Pass	OK	1	12/31/92	20	NRI	OK	
MC23-TS	1F	3	12/31/92	20	Pass	OK	1	12/31/92	20	NRI	OK	
MC23-BS	1F	3	12/31/92	20	Pass	OK	1	12/31/92	20	NRI	OK	
MC24-T		No Record of Visual Inspection					No Record of Ultrasonic Inspection					Weld Not Inspected
MC24-B		No Record of Visual Inspection					No Record of Ultrasonic Inspection					Weld Not Inspected
MC25-T	1F	3	01/04/93	21	Pass	OK	2	01/04/93	21	NRI	OK	
MC25-B	1F	3	01/04/93	21	Pass	OK	2	01/04/93	21	NRI	OK	
MC26-T	1F	3	01/04/93	21	Pass	OK	2	01/04/93	21	NRI	OK	
MC26-B	1F	3	01/04/93	21	Pass	OK	2	01/04/93	21	NRI	OK	
MC27-T	1F	3	01/04/93	21	Pass	OK	2	01/04/93	21	NRI	OK	
MC27-B	1F	3	01/04/93	21	Pass	OK	2	01/04/93	21	NRI	OK	
MC28-T	1F	3	01/04/93	21	Pass	OK	2	01/04/93	21	NRI	OK	
MC28-B	1F	3	01/04/93	21	Pass	OK	2	01/04/93	21	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC29-T	1F	3	01/04/93	21	Pass	OK	2	01/04/93	21	NRI	OK	
MC29-B	1F	3	01/04/93	21	Pass	OK	2	01/04/93	21	NRI	OK	
MC30-T	1F	2	01/13/93	28	Pass	OK	2	01/13/93	28	NRI	OK	
MC30-B	1F	2	01/13/93	28	Pass	OK	2	01/13/93	28	NRI	OK	
MC31-T	1F	2	01/13/93	28	Pass	OK	2	01/13/93	28	NRI	OK	
MC31-B	1F	2	01/13/93	28	Pass	OK	2	01/13/93	28	NRI	OK	
MC32-T	1F	2	01/13/93	28	Pass	OK	2	01/13/93	28	NRI	OK	
MC32-B	1F	2	01/13/93	28	Pass	OK	2	01/13/93	28	NRI	OK	
MC33-T	1F	2	01/13/93	28	Pass	OK	2	01/13/93	28	NRI	OK	
MC33-B	1F	2	01/13/93	28	Pass	OK	2	01/13/93	28	NRI	OK	
MC34-T	1F	2	01/13/93	28	Pass	OK	2	01/13/93	28	NRI	OK	
MC34-B	1F	2	01/13/93	28	Pass	OK	2	01/13/93	28	NRI	OK	
MC35-T	1F	2	01/13/93	28	Pass	OK	2	01/13/93	28	NRI	OK	
MC35-B	1F	2	01/13/93	28	Pass	OK	2	01/13/93	28	NRI	OK	
MC36-T	1F	1	01/14/93	29	Pass	OK	1	01/14/93	29	NRI	OK	
MC36-B	1F	1	01/14/93	29	Pass	OK	1	01/14/93	29	NRI	OK	
MC37-T	1F	1	01/14/93	29	Pass	OK	1	01/14/93	29	NRI	OK	
MC37-B	1F	1	01/14/93	29	Pass	OK	1	01/14/93	29	NRI	OK	
MC38-T	1F	1	01/20/93	33	Pass	OK	1	01/20/93	33	NRI	OK	
MC38-B	1F	1	01/20/93	33	Pass	OK	1	01/20/93	33	NRI	OK	
MC39-T	1F	1	01/20/93	33	Pass	OK	1	01/20/93	33	NRI	OK	
MC39-B	1F	1	01/20/93	33	Pass	OK	1	01/20/93	33	NRI	OK	
MC40-T	1F	1	01/20/93	33	Pass	OK	1	01/20/93	33	NRI	OK	
MC40-B	1F	1	01/20/93	33	Pass	OK	1	01/20/93	33	NRI	OK	
MC41-T	1F	1	01/20/93	33	Pass	OK	1	01/20/93	33	NRI	OK	
MC41-B	1F	1	01/20/93	33	Pass	OK	1	01/20/93	33	NRI	OK	
MC42-T	1F	1	01/20/93	33	Pass	OK	1	01/20/93	33	NRI	OK	
MC42-B	1F	1	01/20/93	33	Pass	OK	1	01/20/93	33	NRI	OK	
MC43-T	1F	1	01/20/93	33	Pass	OK	1	01/20/93	33	NRI	OK	
MC43-B	1F	1	01/20/93	33	Pass	OK	1	01/20/93	33	NRI	OK	
MC44-T	1F	1	01/20/93	33	Pass	OK	1	01/20/93	33	NRI	OK	
MC44-B	1F	1	01/20/93	33	Pass	OK	1	01/20/93	33	NRI	OK	
MC45-T	1F	1	01/20/93	33	Pass	OK	1	01/20/93	33	NRI	OK	
MC45-B	1F	1	01/20/93	33	Pass	OK	1	01/20/93	33	NRI	OK	
MC46-T	1F	1	01/20/93	33	Pass	OK	1	01/20/93	33	NRI	OK	
MC46-B	1F	1	01/20/93	33	Pass	OK	1	01/20/93	33	NRI	OK	
MC47-T	1F	1	01/25/93	36	Pass	OK	1	01/25/93	36	NRI	OK	
MC47-B	1F	1	01/25/93	36	Pass	OK	1	01/25/93	36	NRI	OK	
MC48-T	1F	1	01/25/93	36	Pass	OK	1	01/25/93	36	NRI	OK	
MC48-B	1F	1	01/25/93	36	Pass	OK	1	01/25/93	36	NRI	OK	
MC49-T	1F	1	01/25/93	36	Pass	OK	1	01/25/93	36	NRI	OK	
MC49-B	1F	1	01/25/93	36	Pass	OK	1	01/25/93	36	NRI	OK	
MC50-T	1F	1	01/25/93	36	Pass	OK	1	01/25/93	36	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC50-B	1F	1	01/25/93	36	Pass	OK	1	01/25/93	36	NRI	OK	
MC51-T	1F	1	01/25/93	36	Pass	OK	1	01/25/93	36	NRI	OK	
MC51-B	1F	1	01/25/93	36	Pass	OK	1	01/25/93	36	NRI	OK	
MC52-T	1F	1	01/25/93	36	Pass	OK	1	01/25/93	36	NRI	OK	
MC52-B	1F	1	01/25/93	36	Pass	OK	1	01/25/93	36	NRI	OK	
MC53-T	1F	1	01/25/93	36	Pass	OK	1	01/25/93	36	NRI	OK	
MC53-B	1F	1	01/25/93	36	Pass	OK	1	01/25/93	36	NRI	OK	
MC54-T	1F	1	01/25/93	36	Pass	OK	1	01/25/93	36	NRI	OK	
MC54-B	1F	1	01/25/93	36	Pass	OK	1	01/25/93	36	NRI	OK	
MC55-T	1F	1	01/25/93	36	Pass	OK	1	01/25/93	36	NRI	OK	
MC55-B	1F	1	01/25/93	36	Pass	OK	1	01/25/93	36	NRI	OK	
MC56-T	1F	1	01/25/93	36	Pass	OK	1	01/25/93	36	NRI	OK	
MC56-B	1F	1	01/25/93	36	Pass	OK	1	01/25/93	36	NRI	OK	
MC57-T	1F	1	01/25/93	36	Pass	OK	1	01/25/93	36	NRI	OK	
MC57-B	1F	1	01/25/93	36	Pass	OK	1	01/25/93	36	NRI	OK	
MC58-T	1F	1	01/25/93	36	Pass	OK	1	01/25/93	36	NRI	OK	
MC58-B	1F	1	01/25/93	36	Pass	OK	1	01/25/93	36	NRI	OK	
MC59-T	1F	1	01/28/93	39	Pass	OK	1	01/28/93	39	NRI	OK	
MC59-B	1F	1	01/28/93	39	Pass	OK	1	01/28/93	39	NRI	OK	
MC60-T	1F	1	01/28/93	39	Pass	OK	1	01/28/93	39	NRI	OK	
MC60-B	1F	1	01/28/93	39	Pass	OK	1	01/28/93	39	NRI	OK	
MC61-T	1F	1	01/28/93	39	Pass	OK	1	01/28/93	39	NRI	OK	
MC61-B	1F	1	01/28/93	39	Pass	OK	1	01/28/93	39	NRI	OK	
MC62-T	1F	1	01/28/93	39	Pass	OK	1	01/28/93	39	NRI	OK	
MC62-B	1F	1	01/28/93	39	Pass	OK	1	01/28/93	39	NRI	OK	
MC63-T	1F	1	01/29/93	40	Pass	OK	1	01/29/93	40	NRI	OK	
MC63-B	1F	1	01/29/93	40	Pass	OK	1	01/29/93	40	NRI	OK	
MC64-T	1F	1	01/29/93	40	Pass	OK	1	01/29/93	40	NRI	OK	
MC64-B	1F	1	01/29/93	40	Pass	OK	1	01/29/93	40	NRI	OK	
MC65-T	1F	1	01/29/93	40	Pass	OK	1	01/29/93	40	NRI	OK	
MC65-B	1F	1	01/29/93	40	Pass	OK	1	01/29/93	40	NRI	OK	
MC66-T	10F	1	01/29/93	40	Pass	OK	1	01/29/93	40	NRI	OK	
MC66-B	10F	1	01/29/93	40	Pass	OK	1	01/29/93	40	NRI	OK	
MC67-T	10F	1	01/29/93	40	Pass	OK	1	01/29/93	40	NRI	OK	
MC67-B	10F	1	01/29/93	40	Pass	OK	1	01/29/93	40	Reject	Class A	
MC67-BR1	10F	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	
MC68-T	1F	1	01/29/93	40	Pass	OK	1	01/29/93	40	NRI	OK	
MC68-B	1F	1	01/29/93	40	Pass	OK	1	01/29/93	40	Reject	Class A	
MC68-BR1	1F	2	02/28/93	62	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC68-BR2	7F	3	03/02/93	64	Pass	OK	2	02/28/93	62	NRI	OK	
MC69-T	1F	1	01/29/93	40	Pass	OK	1	01/29/93	40	NRI	OK	
MC69-B	1F	1	01/29/93	40	Pass	OK	1	01/29/93	40	NRI	OK	
MC70-T		No Record of Visual Inspection					No Record of Ultrasonic Inspection					Weld Not Inspected

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC70-B		No Record of Visual Inspection					No Record of Ultrasonic Inspection					Weld Not Inspected
MC71-T	1F	3	02/03/93	42	Pass	OK	2	02/03/93	42	NRI	OK	
MC71-B	1F	3	02/03/93	42	Pass	OK	2	02/03/93	42	NRI	OK	
MC72-T	NS	3	02/03/93	42	Pass	OK	2	02/03/93	42	NRI	OK	
MC72-B	NS	3	02/03/93	42	Pass	OK	2	02/03/93	42	NRI	OK	
MC73-T	NS	3	02/03/93	42	Pass	OK	2	02/03/93	42	NRI	OK	
MC73-B	NS	3	02/03/93	42	Pass	OK	2	02/03/93	42	NRI	OK	
MC74-T	NS	3	02/03/93	42	Pass	OK	2	02/03/93	42	NRI	OK	
MC74-B	NS	3	02/03/93	42	Fail	UF	No UT Inspection - Failed Visual Ins			NRI	OK	
MC74-BR1	1F	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	
MC75-T	NS	3	02/03/93	42	Pass	OK	2	02/03/93	42	NRI	OK	
MC75-B	NS	3	02/03/93	42	Pass	OK	2	02/03/93	42	NRI	OK	
MC76-T	3F	2	02/09/93	46	Pass	OK	1	02/10/93	47	NRI	OK	
MC76-B	3F	2	02/09/93	46	Pass	OK	1	02/10/93	47	NRI	OK	
MC77-T	3F	2	02/09/93	46	Pass	OK	1	02/10/93	47	NRI	OK	
MC77-B	3F	2	02/09/93	46	Pass	OK	1	02/10/93	47	NRI	OK	
MC78-T	10F	2	02/09/93	46	Pass	OK	1	02/10/93	47	NRI	OK	
MC78-B	10F	2	02/09/93	46	Pass	OK	1	02/10/93	47	NRI	OK	
MC79-T	10F	2	02/09/93	46	Pass	OK	1	02/10/93	47	NRI	OK	
MC79-B	10F	2	02/09/93	46	Pass	OK	1	02/10/93	47	NRI	OK	
MC80-T	10F	2	02/09/93	46	Pass	OK	1	02/10/93	47	NRI	OK	
MC80-B	10F	2	02/09/93	46	Pass	OK	1	02/10/93	47	NRI	OK	
MC81-T	10F	2	02/09/93	46	Pass	OK	1	02/10/93	47	NRI	OK	
MC81-B	10F	2	02/09/93	46	Pass	OK	1	02/10/93	47	NRI	OK	
MC82-T	7F	2	02/09/93	46	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC82-TR1	7F	2	02/10/93	47	Pass	OK	1	02/10/93	47	NRI	OK	
MC82-B	7F	2	02/09/93	46	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC82-BR1	7F	2	02/10/93	47	Pass	OK	1	02/10/93	47	NRI	OK	
MC83-T	7F	2	02/09/93	46	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC83-TR1	7F	2	02/10/93	47	Pass	OK	1	02/10/93	47	NRI	OK	
MC83-B	7F	2	02/09/93	46	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC83-BR1	7F	2	02/10/93	47	Pass	OK	1	02/10/93	47	NRI	OK	
MC84-T	7F	2	02/09/93	46	Pass	OK	1	02/10/93	47	NRI	OK	
MC84-B	7F	2	02/09/93	46	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC84-BR1	7F	2	02/10/93	47	Pass	OK	1	02/10/93	47	NRI	OK	
MC85-T	7F	2	02/10/93	47	Pass	OK	1	02/10/93	47	NRI	OK	
MC85-B	7F	2	02/10/93	47	Pass	OK	1	02/10/93	47	NRI	OK	
MC86-T	7F	2	02/10/93	47	Pass	OK	1	02/10/93	47	NRI	OK	
MC86-B	7F	2	02/10/93	47	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC86-BR1	7F	2	02/10/93	47	Pass	OK	1	02/10/93	47	NRI	OK	
MC87-T	7F	2	02/10/93	47	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC87-TR1	7F	2	02/10/93	47	Pass	OK	1	02/10/93	47	NRI	OK	
MC87-B	7F	2	02/10/93	47	Fail	UF	No UT Inspection - Failed Visual Inspection					

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC87-BR1	7F	2	02/10/93	47	Pass	OK	1	02/10/93	47	NRI	OK	
MC88-T	7F	2	02/10/93	47	Pass	OK	1	02/10/93	47	NRI	OK	
MC88-B	7F	2	02/10/93	47	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC88-BR1	7F	2	02/10/93	47	Pass	OK	1	02/10/93	47	NRI	OK	
MC89S-T	1F	3	02/17/93	52	Pass	OK	2	02/17/93	52	NRI	OK	
MC89S-M	1F	3	02/17/93	52	Pass	OK	2	02/17/93	52	NRI	OK	
MC89S-B	1F	3	02/17/93	52	Pass	OK	2	02/17/93	52	NRI	OK	
MC90W-T	1F	3	02/17/93	52	Pass	OK	2	02/17/93	52	NRI	OK	
MC90W-B	1F	3	02/17/93	52	Pass	OK	2	02/17/93	52	NRI	OK	
MC91E-T	1F	3	02/17/93	52	Pass	OK	2	02/17/93	52	NRI	OK	
MC91E-B	1F	3	02/17/93	52	Pass	OK	2	02/17/93	52	NRI	OK	
MC92-T	1F	3	02/17/93	52	Pass	OK	2	02/17/93	52	NRI	OK	
MC92-B	1F	3	02/17/93	52	Pass	OK	2	02/17/93	52	NRI	OK	
MC93-T	1F	3	02/17/93	52	Pass	OK	2	02/17/93	52	NRI	OK	
MC93-B	1F	3	02/17/93	52	Pass	OK	2	02/17/93	52	NRI	OK	
MC94-T	1F	3	02/17/93	52	Pass	OK	2	02/17/93	52	NRI	OK	
MC94-B	1F	3	02/17/93	52	Pass	OK	2	02/17/93	52	NRI	OK	
MC95-T	1F	3	02/17/93	52	Pass	OK	2	02/17/93	52	NRI	OK	
MC95-B	1F	3	02/17/93	52	Pass	OK	2	02/17/93	52	NRI	OK	
MC96-T	1F	3	02/17/93	52	Pass	OK	2	02/17/93	52	NRI	OK	
MC96-B	1F	3	02/17/93	52	Pass	OK	2	02/17/93	52	NRI	OK	
MC97-T	1F	3	02/17/93	52	Pass	OK	2	02/17/93	52	NRI	OK	
MC97-B	1F	3	02/17/93	52	Pass	OK	2	02/17/93	52	NRI	OK	
MC98-T	1F	3	02/17/93	52	Pass	OK	2	02/17/93	52	NRI	OK	
MC98-B	1F	3	02/17/93	52	Pass	OK	2	02/17/93	52	NRI	OK	
MC99-T	1F	3	02/17/93	52	Pass	OK	2	02/17/93	52	NRI	OK	
MC99-B	1F	3	02/17/93	52	Pass	OK	2	02/17/93	52	NRI	OK	
MC100-T	1F	3	02/12/93	49	Pass	OK	2	02/17/93	52	NRI	OK	
MC100-B	NS	3	02/12/93	49	Pass	OK	2	02/18/93	54	NRI	OK	
MC101-T	NS	3	02/12/93	49	Pass	OK	2	02/18/93	54	NRI	OK	
MC101-B	3F	3	02/12/93	49	Pass	OK	2	02/18/93	54	NRI	OK	
MC102-T	3F	3	02/12/93	49	Pass	OK	2	02/18/93	54	NRI	OK	
MC102-B	3F	3	02/12/93	49	Pass	OK	2	02/18/93	54	NRI	OK	
MC103-T	3F	3	02/12/93	49	Pass	OK	2	02/18/93	54	NRI	OK	
MC103-B	3F	3	02/12/93	49	Pass	OK	2	02/18/93	54	NRI	OK	
MC104-T	3F	3	02/12/93	49	Pass	OK	2	02/19/93	55	NRI	OK	
MC104-B	3F	3	02/12/93	49	Pass	OK	2	02/19/93	55	NRI	OK	
MC104-BR1	3F	3	02/26/93	60	Pass	OK	2	02/19/93	55	Reject	Class A	
MC105-T	3F	3	02/12/93	49	Pass	OK	1	02/26/93	60	NRI	OK	
MC105-B	3F	3	02/12/93	49	Pass	OK	2	02/19/93	55	NRI	OK	
MC106-T	3F	3	02/12/93	49	Pass	OK	2	02/19/93	55	NRI	OK	
MC106-B	3F	3	02/12/93	49	Pass	OK	2	02/19/93	55	NRI	OK	
MC107-T	3F	3	02/12/93	49	Pass	OK	2	02/19/93	55	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC107-B	3F	3	02/12/93	49	Pass	OK	2	02/19/93	55	NRI	OK	
MC108-T	NS	3	02/22/93	56	Pass	OK	1	02/22/93	56	NRI	OK	
MC108-B	NS	3	02/22/93	56	Pass	OK	1	02/22/93	56	NRI	OK	
MC109-T	1F	3	02/22/93	56	Pass	OK	1	02/22/93	56	NRI	OK	
MC109-B	1F	3	02/22/93	56	Pass	OK	1	02/22/93	56	NRI	OK	
MC110-T	NS	3	02/22/93	56	Pass	OK	1	02/27/93	61	NRI	OK	
MC110-B	NS	1	02/27/93	61	Pass	OK	1	02/27/93	61	NRI	OK	
MC111-T	NS	3	02/22/93	56	Pass	OK	1	02/27/93	61	NRI	OK	
MC111-B	NS	1	02/27/93	61	Pass	OK	1	02/27/93	61	NRI	OK	
MC112-T	NS	3	02/22/93	56	Pass	OK	1	02/22/93	56	NRI	OK	
MC112-B	NS	3	02/22/93	56	Pass	OK	1	02/22/93	56	NRI	OK	
MC113-T	NS	3	02/22/93	56	Pass	OK	1	02/28/93	62	NRI	OK	
MC113-B	NS	3	02/22/93	56	Pass	OK	1	02/28/93	62	NRI	OK	
MC114-T	10F	3	02/22/93	56	Pass	OK	1	02/28/93	62	NRI	OK	
MC114-B	10F	1	02/28/93	62	Pass	OK	1	02/28/93	62	NRI	OK	
MC115-T	10F	3	02/22/93	56	Pass	OK	1	02/28/93	62	NRI	OK	
MC115-B	10F	1	02/28/93	62	Pass	OK	1	02/28/93	62	NRI	OK	
MC116-T	1F	3	02/22/93	56	Pass	OK	1	02/28/93	62	NRI	OK	
MC116-M	1F	3	02/22/93	56	Pass	OK	1	02/28/93	62	NRI	OK	
MC116-B	1F	3	02/22/93	56	Pass	OK	1	02/28/93	62	NRI	OK	
MC117-T	1F	3	02/22/93	56	Pass	OK	1	02/28/93	62	NRI	OK	
MC117-B	1F	3	02/22/93	56	Pass	OK	1	02/28/93	62	NRI	OK	
MC118-T	1F	3	02/22/93	56	Pass	OK	1	02/28/93	62	NRI	OK	
MC118-B	1F	3	02/22/93	56	Pass	OK	1	02/28/93	62	NRI	OK	
MC119-T	NS	2	02/23/93	57	Fail	FG	No UT Inspection - Failed Visual Inspection					
MC119-TR1	NS	3	02/24/93	58	Pass	OK	2	02/24/93	58	NRI	OK	
MC119-B	NS	2	02/23/93	57	Pass	OK	2	02/24/93	58	NRI	OK	
MC120-T	NS	2	02/23/93	57	Pass	OK	2	02/23/93	57	NRI	OK	
MC120-B	NS	2	02/23/93	57	Pass	OK	2	02/23/93	57	NRI	OK	
MC121-T	NS	2	02/23/93	57	Pass	OK	2	02/23/93	57	NRI	OK	
MC121-B	NS	2	02/23/93	57	Pass	OK	2	02/23/93	57	NRI	OK	
MC122-T	1F	2	02/23/93	57	Pass	OK	2	02/23/93	57	NRI	OK	
MC122-B	1F	2	02/23/93	57	Pass	OK	2	02/23/93	57	NRI	OK	
MC123-T	1F	2	02/23/93	57	Pass	OK	2	02/23/93	57	NRI	OK	
MC123-B	1F	2	02/23/93	57	Pass	OK	2	02/23/93	57	NRI	OK	
MC124-T	8F	2	02/23/93	57	Pass	OK	2	02/23/93	57	NRI	OK	
MC124-B	8F	2	02/23/93	57	Pass	OK	2	02/23/93	57	NRI	OK	
MC125-T	8F	2	02/23/93	57	Pass	OK	2	02/23/93	57	NRI	OK	
MC125-B	8F	2	02/23/93	57	Pass	OK	2	02/23/93	57	NRI	OK	
MC126-T	1F	2	02/24/93	58	Pass	OK	2	02/24/93	58	NRI	OK	
MC126-B	1F	2	02/24/93	58	Pass	OK	2	02/24/93	58	NRI	OK	
MC127-T	1F	2	02/24/93	58	Pass	OK	2	02/24/93	58	NRI	OK	
MC127-B	1F	2	02/24/93	58	Pass	OK	2	02/24/93	58	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC128-T	1F	2	02/24/93	58	Pass	OK	2	02/24/93	58	NRI	OK	
MC128-B	1F	2	02/24/93	58	Pass	OK	2	02/24/93	58	NRI	OK	
MC129-T	1F	2	02/24/93	58	Pass	OK	2	02/24/93	58	NRI	OK	
MC129-B	1F	2	02/24/93	58	Pass	OK	2	02/24/93	58	NRI	OK	
MC130-T	1F	2	02/24/93	58	Pass	OK	2	02/24/93	58	NRI	OK	
MC130-B	1F	2	02/24/93	58	Pass	OK	2	02/24/93	58	NRI	OK	
MC131-T	1F	2	02/24/93	58	Pass	OK	2	02/24/93	58	NRI	OK	
MC131-B	1F	2	02/24/93	58	Pass	OK	2	02/24/93	58	NRI	OK	
MC132-T	NS	1	02/27/93	61	Pass	OK	1	02/27/93	61	NRI	OK	
MC132-B	NS	1	02/27/93	61	Pass	OK	1	02/27/93	61	NRI	OK	
MC133-T	NS	1	02/27/93	61	Pass	OK	1	02/27/93	61	NRI	OK	
MC133-B	NS	1	02/27/93	61	Pass	OK	1	02/27/93	61	Reject	Class A	
MC133-BR1	1F	3	03/04/93	66	Pass	OK	2	03/04/93	66	NRI	OK	
MC134-T	1F	1	02/27/93	61	Pass	OK	1	02/27/93	61	NRI	OK	
MC134-B	1F	1	02/27/93	61	Pass	OK	1	02/27/93	61	NRI	OK	
MC135-T	1F	1	02/27/93	61	Pass	OK	1	02/27/93	61	NRI	OK	
MC135-B	1F	1	02/27/93	61	Pass	OK	1	02/27/93	61	NRI	OK	
MC136-T	1F	1	02/27/93	61	Pass	OK	1	02/27/93	61	NRI	OK	
MC136-B	1F	1	02/27/93	61	Pass	OK	1	02/27/93	61	NRI	OK	
MC137-T	1F	1	02/27/93	61	Pass	OK	1	02/27/93	61	NRI	OK	
MC137-B	1F	1	02/27/93	61	Pass	OK	1	02/27/93	61	NRI	OK	
MC138-T	10F	1	02/27/93	61	Pass	OK	1	02/27/93	61	NRI	OK	
MC138-B	10F	1	02/27/93	61	Pass	OK	1	02/27/93	61	NRI	OK	
MC139-T	10F	1	02/28/93	62	Pass	OK	1	02/28/93	62	NRI	OK	
MC139-B	10F	1	02/28/93	62	Pass	OK	1	02/28/93	62	NRI	OK	
MC140-T	10F	1	02/28/93	62	Fail	FG	No UT Inspection - Failed Visual Inspection					
MC140-TR1	10F	1	03/19/93	76	Pass	OK	1	03/19/93	76	NRI	OK	
MC140-B	10F	1	02/28/93	62	Pass	OK	1	03/19/93	76	NRI	OK	
MC141-T	10F	1	02/28/93	62	Pass	OK	1	03/19/93	76	NRI	OK	
MC141-B	10F	1	02/28/93	62	Pass	OK	1	03/19/93	76	NRI	OK	
MC142-T	NS	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	
MC142-B	NS	2	02/28/93	62	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC142-BR1	7F	3	03/02/93	64	Pass	OK	2	02/28/93	62	NRI	OK	
MC143-T	NS	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	
MC143-B	NS	2	02/28/93	62	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC143-BR1	7F	3	03/02/93	64	Pass	OK	2	02/28/93	62	NRI	OK	
MC144-T	NS	1	02/28/93	62	Pass	OK	1	02/28/93	62	NRI	OK	
MC144-B	NS	1	02/28/93	62	Pass	OK	1	02/28/93	62	NRI	OK	
MC145-T	1F	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	
MC145-B	1F	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	
MC146-T	1F	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	
MC146-B	1F	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	
MC147-T	1F	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC147-B	1F	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	
MC148-T	3F	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	
MC148-B	3F	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	
MC149-T	NS	1	02/28/93	62	Pass	OK	1	02/28/93	62	NRI	OK	
MC149-B	NS	1	02/28/93	62	Pass	OK	1	02/28/93	62	NRI	OK	
MC150-T	10F	1	02/28/93	62	Pass	OK	1	02/28/93	62	NRI	OK	
MC150-B	10F	1	02/28/93	62	Pass	OK	1	02/28/93	62	NRI	OK	
MC151-T	1F	1	02/28/93	62	Pass	OK	1	02/28/93	62	NRI	OK	
MC151-B	1F	1	02/28/93	62	Pass	OK	1	02/28/93	62	NRI	OK	
MC152-T	3F	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	
MC152-B	3F	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	
MC153-T	3F	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	
MC153-B	3F	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	
MC154-T	3F	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	
MC154-B	3F	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	
MC155-T	3F	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	
MC155-B	3F	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	
MC156-T	3F	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	
MC156-B	3F	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	
MC157-T	3F	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	
MC157-B	3F	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	
MC158-T	3F	1	02/28/93	62	Pass	OK	1	02/28/93	62	NRI	OK	
MC158-B	3F	1	02/28/93	62	Pass	OK	1	02/28/93	62	NRI	OK	
MC159-T	3F	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	
MC159-B	3F	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	
MC160-T	NS	1	02/28/93	62	Pass	OK	1	02/28/93	62	NRI	OK	
MC160-B	NS	1	02/28/93	62	Pass	OK	1	02/28/93	62	NRI	OK	
MC161-T	NS	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	
MC161-B	NS	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	
MC162-T	NS	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	
MC162-B	NS	2	02/28/93	62	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC162-BR1	7F	3	03/02/93	64	Pass	OK	2	02/28/93	62	NRI	OK	
MC163-T	NS	1	02/28/93	62	Pass	OK	1	02/28/93	62	NRI	OK	
MC163-B	NS	1	02/28/93	62	Pass	OK	1	02/28/93	62	NRI	OK	
MC164-T	1F	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	
MC164-B	1F	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	
MC165-T	1F	1	02/28/93	62	Pass	OK	1	02/28/93	62	NRI	OK	
MC165-B	1F	1	02/28/93	62	Pass	OK	1	02/28/93	62	NRI	OK	
MC166-T	1F	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	
MC166-B	1F	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	
MC167-T	1F	1	02/28/93	62	Pass	OK	1	02/28/93	62	NRI	OK	
MC167-B	1F	1	02/28/93	62	Pass	OK	1	02/28/93	62	NRI	OK	
MC168-T	1F	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC168-B	1F	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	
MC169-T	1F	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	
MC169-B	1F	2	02/28/93	62	Pass	OK	2	02/28/93	62	NRI	OK	
MC170-T	1F	1	02/28/93	62	Pass	OK	1	02/28/93	62	NRI	OK	
MC170-B	1F	1	02/28/93	62	Pass	OK	1	02/28/93	62	NRI	OK	
MC171-T	1F	1	02/28/93	62	Pass	OK	1	02/28/93	62	NRI	OK	
MC171-M	1F	1	02/28/93	62	Pass	OK	1	02/28/93	62	NRI	OK	
MC171-B	1F	1	02/28/93	62	Pass	OK	1	02/28/93	62	NRI	OK	
MC172-T	1F	1	02/28/93	62	Pass	OK	1	02/28/93	62	NRI	OK	
MC172-B	1F	1	02/28/93	62	Pass	OK	1	02/28/93	62	NRI	OK	
MC173-T	1F	2	03/04/93	66	Pass	OK	2	03/04/93	66	NRI	OK	
MC173-B	1F	2	03/04/93	66	Pass	OK	2	03/04/93	66	NRI	OK	
MC174-T	1F	2	03/04/93	66	Pass	OK	2	03/04/93	66	NRI	OK	
MC174-B	1F	2	03/04/93	66	Pass	OK	2	03/04/93	66	NRI	OK	
MC175-T	1F	2	03/04/93	66	Pass	OK	2	03/04/93	66	NRI	OK	
MC175-B	1F	2	03/04/93	66	Pass	OK	2	03/04/93	66	NRI	OK	
MC176-T	1F	2	03/04/93	66	Pass	OK	2	03/04/93	66	NRI	OK	
MC176-B	1F	2	03/04/93	66	Pass	OK	2	03/04/93	66	NRI	OK	
MC177-T	1F	2	03/04/93	66	Pass	OK	2	03/04/93	66	NRI	OK	
MC177-B	1F	2	03/04/93	66	Pass	OK	2	03/04/93	66	NRI	OK	
MC178-T	1F	2	03/04/93	66	Pass	OK	2	03/04/93	66	NRI	OK	
MC178-B	1F	2	03/04/93	66	Pass	OK	2	03/04/93	66	NRI	OK	
MC179-T	1F	3	03/05/93	67	Pass	OK	2	03/04/93	66	NRI	OK	
MC179-B	1F	3	03/05/93	67	Pass	OK	1	04/26/93	101	NRI	OK	
MC180-T	1F	3	03/05/93	67	Pass	OK	1	04/26/93	101	NRI	OK	
MC180-B	1F	3	03/05/93	67	Pass	OK	1	04/26/93	101	NRI	OK	
MC181-T	1F	2	03/08/93	68	Pass	OK	1	04/26/93	101	NRI	OK	
MC181-B	1F	2	03/08/93	68	Pass	OK	2	03/08/93	68	NRI	OK	
MC182-T	1F	2	03/08/93	68	Pass	OK	2	03/08/93	68	NRI	OK	
MC182-B	1F	2	03/08/93	68	Pass	OK	2	03/08/93	68	NRI	OK	
MC183-T	1F	2	03/08/93	68	Pass	OK	2	03/08/93	68	NRI	OK	
MC183-B	1F	2	03/08/93	68	Pass	OK	2	03/08/93	68	NRI	OK	
MC184-T	1F	2	03/08/93	68	Pass	OK	2	03/08/93	68	NRI	OK	
MC184-B	1F	2	03/08/93	68	Pass	OK	2	03/08/93	68	NRI	OK	
MC185-T	10F	2	03/08/93	68	Pass	OK	2	03/08/93	68	NRI	OK	
MC185-B	10F	2	03/08/93	68	Pass	OK	2	03/08/93	68	NRI	OK	
MC186-T	NS	2	03/08/93	68	Pass	OK	2	03/08/93	68	NRI	OK	
MC186-B	NS	2	03/08/93	68	Pass	OK	2	03/08/93	68	NRI	OK	
MC187-T	1F	3	03/09/93	69	Pass	OK	2	03/08/93	68	NRI	OK	
MC187-B	1F	3	03/09/93	69	Pass	OK	2	03/11/93	71	NRI	OK	
MC188-T	1F	3	03/09/93	69	Pass	OK	2	03/11/93	71	NRI	OK	
MC188-B	1F	3	03/09/93	69	Pass	OK	2	03/11/93	71	NRI	OK	
MC189-T	1F	3	03/09/93	69	Pass	OK	2	03/11/93	71	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC189-B	1F	3	03/09/93	69	Pass	OK	2	03/11/93	71	NRI	OK	
MC190-T	1F	3	03/09/93	69	Pass	OK	2	03/11/93	71	NRI	OK	
MC190-B	1F	3	03/09/93	69	Pass	OK	2	03/11/93	71	NRI	OK	
MC191-T	1F	2	03/11/93	71	Pass	OK	2	03/11/93	71	NRI	OK	
MC191-B	1F	2	03/11/93	71	Pass	OK	2	03/11/93	71	NRI	OK	
MC192-T	1F	2	03/11/93	71	Pass	OK	2	03/11/93	71	NRI	OK	
MC192-B	1F	2	03/11/93	71	Pass	OK	2	03/11/93	71	NRI	OK	
MC193-T	1F	2	03/11/93	71	Pass	OK	2	03/11/93	71	NRI	OK	
MC193-B	1F	2	03/11/93	71	Pass	OK	2	03/11/93	71	NRI	OK	
MC194-T	1F	2	03/11/93	71	Pass	OK	2	03/11/93	71	NRI	OK	
MC194-B	1F	2	03/11/93	71	Pass	OK	2	03/11/93	71	NRI	OK	
MC195-T	1F	2	03/11/93	71	Pass	OK	2	03/11/93	71	NRI	OK	
MC195-B	1F	2	03/11/93	71	Pass	OK	2	03/11/93	71	NRI	OK	
MC196-T	1F	2	03/11/93	71	Pass	OK	2	03/11/93	71	NRI	OK	
MC196-B	1F	2	03/11/93	71	Pass	OK	2	03/11/93	71	NRI	OK	
MC197-T	1F	2	03/11/93	71	Pass	OK	2	03/11/93	71	NRI	OK	
MC197-B	1F	2	03/11/93	71	Pass	OK	2	03/11/93	71	NRI	OK	
MC198-T	1F	2	03/11/93	71	Pass	OK	2	03/11/93	71	NRI	OK	
MC198-B	1F	2	03/11/93	71	Pass	OK	2	03/11/93	71	NRI	OK	
MC199-T	1F	2	03/11/93	71	Pass	OK	2	03/11/93	71	NRI	OK	
MC199-B	1F	2	03/11/93	71	Pass	OK	2	03/11/93	71	NRI	OK	
MC200-T	10F	3	03/19/93	76	Pass	OK	1	03/19/93	76	NRI	OK	
MC200-B	10F	3	03/19/93	76	Pass	OK	1	03/19/93	76	NRI	OK	
MC201-T	10F	3	03/19/93	76	Pass	OK	1	03/19/93	76	NRI	OK	
MC201-B	10F	3	03/19/93	76	Pass	OK	1	03/19/93	76	NRI	OK	
MC202-T	10F	3	03/19/93	76	Pass	OK	1	03/19/93	76	NRI	OK	
MC202-B	10F	3	03/19/93	76	Pass	OK	1	03/19/93	76	NRI	OK	
MC203-T	10F	3	03/19/93	76	Pass	OK	1	03/19/93	76	NRI	OK	
MC203-B	10F	3	03/19/93	76	Pass	OK	1	03/19/93	76	NRI	OK	
MC204-T	10F	3	03/19/93	76	Pass	OK	1	03/19/93	76	NRI	OK	
MC204-B	10F	3	03/19/93	76	Pass	OK	1	03/19/93	76	NRI	OK	
MC205-T	10F	3	03/19/93	76	Pass	OK	1	03/19/93	76	NRI	OK	
MC205-B	10F	3	03/19/93	76	Pass	OK	1	03/19/93	76	NRI	OK	
MC206-T	10F	3	03/19/93	76	Pass	OK	1	03/19/93	76	NRI	OK	
MC206-B	10F	3	03/19/93	76	Pass	OK	1	03/19/93	76	NRI	OK	
MC207-T	10F	3	03/19/93	76	Pass	OK	1	03/19/93	76	NRI	OK	
MC207-B	10F	3	03/19/93	76	Pass	OK	1	03/19/93	76	NRI	OK	
MC208-T	10F	3	03/19/93	76	Pass	OK	1	03/19/93	76	NRI	OK	
MC208-B	10F	3	03/19/93	76	Pass	OK	1	03/19/93	76	NRI	OK	
MC209-T	10F	3	03/19/93	76	Pass	OK	1	03/19/93	76	NRI	OK	
MC209-B	10F	3	03/19/93	76	Pass	OK	1	03/19/93	76	NRI	OK	
MC210-T	10F	3	03/19/93	76	Pass	OK	1	03/19/93	76	NRI	OK	
MC210-B	10F	3	03/19/93	76	Pass	OK	1	03/19/93	76	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC211-T	8F	2	03/29/93	82	Pass	OK	2	03/29/93	82	NRI	OK	
MC211-B	8F	2	03/29/93	82	Pass	OK	2	03/29/93	82	NRI	OK	
MC212-T	8F	2	03/29/93	82	Pass	OK	2	03/29/93	82	NRI	OK	
MC212-B	8F	2	03/29/93	82	Pass	OK	2	03/29/93	82	NRI	OK	
MC213-T	16F	3	03/29/93	82	Pass	OK	2	03/29/93	82	NRI	OK	
MC213-B	16F	3	03/29/93	82	Pass	OK	2	03/29/93	82	NRI	OK	
MC214-T	16F	3	03/29/93	82	Pass	OK	2	03/29/93	82	NRI	OK	
MC214-B	16F	3	03/29/93	82	Pass	OK	2	03/29/93	82	NRI	OK	
MC215-T	16F	3	03/29/93	82	Pass	OK	2	03/29/93	82	NRI	OK	
MC215-B	16F	3	03/29/93	82	Pass	OK	2	03/29/93	82	NRI	OK	
MC216-T	16F	3	03/29/93	82	Pass	OK	2	03/29/93	82	NRI	OK	
MC216-B	16F	3	03/29/93	82	Pass	OK	2	03/29/93	82	NRI	OK	
MC217-T	NS	2	03/29/93	82	Pass	OK	2	03/29/93	82	NRI	OK	
MC217-B	NS	2	03/29/93	82	Pass	OK	2	03/29/93	82	NRI	OK	
MC218-T	NS	2	03/29/93	82	Pass	OK	2	03/29/93	82	NRI	OK	
MC218-B	NS	2	03/29/93	82	Pass	OK	2	03/29/93	82	NRI	OK	
MC219-T	NS	2	03/29/93	82	Pass	OK	2	03/29/93	82	NRI	OK	
MC219-B	NS	2	03/29/93	82	Pass	OK	2	03/29/93	82	NRI	OK	
MC220-T	NS	2	03/29/93	82	Pass	OK	2	03/29/93	82	NRI	OK	
MC220-B	NS	2	03/29/93	82	Pass	OK	2	03/29/93	82	NRI	OK	
MC221-T	16F	3	03/29/93	82	Pass	OK	2	03/29/93	82	NRI	OK	
MC221-B	16F	3	03/29/93	82	Pass	OK	2	03/29/93	82	NRI	OK	
MC222-T	16F	3	03/30/93	83	Pass	OK	1	04/02/93	86	NRI	OK	
MC222-B	16F	3	03/30/93	83	Pass	OK	1	04/02/93	86	NRI	OK	
MC223-T	16F	3	03/30/93	83	Pass	OK	1	04/02/93	86	NRI	OK	
MC223-B	16F	3	03/30/93	83	Pass	OK	1	04/02/93	86	NRI	OK	
MC224-T	16F	3	03/30/93	83	Pass	OK	1	04/02/93	86	NRI	OK	
MC224-B	16F	3	03/30/93	83	Pass	OK	1	04/02/93	86	NRI	OK	
MC225-T	16F	3	03/30/93	83	Pass	OK	1	04/02/93	86	NRI	OK	
MC225-B	16F	3	03/30/93	83	Pass	OK	1	04/02/93	86	Reject	Class A	
MC225-BR1	16F	3	04/13/93	92	Pass	OK	1	04/13/93	92	NRI	OK	
MC226-T	16F	3	03/30/93	83	Pass	OK	1	04/02/93	86	NRI	OK	
MC226-B	16F	3	03/30/93	83	Pass	OK	1	04/02/93	86	NRI	OK	
MC227-T	16F	1	04/02/93	86	Pass	OK	1	04/02/93	86	NRI	OK	
MC227-B	16F	1	04/02/93	86	Pass	OK	1	04/02/93	86	NRI	OK	
MC228-T	16F	1	04/02/93	86	Pass	OK	1	04/02/93	86	NRI	OK	
MC228-B	16F	1	04/02/93	86	Pass	OK	1	04/02/93	86	NRI	OK	
MC229-T	1F	2	04/05/93	87	Pass	OK	1	04/05/93	87	Reject	Class A	
MC229-TR1	1F	2	04/15/93	94	Pass	OK	2	04/15/93	94	Reject	Class A	
MC229-TR2	1F	2	05/28/93	125	Pass	OK	2	05/28/93	125	NRI	OK	
MC229-M	1F	2	04/05/93	87	Pass	OK	2	04/05/93	87	Reject	Class A	
MC229-MR1	1F	2	04/23/93	100	Pass	OK	2	04/23/93	100	NRI	OK	
MC229-B	1F	2	04/05/93	87	Pass	OK	2	04/05/93	87	Reject	Class A	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC229-BR1	1F	2	04/23/93	100	Pass	OK	2	04/23/93	100	NRI	OK	
MC230-T	1F	2	04/05/93	87	Pass	OK	1	04/05/93	87	Reject	Class A	
MC230-TR1	1F	2	04/21/93	98	Pass	OK	1	04/21/93	98	NRI	OK	
MC230-M	1F	2	04/23/93	100	Pass	OK	2	04/23/93	100	Reject	Class A	
MC230-MR1	1F	2	05/28/93	125	Pass	OK	2	05/28/93	125	NRI	OK	
MC230-B	1F	2	04/23/93	100	Pass	OK	2	04/23/93	100	NRI	OK	
MC231-T	1F	2	04/05/93	87	Pass	OK	1	04/05/93	87	Reject	Class A	
MC231-TR1	1F	2	04/15/93	94	Pass	OK	2	04/15/93	94	NRI	OK	
MC231-M	1F	2	04/23/93	100	Pass	OK	2	04/23/93	100	NRI	OK	
MC231-B	1F	2	04/23/93	100	Pass	OK	2	04/23/93	100	NRI	OK	
MC232-T	1F	2	04/05/93	87	Pass	OK	1	04/05/93	87	NRI	OK	
MC232-M	1F	2	04/23/93	100	Pass	OK	2	04/23/93	100	NRI	OK	
MC232-B	1F	2	04/23/93	100	Pass	OK	2	04/23/93	100	NRI	OK	
MC233-T	1F	2	04/05/93	87	Pass	OK	2	04/05/93	87	Reject	Class A	
MC233-TR1	1F	2	04/15/93	94	Pass	OK	2	04/15/93	94	NRI	OK	
MC233-M	1F	3	04/26/93	101	Pass	OK	1	04/26/93	101	Reject	Class A	
MC233-MR1	1F	1	10/14/93	229	Pass	OK	1	10/14/93	229	NRI	OK	
MC233-B	1F	3	04/26/93	101	Pass	OK	1	04/26/93	101	NRI	OK	
MC234-T	16F	3	04/08/93	90	Pass	OK	1	04/08/93	90	NRI	OK	
MC234-B	16F	3	04/08/93	90	Pass	OK	1	04/08/93	90	NRI	OK	
MC235-T	16F	3	04/08/93	90	Pass	OK	1	04/08/93	90	NRI	OK	
MC235-B	16F	3	04/08/93	90	Pass	OK	1	04/08/93	90	NRI	OK	
MC236-T	16F	3	04/08/93	90	Pass	OK	1	04/08/93	90	Reject	Class A	
MC236-TR1	16F	3	04/08/93	90	Pass	OK	1	04/08/93	90	NRI	OK	
MC236-B	16F	3	04/08/93	90	Pass	OK	1	04/08/93	90	NRI	OK	
MC237-T	16F	3	04/08/93	90	Pass	OK	1	04/08/93	90	NRI	OK	
MC237-B	16F	3	04/08/93	90	Pass	OK	1	04/08/93	90	NRI	OK	
MC238-T	16F	3	04/08/93	90	Pass	OK	1	04/08/93	90	NRI	OK	
MC238-B	16F	3	04/08/93	90	Pass	OK	1	04/08/93	90	NRI	OK	
MC239-T	16F	3	04/08/93	90	Pass	OK	1	04/08/93	90	NRI	OK	
MC239-B	16F	3	04/08/93	90	Pass	OK	1	04/08/93	90	NRI	OK	
MC240-T	16F	3	04/08/93	90	Pass	OK	1	04/08/93	90	NRI	OK	
MC240-B	16F	3	04/08/93	90	Pass	OK	1	04/08/93	90	NRI	OK	
MC241-T	16F	3	04/08/93	90	Pass	OK	1	04/08/93	90	NRI	OK	
MC241-B	16F	3	04/08/93	90	Pass	OK	1	04/08/93	90	NRI	OK	
MC242-T	16F	3	04/08/93	90	Pass	OK	1	04/08/93	90	Reject	Class A	
MC242-TR1	16F	3	04/08/93	90	Pass	OK	1	04/08/93	90	NRI	OK	
MC242-B	16F	3	04/08/93	90	Pass	OK	1	04/08/93	90	NRI	OK	
MC243-T	16F	3	04/08/93	90	Pass	OK	1	04/08/93	90	NRI	OK	
MC243-B	16F	3	04/08/93	90	Pass	OK	1	04/08/93	90	NRI	OK	
MC244-T	16F	3	04/08/93	90	Pass	OK	1	04/08/93	90	NRI	OK	
MC244-B	16F	3	04/08/93	90	Pass	OK	1	04/08/93	90	NRI	OK	
MC245-T	16F	3	04/08/93	90	Pass	OK	1	04/08/93	90	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC245-B	16F	3	04/08/93	90	Pass	OK	1	04/08/93	90	NRI	OK	
MC246-T	16F	3	04/08/93	90	Pass	OK	1	04/08/93	90	NRI	OK	
MC246-B	16F	3	04/08/93	90	Pass	OK	1	04/08/93	90	NRI	OK	
MC247-T	1F	3	04/12/93	91	Pass	OK	1	04/13/93	92	NRI	OK	
MC247-B	1F	3	04/12/93	91	Pass	OK	1	04/26/93	101	NRI	OK	
MC248-T	1F	3	04/12/93	91	Fail	ER	No UT Inspection - Failed Visual Inspection					
MC248-TR1	1F	3	09/21/93	209	Pass	OK	No Record of Ultrasonic Inspection					Incomplete Inspection
MC248-B	1F	3	04/12/93	91	Pass	OK	1	04/26/93	101	NRI	OK	
MC249-T	1F	3	04/12/93	91	Pass	OK	1	04/13/93	92	NRI	OK	
MC249-B	1F	3	04/12/93	91	Pass	OK	1	04/26/93	101	NRI	OK	
MC250-T	1F	3	04/12/93	91	Pass	OK	2	04/15/93	94	NRI	OK	
MC250-B	1F	3	04/12/93	91	Pass	OK	2	04/15/93	94	NRI	OK	
MC251-T	1F	3	04/12/93	91	Pass	OK	1	04/13/93	92	NRI	OK	
MC251-B	1F	3	04/12/93	91	Pass	OK	2	04/15/93	94	NRI	OK	
MC252-T	1F	3	04/12/93	91	Pass	OK	1	04/13/93	92	NRI	OK	
MC252-B	1F	3	04/12/93	91	Pass	OK	2	04/15/93	94	NRI	OK	
MC253-T	1F	3	04/12/93	91	Pass	OK	1	04/13/93	92	NRI	OK	
MC253-B	1F	3	04/12/93	91	Pass	OK	2	04/15/93	94	NRI	OK	
MC254-T	1F	3	04/12/93	91	Pass	OK	1	04/13/93	92	NRI	OK	
MC254-B	1F	3	04/12/93	91	Pass	OK	2	04/15/93	94	NRI	OK	
MC255-T	1F	3	04/12/93	91	Pass	OK	1	04/13/93	92	Reject	Class A	
MC255-TR1	1F	2	04/15/93	94	Pass	OK	2	04/15/93	94	Reject	Class A	
MC255-TR2	1F	2	04/15/93	94	Pass	OK	2	10/13/93	228	Reject	Class A	
MC255-TR3	24F	1	11/04/93	246	Pass	OK	1	11/04/93	246	NRI	OK	
MC255-B	1F	3	04/12/93	91	Pass	OK	1	04/13/93	92	Reject	Class A	
MC255-BR1	1F	2	04/15/93	94	Pass	OK	2	04/15/93	94	NRI	OK	
MC256-T	1F	3	04/12/93	91	Pass	OK	1	04/13/93	92	NRI	OK	
MC256-B	1F	3	04/12/93	91	Pass	OK	1	04/13/93	92	NRI	OK	
MC257-T	1F	3	04/12/93	91	Pass	OK	2	04/13/93	92	NRI	OK	
MC257-B	1F	3	04/12/93	91	Pass	OK	2	04/13/93	92	NRI	OK	
MC258-T	1F	3	04/12/93	91	Pass	OK	2	04/13/93	92	NRI	OK	
MC258-B	1F	3	04/12/93	91	Pass	OK	2	04/13/93	92	NRI	OK	
MC259-T	1F	3	04/12/93	91	Pass	OK	2	04/13/93	92	NRI	OK	
MC259-B	1F	3	04/12/93	91	Pass	OK	2	04/13/93	92	NRI	OK	
MC260-T	1F	3	04/12/93	91	Pass	OK	2	04/13/93	92	NRI	OK	
MC260-B	1F	3	04/12/93	91	Pass	OK	2	04/13/93	92	NRI	OK	
MC261-T	1F	2	04/13/93	92	Pass	OK	2	04/13/93	92	NRI	OK	
MC261-B	1F	3	04/26/93	101	Pass	OK	2	04/13/93	92	NRI	OK	
MC261-BR1	1F	1	10/14/93	229	Pass	OK	1	04/26/93	101	Reject	Class A	
MC262-T	1F	2	04/13/93	92	Pass	OK	1	10/14/93	229	NRI	OK	
MC262-B	1F	3	04/26/93	101	Pass	OK	2	04/13/93	92	NRI	OK	
MC263-T	1F	2	04/13/93	92	Pass	OK	1	04/26/93	101	NRI	OK	
MC263-B	1F	3	04/26/93	101	Pass	OK	2	04/13/93	92	NRI	OK	
							1	04/26/93	101	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC264-T	1F	2	04/13/93	92	Pass	OK	2	04/13/93	92	Reject	Class A	
MC264-TR1	1F	2	04/15/93	94	Pass	OK	2	04/15/93	94	NRI	OK	
MC264-B	1F	3	04/26/93	101	Pass	OK	1	04/26/93	101	NRI	OK	
MC265-T	1F	1	04/13/93	92	Pass	OK	1	04/13/93	92	NRI	OK	
MC265-M	1F	1	04/13/93	92	Pass	OK	1	04/13/93	92	NRI	OK	
MC265-B	1F	1	04/13/93	92	Pass	OK	1	04/13/93	92	NRI	OK	
MC266-T	1F	1	04/13/93	92	Pass	OK	1	04/13/93	92	NRI	OK	
MC266-B	1F	1	04/13/93	92	Pass	OK	1	04/13/93	92	NRI	OK	
MC267-T	1F	1	04/13/93	92	Pass	OK	1	04/13/93	92	NRI	OK	
MC267-M	1F	1	04/13/93	92	Pass	OK	1	04/13/93	92	NRI	OK	
MC267-B	1F	1	04/13/93	92	Pass	OK	1	04/13/93	92	NRI	OK	
MC268-T	1F	1	04/13/93	92	Pass	OK	1	04/13/93	92	NRI	OK	
MC268-B	1F	1	04/13/93	92	Pass	OK	1	04/13/93	92	NRI	OK	
MC269-T	1F	1	04/13/93	92	Pass	OK	1	04/13/93	92	NRI	OK	
MC269-B	1F	1	04/13/93	92	Pass	OK	1	04/13/93	92	NRI	OK	
MC270-T	1F	1	04/13/93	92	Pass	OK	1	04/13/93	92	NRI	OK	
MC270-B	1F	1	04/13/93	92	Pass	OK	1	04/13/93	92	NRI	OK	
MC271-T	1F	1	04/13/93	92	Pass	OK	1	04/13/93	92	NRI	OK	
MC271-B	1F	1	04/13/93	92	Pass	OK	1	04/13/93	92	NRI	OK	
MC272-T	1F	2	04/15/93	94	Pass	OK	2	04/15/93	94	NRI	OK	
MC272-M	1F	2	04/23/93	100	Pass	OK	2	04/23/93	100	Reject	Class A	
MC272-MR1	1F	2	05/28/93	125	Pass	OK	2	05/28/93	125	NRI	OK	
MC272-B	1F	2	04/23/93	100	Pass	OK	2	04/23/93	100	NRI	OK	
MC273-T	NS	1	04/19/93	96	Pass	OK	1	04/19/93	96	NRI	OK	
MC273-TM	NS	1	04/19/93	96	Pass	OK	1	04/19/93	96	NRI	OK	
MC273-BM	NS	1	04/19/93	96	Pass	OK	1	04/19/93	96	NRI	OK	
MC273-B	NS	1	04/19/93	96	Pass	OK	1	04/19/93	96	NRI	OK	
MC274-T	NS	1	04/19/93	96	Pass	OK	1	04/19/93	96	NRI	OK	
MC274-B	NS	1	04/19/93	96	Pass	OK	1	04/19/93	96	NRI	OK	
MC275-T	NS	1	04/19/93	96	Pass	OK	1	04/19/93	96	NRI	OK	
MC275-B	NS	1	04/19/93	96	Pass	OK	1	04/19/93	96	NRI	OK	
MC276-T	NS	1	04/19/93	96	Pass	OK	1	04/19/93	96	NRI	OK	
MC276-B	NS	1	04/19/93	96	Pass	OK	1	04/19/93	96	NRI	OK	
MC277-T	NS	1	04/19/93	96	Pass	OK	1	04/19/93	96	NRI	OK	
MC277-M	NS	1	04/19/93	96	Pass	OK	1	04/19/93	96	NRI	OK	
MC277-B	NS	1	04/19/93	96	Pass	OK	1	04/19/93	96	NRI	OK	
MC278-T	NS	1	04/19/93	96	Pass	OK	1	04/19/93	96	NRI	OK	
MC278-B	NS	1	04/19/93	96	Pass	OK	1	04/19/93	96	NRI	OK	
MC279-T	1F	2	04/21/93	98	Pass	OK	2	04/21/93	98	NRI	OK	
MC279-B	1F	2	04/21/93	98	Pass	OK	2	04/21/93	98	NRI	OK	
MC280-T	1F	2	04/21/93	98	Pass	OK	2	04/21/93	98	NRI	OK	
MC280-B	1F	2	04/21/93	98	Pass	OK	2	04/21/93	98	NRI	OK	
MC281-T	1F	2	04/21/93	98	Pass	OK	2	04/21/93	98	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC281-B	1F	2	04/21/93	98	Pass	OK	2	04/21/93	98	NRI	OK	
MC282-T	1F	2	04/21/93	98	Pass	OK	2	04/21/93	98	NRI	OK	
MC282-B	1F	2	04/21/93	98	Pass	OK	2	04/21/93	98	NRI	OK	
MC283-T	1F	2	04/21/93	98	Pass	OK	2	04/21/93	98	NRI	OK	
MC283-B	1F	2	04/21/93	98	Pass	OK	2	04/21/93	98	NRI	OK	
MC284-T	1F	2	04/21/93	98	Pass	OK	2	04/21/93	98	NRI	OK	
MC284-B	1F	2	04/21/93	98	Pass	OK	2	04/21/93	98	NRI	OK	
MC285-T	1F	3	04/26/93	101	Pass	OK	1	04/26/93	101	NRI	OK	
MC285-B	1F	3	04/26/93	101	Pass	OK	1	04/26/93	101	NRI	OK	
MC286-T	No Weld	3	04/26/93	101	Fail	INC	No UT Inspection - Failed Visual Inspection					Weld Not Repaired
MC286-B	1F	3	04/26/93	101	Pass	OK	1	04/26/93	101	Reject	Class A	
MC286-BR1	1F	2	05/28/93	125	Pass	OK	2	05/28/93	125	NRI	OK	
MC287-T	8F	3	04/28/93	103	Pass	OK	2	07/06/93	153	NRI	OK	
MC287-B	8F	3	04/28/93	103	Pass	OK	2	07/06/93	153	NRI	OK	
MC288-T	8F	3	04/28/93	103	Pass	OK	2	07/06/93	153	NRI	OK	
MC288-B	8F	3	04/28/93	103	Pass	OK	2	07/06/93	153	NRI	OK	
MC289-T	1F	3	04/28/93	103	Pass	OK	2	07/06/93	153	NRI	OK	
MC289-B	1F	3	04/28/93	103	Pass	OK	2	07/06/93	153	NRI	OK	
MC290-T	1F	3	04/28/93	103	Pass	OK	2	07/06/93	153	NRI	OK	
MC290-B	1F	3	04/28/93	103	Pass	OK	2	07/06/93	153	NRI	OK	
MC291-T	1F	3	04/28/93	103	Pass	OK	2	07/06/93	153	NRI	OK	
MC291-B	1F	3	04/28/93	103	Pass	OK	2	07/06/93	153	NRI	OK	
MC292-T	1F	3	04/28/93	103	Pass	OK	2	07/06/93	153	NRI	OK	
MC292-B	1F	3	04/28/93	103	Pass	OK	2	07/06/93	153	NRI	OK	
MC293-T	8F	3	04/28/93	103	Pass	OK	2	07/06/93	153	NRI	OK	
MC293-B	8F	3	04/28/93	103	Pass	OK	2	07/06/93	153	NRI	OK	
MC294-T	3F	3	04/28/93	103	Pass	OK	2	07/06/93	153	NRI	OK	
MC294-B	3F	3	04/28/93	103	Pass	OK	2	07/06/93	153	NRI	OK	
MC295-T	7F	3	04/28/93	103	Pass	OK	2	07/06/93	153	NRI	OK	
MC295-B	7F	3	04/28/93	103	Pass	OK	2	07/06/93	153	NRI	OK	
MC296-T	7F	3	04/28/93	103	Pass	OK	2	07/06/93	153	NRI	OK	
MC296-B	7F	3	04/28/93	103	Pass	OK	2	07/06/93	153	NRI	OK	
MC297-T	7F	3	04/28/93	103	Pass	OK	2	07/06/93	153	NRI	OK	
MC297-B	7F	3	04/28/93	103	Pass	OK	2	07/06/93	153	NRI	OK	
MC298-T	16F	3	05/04/93	107	Pass	OK	1	05/04/93	107	NRI	OK	
MC298-B	16F	3	05/04/93	107	Pass	OK	1	05/04/93	107	NRI	OK	
MC299-T	16F	3	05/04/93	107	Pass	OK	1	05/04/93	107	Reject	Class A	
MC299-TR1	16F	2	05/12/93	113	Pass	OK	1	05/12/93	113	Reject	Class A	
MC299-TR2	16F	1	10/14/93	229	Pass	OK	1	10/14/93	229	NRI	OK	
MC299-B	16F	3	05/04/93	107	Pass	OK	1	05/04/93	107	NRI	OK	
MC300-T	16F	3	05/04/93	107	Pass	OK	1	05/04/93	107	NRI	OK	
MC300-B	16F	3	05/04/93	107	Pass	OK	1	05/04/93	107	NRI	OK	
MC301-T	16F	3	05/04/93	107	Pass	OK	1	05/04/93	107	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC301-B	16F	3	05/04/93	107	Pass	OK	1	05/04/93	107	NRI	OK	
MC302-T	16F	3	05/04/93	107	Pass	OK	1	05/04/93	107	NRI	OK	
MC302-B	16F	3	05/04/93	107	Pass	OK	1	05/04/93	107	NRI	OK	
MC303-T	16F	3	05/04/93	107	Pass	OK	1	05/04/93	107	Reject	Class A	
MC303-TR1	16F	3	05/07/93	110	Pass	OK	2	07/14/93	160	NRI	OK	
MC303-B	16F	3	05/04/93	107	Pass	OK	1	05/04/93	107	NRI	OK	
MC304-T	16F	3	05/07/93	110	Pass	OK	2	07/14/93	160	NRI	OK	
MC304-B	16F	3	05/07/93	110	Pass	OK	2	07/14/93	160	NRI	OK	
MC305-T	16F	3	05/07/93	110	Pass	OK	2	07/14/93	160	NRI	OK	
MC305-B	16F	3	05/07/93	110	Pass	OK	2	07/14/93	160	NRI	OK	
MC306-T	16F	3	05/07/93	110	Pass	OK	2	07/14/93	160	NRI	OK	
MC306-B	16F	3	05/07/93	110	Pass	OK	2	07/14/93	160	NRI	OK	
MC307-T	16F	3	05/07/93	110	Pass	OK	2	07/14/93	160	NRI	OK	
MC307-B	16F	3	05/07/93	110	Pass	OK	2	07/14/93	160	NRI	OK	
MC308-T	16F	3	05/07/93	110	Pass	OK	2	07/14/93	160	NRI	OK	
MC308-B	16F	3	05/07/93	110	Pass	OK	2	07/14/93	160	NRI	OK	
MC309-T	16F	3	05/07/93	110	Pass	OK	2	07/14/93	160	NRI	OK	
MC309-B	16F	3	05/07/93	110	Pass	OK	2	07/14/93	160	NRI	OK	
MC310-T	16F	2	05/12/93	113	Pass	OK	2	05/12/93	113	NRI	OK	
MC310-B	16F	2	05/12/93	113	Pass	OK	2	05/12/93	113	NRI	OK	
MC311-T	16F	2	05/12/93	113	Pass	OK	2	05/12/93	113	NRI	OK	
MC311-B	16F	2	05/12/93	113	Pass	OK	2	05/12/93	113	NRI	OK	
MC312-T	16F	2	05/12/93	113	Pass	OK	2	05/12/93	113	NRI	OK	
MC312-B	16F	2	05/12/93	113	Pass	OK	2	05/12/93	113	NRI	OK	
MC313-T	16F	2	05/12/93	113	Pass	OK	2	05/12/93	113	NRI	OK	
MC313-B	16F	2	05/12/93	113	Pass	OK	2	05/12/93	113	NRI	OK	
MC314-T	NS	2	05/12/93	113	Fail	FM	No UT Inspection - Failed Visual Inspection					
MC314-TR1	NS	3	09/22/93	210	Pass	OK	No Record of Ultrasonic Inspection					Incomplete Inspection
MC314-B	NS	2	05/12/93	113	Fail	FM	No UT Inspection - Failed Visual Inspection					
MC314-BR1	NS	3	09/22/93	210	Pass	OK	No Record of Ultrasonic Inspection					Incomplete Inspection
MC315-T	3F	2	05/12/93	113	Pass	OK	2	05/12/93	113	NRI	OK	
MC315-B	3F	2	05/12/93	113	Pass	OK	2	05/12/93	113	NRI	OK	
MC316-T	3F	2	05/12/93	113	Pass	OK	2	05/12/93	113	NRI	OK	
MC316-B	3F	2	05/12/93	113	Pass	OK	2	05/12/93	113	NRI	OK	
MC317-T	3F	2	05/12/93	113	Pass	OK	2	05/12/93	113	NRI	OK	
MC317-B	3F	2	05/12/93	113	Pass	OK	2	05/12/93	113	NRI	OK	
MC318-T	1F	3	05/13/93	114	Pass	OK	2	05/13/93	114	NRI	OK	
MC318-B	1F	3	05/13/93	114	Pass	OK	2	05/13/93	114	NRI	OK	
MC319-T	1F	3	05/13/93	114	Pass	OK	2	05/13/93	114	NRI	OK	
MC319-B	1F	3	05/13/93	114	Pass	OK	2	05/13/93	114	NRI	OK	
MC320-T	1F	3	05/13/93	114	Pass	OK	2	05/13/93	114	NRI	OK	
MC320-B	1F	3	05/13/93	114	Pass	OK	2	05/13/93	114	NRI	OK	
MC321-T	16F	1	05/12/93	113	Pass	OK	1	05/12/93	113	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC321-B	16F	1	05/12/93	113	Pass	OK	1	05/12/93	113	NRI	OK	
MC322-T	16F	1	05/12/93	113	Pass	OK	1	05/12/93	113	NRI	OK	
MC322-B	16F	1	05/12/93	113	Pass	OK	1	05/12/93	113	NRI	OK	
MC323-T	1F	1	05/12/93	113	Pass	OK	1	05/12/93	113	NRI	OK	
MC323-B	1F	1	05/12/93	113	Pass	OK	1	05/12/93	113	NRI	OK	
MC324-T	1F	1	05/12/93	113	Pass	OK	1	05/12/93	113	NRI	OK	
MC324-B	1F	1	05/12/93	113	Pass	OK	1	05/12/93	113	NRI	OK	
MC325-T	1F	3	05/13/93	114	Pass	OK	2	05/13/93	114	NRI	OK	
MC325-B	1F	3	05/13/93	114	Pass	OK	2	05/13/93	114	NRI	OK	
MC326-T	18F	3	05/13/93	114	Pass	OK	2	05/13/93	114	NRI	OK	
MC326-B	18F	3	05/13/93	114	Pass	OK	2	05/13/93	114	NRI	OK	
MC327-T	18F	3	05/13/93	114	Pass	OK	2	05/13/93	114	NRI	OK	
MC327-B	18F	3	05/13/93	114	Pass	OK	2	05/13/93	114	NRI	OK	
MC328-T	18F	3	05/13/93	114	Pass	OK	2	05/13/93	114	NRI	OK	
MC328-B	18F	3	05/13/93	114	Pass	OK	2	05/13/93	114	NRI	OK	
MC329-T	18F	3	05/13/93	114	Pass	OK	2	05/13/93	114	NRI	OK	
MC329-B	18F	3	05/13/93	114	Pass	OK	2	05/13/93	114	NRI	OK	
MC330-T	18F	3	05/13/93	114	Pass	OK	2	05/13/93	114	NRI	OK	
MC330-B	18F	3	05/13/93	114	Pass	OK	2	05/13/93	114	NRI	OK	
MC331-T	18F	3	05/19/93	118	Pass	OK	2	05/19/93	118	NRI	OK	
MC331-B	18F	3	05/19/93	118	Pass	OK	2	05/19/93	118	NRI	OK	
MC332-T	18F	3	05/19/93	118	Pass	OK	2	05/19/93	118	NRI	OK	
MC332-B	18F	3	05/19/93	118	Pass	OK	2	05/19/93	118	NRI	OK	
MC333-T	18F	3	05/19/93	118	Pass	OK	2	05/19/93	118	NRI	OK	
MC333-B	18F	3	05/19/93	118	Pass	OK	2	05/19/93	118	NRI	OK	
MC334-T	18F	3	05/19/93	118	Pass	OK	2	05/19/93	118	NRI	OK	
MC334-B	18F	3	05/19/93	118	Pass	OK	2	05/19/93	118	NRI	OK	
MC335-T	18F	3	05/19/93	118	Pass	OK	2	05/19/93	118	NRI	OK	
MC335-B	18F	3	05/19/93	118	Pass	OK	2	05/19/93	118	NRI	OK	
MC336-T	18F	3	05/19/93	118	Pass	OK	2	05/19/93	118	NRI	OK	
MC336-B	18F	3	05/19/93	118	Pass	OK	2	05/19/93	118	NRI	OK	
MC337-T	18F	3	05/19/93	118	Pass	OK	2	05/19/93	118	NRI	OK	
MC337-B	18F	3	05/19/93	118	Pass	OK	2	05/19/93	118	NRI	OK	
MC338-T	18F	3	05/19/93	118	Pass	OK	2	05/19/93	118	NRI	OK	
MC338-B	18F	3	05/19/93	118	Pass	OK	2	05/19/93	118	NRI	OK	
MC339-T	18F	3	05/20/93	119	Pass	OK	2	06/07/93	131	NRI	OK	
MC339-B	18F	3	05/20/93	119	Pass	OK	2	06/07/93	131	NRI	OK	
MC340-T	18F	3	05/20/93	119	Pass	OK	2	06/07/93	131	NRI	OK	
MC340-B	18F	3	05/20/93	119	Pass	OK	2	06/07/93	131	NRI	OK	
MC341-T	18F	3	05/20/93	119	Pass	OK	1	05/20/93	119	NRI	OK	
MC341-B	18F	3	05/20/93	119	Pass	OK	1	05/20/93	119	NRI	OK	
MC342-T	18F	3	05/20/93	119	Pass	OK	1	05/20/93	119	NRI	OK	
MC342-B	18F	3	05/20/93	119	Pass	OK	1	05/20/93	119	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC343-T	18F	3	05/20/93	119	Pass	OK	1	05/20/93	119	NRI	OK	
MC343-B	18F	3	05/20/93	119	Pass	OK	1	05/20/93	119	NRI	OK	
MC344-T	18F	3	05/20/93	119	Pass	OK	1	05/20/93	119	NRI	OK	
MC344-B	18F	3	05/20/93	119	Pass	OK	1	05/20/93	119	NRI	OK	
MC345-T	18F	3	05/20/93	119	Pass	OK	1	05/20/93	119	NRI	OK	
MC345-B	18F	3	05/20/93	119	Pass	OK	1	05/20/93	119	NRI	OK	
MC346-T	18F	3	05/20/93	119	Pass	OK	1	05/20/93	119	NRI	OK	
MC346-B	18F	3	05/20/93	119	Pass	OK	1	05/20/93	119	NRI	OK	
MC347-T	18F	3	05/20/93	119	Pass	OK	1	05/20/93	119	NRI	OK	
MC347-B	18F	3	05/20/93	119	Pass	OK	1	05/20/93	119	NRI	OK	
MC348-T	1F	1	05/21/93	120	Pass	OK	1	05/21/93	120	NRI	OK	
MC348-B	1F	1	05/21/93	120	Pass	OK	1	05/21/93	120	NRI	OK	
MC349-T	NS	1	05/21/93	120	Pass	OK	1	05/21/93	120	NRI	OK	
MC349-B	NS	1	05/21/93	120	Pass	OK	1	05/21/93	120	NRI	OK	
MC350-T	NS	1	05/21/93	120	Pass	OK	1	05/21/93	120	NRI	OK	
MC350-B	NS	1	05/21/93	120	Pass	OK	1	05/21/93	120	NRI	OK	
MC351-T	NS	1	05/21/93	120	Pass	OK	1	05/21/93	120	NRI	OK	
MC351-B	NS	1	05/21/93	120	Pass	OK	1	05/21/93	120	NRI	OK	
MC352-T	1F	1	05/21/93	120	Pass	OK	1	05/21/93	120	NRI	OK	
MC352-B	1F	1	05/21/93	120	Pass	OK	1	05/21/93	120	NRI	OK	
MC353-T	1F	1	05/21/93	120	Pass	OK	1	05/21/93	120	NRI	OK	
MC353-B	1F	1	05/21/93	120	Pass	OK	1	05/21/93	120	NRI	OK	
MC354-T	1F	1	05/21/93	120	Pass	OK	1	05/21/93	120	NRI	OK	
MC354-B	1F	1	05/21/93	120	Pass	OK	1	05/21/93	120	NRI	OK	
MC355-T	1F	1	05/21/93	120	Pass	OK	1	05/21/93	120	NRI	OK	
MC355-B	1F	1	05/21/93	120	Pass	OK	1	05/21/93	120	Class D	OK	
MC356-T	1F	1	05/21/93	120	Pass	OK	1	05/21/93	120	NRI	OK	
MC356-B	1F	1	05/21/93	120	Pass	OK	1	05/21/93	120	NRI	OK	
MC357-T	1F	1	05/21/93	120	Pass	OK	1	05/21/93	120	NRI	OK	
MC357-B	1F	1	05/21/93	120	Pass	OK	1	05/21/93	120	NRI	OK	
MC358-T	1F	1	05/21/93	120	Pass	OK	1	05/21/93	120	NRI	OK	
MC358-B	1F	1	05/21/93	120	Pass	OK	1	05/21/93	120	NRI	OK	
MC359-T	1F	1	05/21/93	120	Pass	OK	1	05/21/93	120	NRI	OK	
MC359-B	1F	1	05/21/93	120	Pass	OK	1	05/21/93	120	NRI	OK	
MC360-T	18F	1	05/21/93	120	Pass	OK	1	05/21/93	120	NRI	OK	
MC360-B	18F	1	05/21/93	120	Pass	OK	1	05/21/93	120	NRI	OK	
MC361-T	18F	1	05/21/93	120	Pass	OK	1	05/21/93	120	NRI	OK	
MC361-B	18F	1	05/21/93	120	Pass	OK	1	05/21/93	120	NRI	OK	
MC362-T	18F	1	05/21/93	120	Pass	OK	1	05/21/93	120	NRI	OK	
MC362-B	18F	1	05/21/93	120	Pass	OK	1	05/21/93	120	NRI	OK	
MC363-T	18F	1	05/21/93	120	Pass	OK	1	05/21/93	120	NRI	OK	
MC363-B	18F	1	05/21/93	120	Pass	OK	1	05/21/93	120	NRI	OK	
MC364X-T	18F	1	05/21/93	120	Pass	OK	1	05/21/93	120	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC364X-B	18F	1	05/21/93	120	Pass	OK	1	05/21/93	120	NRI	OK	
MC364-T	16F	1	05/24/93	121	Pass	OK	1	05/24/93	121	NRI	OK	
MC364-B	16F	1	05/24/93	121	Pass	OK	1	05/24/93	121	NRI	OK	
MC365-T	16F	1	05/24/93	121	Pass	OK	1	05/24/93	121	NRI	OK	
MC365-B	16F	1	05/24/93	121	Pass	OK	1	05/24/93	121	NRI	OK	
MC366-T	16F	1	05/24/93	121	Pass	OK	1	05/24/93	121	NRI	OK	
MC366-B	16F	1	05/24/93	121	Pass	OK	1	05/24/93	121	NRI	OK	
MC367-T	16F	1	05/24/93	121	Pass	OK	1	05/24/93	121	NRI	OK	
MC367-B	16F	1	05/24/93	121	Pass	OK	1	05/24/93	121	NRI	OK	
MC368-T	16F	1	05/24/93	121	Pass	OK	1	05/24/93	121	NRI	OK	
MC368-B	16F	1	05/24/93	121	Pass	OK	1	05/24/93	121	NRI	OK	
MC369-T	16F	1	05/24/93	121	Pass	OK	1	05/24/93	121	NRI	OK	
MC369-B	16F	1	05/24/93	121	Pass	OK	1	05/24/93	121	Reject	Class A	
MC369-BR1	16F	1	10/14/93	229	Pass	OK	1	10/14/93	229	Reject	Class A	
MC369-BR2	24F	1	11/04/93	246	Pass	OK	1	11/04/93	246	NRI	OK	
MC370-T	16F	1	05/24/93	121	Pass	OK	1	05/24/93	121	NRI	OK	
MC370-B	16F	1	05/24/93	121	Pass	OK	1	05/24/93	121	NRI	OK	
MC371-T	16F	1	05/24/93	121	Pass	OK	1	05/24/93	121	NRI	OK	
MC371-B	16F	1	05/24/93	121	Pass	OK	1	05/24/93	121	NRI	OK	
MC372-T	16F	1	05/24/93	121	Pass	OK	1	05/24/93	121	NRI	OK	
MC372-B	16F	1	05/24/93	121	Pass	OK	1	05/24/93	121	NRI	OK	
MC373-T	16F	1	05/24/93	121	Pass	OK	1	05/24/93	121	NRI	OK	
MC373-B	16F	1	05/24/93	121	Pass	OK	1	05/24/93	121	NRI	OK	
MC374-T	16F	1	05/24/93	121	Pass	OK	1	05/24/93	121	NRI	OK	
MC374-B	16F	1	05/24/93	121	Pass	OK	1	05/24/93	121	NRI	OK	
MC375-T	3F	2	05/28/93	125	Pass	OK	2	05/28/93	125	NRI	OK	
MC375-B	3F	2	05/28/93	125	Pass	OK	2	05/28/93	125	Reject	Class A	
MC375-BR1	24F	1	11/04/93	246	Pass	OK	1	11/04/93	246	NRI	OK	
MC376-T	3F	2	05/28/93	125	Pass	OK	2	05/28/93	125	NRI	OK	
MC376-B	3F	2	05/28/93	125	Pass	OK	2	05/28/93	125	NRI	OK	
MC377-T	3F	2	05/28/93	125	Pass	OK	2	05/28/93	125	NRI	OK	
MC377-B	3F	2	05/28/93	125	Pass	OK	2	05/28/93	125	NRI	OK	
MC378-T	NS	2	05/28/93	125	Pass	OK	2	05/28/93	125	NRI	OK	
MC378-B	NS	2	05/28/93	125	Pass	OK	2	05/28/93	125	NRI	OK	
MC379-T	NS	2	05/28/93	125	Pass	OK	2	05/28/93	125	NRI	OK	
MC379-B	NS	2	05/28/93	125	Pass	OK	2	05/28/93	125	NRI	OK	
MC380-T	NS	2	05/28/93	125	Pass	OK	2	05/28/93	125	NRI	OK	
MC380-B	NS	2	05/28/93	125	Pass	OK	2	05/28/93	125	NRI	OK	
MC381-T	NS	2	05/28/93	125	Pass	OK	2	05/28/93	125	NRI	OK	
MC381-B	NS	2	05/28/93	125	Pass	OK	2	05/28/93	125	NRI	OK	
MC382-T	NS	2	05/28/93	125	Pass	OK	2	05/28/93	125	NRI	OK	
MC382-B	NS	2	05/28/93	125	Pass	OK	2	05/28/93	125	NRI	OK	
MC383-T	16F	2	05/28/93	125	Pass	OK	2	05/28/93	125	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC383-B	16F	2	05/28/93	125	Pass	OK	2	05/28/93	125	NRI	OK	
MC384-T	16F	2	05/28/93	125	Pass	OK	2	05/28/93	125	NRI	OK	
MC384-B	16F	2	05/28/93	125	Pass	OK	2	05/28/93	125	Reject	Class A	
MC384-BR1	16F	1	10/14/93	229	Pass	OK	1	10/14/93	229	Reject	Class A	
MC384-BR2	24F	1	11/04/93	246	Pass	OK	1	11/04/93	246	NRI	OK	
MC385-T	1F	2	06/01/93	126	Pass	OK	2	06/01/93	126	NRI	OK	
MC385-B	1F	2	06/01/93	126	Pass	OK	2	06/01/93	126	NRI	OK	
MC386-T	NS	2	06/01/93	126	Pass	OK	2	06/01/93	126	NRI	OK	
MC386-B	NS	2	06/01/93	126	Pass	OK	2	06/01/93	126	NRI	OK	
MC386X-T	18F	2	06/07/93	131	Pass	OK	2	06/07/93	131	NRI	OK	
MC386X-M	18F	2	06/07/93	131	Pass	OK	2	06/07/93	131	NRI	OK	
MC386X-B	18F	2	06/07/93	131	Pass	OK	2	06/07/93	131	NRI	OK	
MC387-T	1F	2	06/01/93	126	Pass	OK	2	06/01/93	126	NRI	OK	
MC387-B	1F	2	06/01/93	126	Pass	OK	2	06/01/93	126	NRI	OK	
MC387X-T	18F	2	06/07/93	131	Pass	OK	2	06/07/93	131	NRI	OK	
MC387X-M	18F	2	06/07/93	131	Pass	OK	2	06/07/93	131	NRI	OK	
MC387X-B	18F	2	06/07/93	131	Pass	OK	2	06/07/93	131	NRI	OK	
MC388-T	18F	2	06/07/93	131	Pass	OK	2	06/07/93	131	NRI	OK	
MC388-B	18F	2	06/07/93	131	Pass	OK	2	06/07/93	131	NRI	OK	
MC389-T	18F	2	06/07/93	131	Pass	OK	2	06/07/93	131	NRI	OK	
MC389-B	18F	2	06/07/93	131	Pass	OK	2	06/07/93	131	NRI	OK	
MC390-T	18F	2	06/07/93	131	Pass	OK	2	06/07/93	131	NRI	OK	
MC390-M	18F	2	06/07/93	131	Pass	OK	2	06/07/93	131	NRI	OK	
MC390-B	18F	2	06/07/93	131	Pass	OK	2	06/07/93	131	NRI	OK	
MC391-T	18F	2	06/07/93	131	Pass	OK	2	06/07/93	131	NRI	OK	
MC391-M	18F	2	06/07/93	131	Pass	OK	2	06/07/93	131	NRI	OK	
MC391-B	18F	2	06/07/93	131	Pass	OK	2	06/07/93	131	NRI	OK	
MC392-T	18F	2	06/07/93	131	Pass	OK	2	06/07/93	131	NRI	OK	
MC392-B	18F	2	06/07/93	131	Pass	OK	2	06/07/93	131	NRI	OK	
MC393-T	18F	2	06/07/93	131	Pass	OK	2	06/07/93	131	NRI	OK	
MC393-B	No Weld	2	06/07/93	131	Fail	INC	No UT Inspection - Failed Visual Inspection					
MC393-BR1	18F	3	09/22/93	210	Pass	OK	No Record of Ultrasonic Inspection					Incomplete Inspection
MC394-T	1F	2	06/07/93	131	Pass	OK	2	06/07/93	131	NRI	OK	
MC394-B	1F	2	06/07/93	131	Pass	OK	2	06/07/93	131	NRI	OK	
MC395-T	18F	2	06/07/93	131	Pass	OK	2	06/07/93	131	NRI	OK	
MC395-B	18F	2	06/07/93	131	Pass	OK	2	06/07/93	131	NRI	OK	
MC396-T	1F	2	06/07/93	131	Pass	OK	2	06/07/93	131	NRI	OK	
MC396-B	1F	2	06/07/93	131	Pass	OK	2	06/07/93	131	NRI	OK	
MC397-T	18F	2	06/07/93	131	Pass	OK	2	06/07/93	131	NRI	OK	
MC397-B	18F	2	06/07/93	131	Pass	OK	2	06/07/93	131	NRI	OK	
MC398-T	10F	3	06/22/93	143	Pass	OK	1	09/22/93	210	NRI	OK	
MC398-B	10F	3	06/22/93	143	Pass	OK	1	09/22/93	210	NRI	OK	
MC399-T	10F	3	06/22/93	143	Pass	OK	1	09/22/93	210	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC399-B	10F	3	06/22/93	143	Pass	OK	1	09/22/93	210	NRI	OK	
MC400-T	10F	3	06/22/93	143	Pass	OK	1	09/22/93	210	NRI	OK	
MC400-B	10F	3	06/22/93	143	Pass	OK	1	09/22/93	210	NRI	OK	
MC401-T	10F	3	06/22/93	143	Pass	OK	1	09/22/93	210	NRI	OK	
MC401-B	10F	3	06/22/93	143	Pass	OK	1	09/22/93	210	NRI	OK	
MC402-T	10F	3	06/22/93	143	Pass	OK	1	09/17/93	207	NRI	OK	
MC402-B	10F	3	06/22/93	143	Pass	OK	1	09/17/93	207	Reject	Class A	
MC402-BR1	24F	1	11/04/93	246	Pass	OK	1	11/04/93	246	NRI	OK	
MC403-T	10F	3	06/22/93	143	Pass	OK	1	09/17/93	207	NRI	OK	
MC403-B	10F	3	06/22/93	143	Pass	OK	1	09/17/93	207	NRI	OK	
MC404-T	10F	3	06/22/93	143	Pass	OK	1	09/17/93	207	NRI	OK	
MC404-B	10F	3	06/22/93	143	Pass	OK	1	09/17/93	207	NRI	OK	
MC405-T	10F	3	06/23/93	144	Pass	OK	1	09/17/93	207	NRI	OK	
MC405-B	10F	3	06/23/93	144	Pass	OK	1	09/17/93	207	NRI	OK	
MC406-T	10F	3	06/23/93	144	Pass	OK	1	09/17/93	207	NRI	OK	
MC406-B	10F	3	06/23/93	144	Pass	OK	1	09/17/93	207	NRI	OK	
MC407-T	10F	3	06/23/93	144	Pass	OK	1	09/17/93	207	NRI	OK	
MC407-B	10F	3	06/23/93	144	Pass	OK	1	09/17/93	207	NRI	OK	
MC408-T	10F	3	06/23/93	144	Pass	OK	1	09/17/93	207	NRI	OK	
MC408-B	10F	3	06/23/93	144	Pass	OK	1	09/17/93	207	NRI	OK	
MC409-T	10F	3	06/28/93	147	Pass	OK	1	09/17/93	207	NRI	OK	
MC409-B	10F	3	06/28/93	147	Pass	OK	1	09/17/93	207	NRI	OK	
MC410-T	10F	3	06/28/93	147	Pass	OK	1	09/22/93	210	NRI	OK	
MC410-B	10F	3	06/28/93	147	Pass	OK	1	09/22/93	210	NRI	OK	
MC411-T	10F	3	06/28/93	147	Pass	OK	1	09/22/93	210	NRI	OK	
MC411-B	10F	3	06/28/93	147	Pass	OK	1	09/22/93	210	NRI	OK	
MC412-T	10F	3	06/28/93	147	Pass	OK	1	09/22/93	210	NRI	OK	
MC412-B	10F	3	06/28/93	147	Pass	OK	1	09/22/93	210	NRI	OK	
MC413-T	10F	3	06/28/93	147	Pass	OK	1	09/22/93	210	NRI	OK	
MC413-B	10F	3	06/28/93	147	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC413-BR1	10F	3	09/24/93	212	Pass	OK	1	09/22/93	210	NRI	OK	
MC414-T	10F	3	06/28/93	147	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC414-TR1	10F	3	06/29/93	148	Pass	OK	1	09/22/93	210	NRI	OK	
MC414-B	10F	3	06/28/93	147	Pass	OK	1	09/22/93	210	NRI	OK	
MC415-T	10F	3	06/28/93	147	Pass	OK	1	09/22/93	210	NRI	OK	
MC415-B	10F	3	06/28/93	147	Pass	OK	1	09/22/93	210	NRI	OK	
MC416-T	10F	3	06/28/93	147	Pass	OK	2	07/14/93	160	NRI	OK	
MC416-B	10F	3	06/28/93	147	Pass	OK	2	07/14/93	160	Reject	Class A	
MC416-BR1	10F	1	10/14/93	229	Pass	OK	1	10/14/93	229	NRI	OK	
MC417-T	10F	3	06/28/93	147	Pass	OK	1	09/16/93	206	NRI	OK	
MC417-B	10F	3	06/28/93	147	Pass	OK	1	09/16/93	206	Reject	Class A	
MC417-BR1	24F	1	11/04/93	246	Pass	OK	1	11/04/93	246	NRI	OK	
MC418-T	10F	3	06/30/93	149	Pass	OK	1	09/17/93	207	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC418-B	10F	3	06/30/93	149	Pass	OK	1	09/17/93	207	NRI	OK	
MC419-T	1F	3	06/30/93	149	Pass	OK	1	09/17/93	207	NRI	OK	
MC419-B	9F	3	07/19/93	164	Pass	OK	1	09/17/93	207	NRI	OK	
MC420-T	1F	3	06/30/93	149	Pass	OK	1	09/17/93	207	NRI	OK	
MC420-B	9F	3	07/19/93	164	Pass	OK	1	09/17/93	207	NRI	OK	
MC421-T	1F	3	06/30/93	149	Pass	OK	1	09/17/93	207	NRI	OK	
MC421-B	9F	3	07/19/93	164	Pass	OK	1	09/17/93	207	NRI	OK	
MC422-T	17F	3	06/30/93	149	Pass	OK	1	09/16/93	206	NRI	OK	
MC422-B	17F	3	06/30/93	149	Pass	OK	1	09/16/93	206	Reject	Class A	
MC422-BR1	24F	1	11/04/93	246	Pass	OK	1	11/04/93	246	NRI	OK	
MC423-T	17F	3	06/30/93	149	Fail	UF	No UT Inspection - Failed Visual Inspection					Weld Not Repaired
MC423-B	17F	3	06/30/93	149	Pass	OK	1	09/16/93	206	Reject	Class A	
MC423-BR1	24F	1	11/04/93	246	Pass	OK	1	11/04/93	246	NRI	OK	
MC424-T	17F	3	06/30/93	149	Pass	OK	1	09/16/93	206	NRI	OK	
MC424-B	17F	3	06/30/93	149	Pass	OK	1	09/16/93	206	NRI	OK	
MC425-T	17F	3	06/30/93	149	Pass	OK	1	09/16/93	206	NRI	OK	
MC425-B	17F	3	06/30/93	149	Pass	OK	1	09/16/93	206	NRI	OK	
MC426-T	17F	3	06/30/93	149	Pass	OK	1	09/16/93	206	NRI	OK	
MC426-B	17F	3	06/30/93	149	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC426-BR1	24F	1	11/04/93	246	Pass	OK	1	11/04/93	246	NRI	OK	
MC427-T	17F	3	06/30/93	149	Pass	OK	1	09/16/93	206	NRI	OK	
MC427-B	17F	3	06/30/93	149	Pass	OK	1	09/16/93	206	Reject	Class A	
MC427-BR1	24F	1	11/04/93	246	Pass	OK	1	11/04/93	246	NRI	OK	
MC428-T	17F	3	06/29/93	148	Fail	ER	No UT Inspection - Failed Visual Inspection					
MC428-TR1	17F	1	09/22/93	210	Pass	OK	1	09/22/93	210	NRI	OK	
MC428-B	17F	3	06/29/93	148	Pass	OK	1	09/22/93	210	Reject	Class A	
MC428-BR1	24F	1	11/04/93	246	Pass	OK	1	11/04/93	246	NRI	OK	
MC429-T	17F	3	06/29/93	148	Pass	OK	1	09/22/93	210	NRI	OK	
MC429-B	17F	3	06/29/93	148	Pass	OK	1	09/22/93	210	NRI	OK	
MC430-T	17F	3	06/29/93	148	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC430-TR1	17F	1	09/22/93	210	Pass	OK	1	09/22/93	210	NRI	OK	
MC430-B	17F	3	06/29/93	148	Pass	OK	1	09/22/93	210	NRI	OK	
MC431-T	17F	3	06/29/93	148	Pass	OK	1	09/17/93	207	NRI	OK	
MC431-B	9F	3	07/02/93	151	Pass	OK	1	09/17/93	207	NRI	OK	
MC432-T	17F	3	06/29/93	148	Pass	OK	1	09/17/93	207	NRI	OK	
MC432-B	9F	3	07/02/93	151	Pass	OK	1	09/17/93	207	NRI	OK	
MC433-T	17F	3	06/29/93	148	Pass	OK	1	09/17/93	207	NRI	OK	
MC433-B	9F	3	07/02/93	151	Pass	OK	1	09/17/93	207	NRI	OK	
MC434-T	17F	3	06/29/93	148	Pass	OK	1	09/17/93	207	NRI	OK	
MC434-B	9F	3	07/02/93	151	Pass	OK	1	09/17/93	207	NRI	OK	
MC435-T	1F	3	06/30/93	149	Pass	OK	1	09/22/93	210	NRI	OK	
MC435-B	1F	3	06/30/93	149	Pass	OK	1	09/22/93	210	NRI	OK	
MC436-T	17F	3	06/30/93	149	Pass	OK	1	09/16/93	206	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC436-B	17F	3	06/30/93	149	Pass	OK	1	09/16/93	206	Reject	Class A	
MC436-BR1	24F	1	11/04/93	246	Pass	OK	1	11/04/93	246	NRI	OK	
MC437-T	17F	3	06/30/93	149	Pass	OK	1	09/14/93	204	NRI	OK	
MC437-B	17F	3	06/30/93	149	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC437-BR1	NS	3	09/24/93	212	Pass	OK	No Record of Ultrasonic Inspection					Incomplete Inspection
MC438-T	NS	3	07/01/93	150	Pass	OK	1	09/22/93	210	NRI	OK	
MC438-M	NS	3	07/01/93	150	Pass	OK	1	09/22/93	210	NRI	OK	
MC438-B	NS	3	07/01/93	150	Pass	OK	1	09/22/93	210	NRI	OK	
MC439-T	13F	3	07/01/93	150	Pass	OK	1	09/22/93	210	NRI	OK	
MC439-M	9F	3	07/02/93	151	Pass	OK	1	09/22/93	210	NRI	OK	
MC439-B	9F	3	07/02/93	151	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC439-BR1	9F	1	09/22/93	210	Pass	OK	1	09/22/93	210	NRI	OK	
MC440-T	13F	3	07/01/93	150	Pass	OK	1	09/22/93	210	NRI	OK	
MC440-M	9F	3	07/02/93	151	Pass	OK	1	09/22/93	210	NRI	OK	
MC440-B	9F	3	07/02/93	151	Pass	OK	1	09/22/93	210	NRI	OK	
MC441-T	13F	3	07/01/93	150	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC441-TR1	13F	3	07/01/93	150	Pass	OK	1	09/22/93	210	NRI	OK	
MC441-B	13F	3	07/01/93	150	Pass	OK	1	09/22/93	210	NRI	OK	
MC442-T	13F	3	07/01/93	150	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC442-TR1	13F	3	07/01/93	150	Pass	OK	1	09/22/93	210	NRI	OK	
MC442-B	9F	3	07/02/93	151	Pass	OK	1	09/22/93	210	Reject	Class A	
MC442-BR1	24F	1	11/04/93	246	Pass	OK	1	11/04/93	246	Reject	Class A	
MC442-BR2	24F	1	11/05/93	247	Pass	OK	1	11/05/93	247	NRI	OK	
MC443-T	NS	3	07/01/93	150	Pass	OK	1	09/23/93	211	NRI	OK	
MC443-M	9F	1	09/23/93	211	Pass	OK	1	09/23/93	211	NRI	OK	
MC443-B	9F	1	09/23/93	211	Pass	OK	1	09/23/93	211	NRI	OK	
MC444-T	NS	3	07/01/93	150	Fail	P	No UT Inspection - Failed Visual Inspection					
MC444-TR1	NS	3	09/24/93	212	Pass	OK	1	09/23/93	211	NRI	OK	
MC444-M	9F	1	09/23/93	211	Pass	OK	1	09/23/93	211	NRI	OK	
MC444-B	9F	1	09/23/93	211	Pass	OK	1	09/23/93	211	NRI	OK	
MC445-T	9F	1	08/21/93	187	Pass	OK	1	08/21/93	187	NRI	OK	
MC445-M	9F	1	08/21/93	187	Fail	UC	No UT Inspection - Failed Visual Inspection					
MC445-MR1	NS	1	11/04/93	246	Pass	OK	1	11/04/93	246	NRI	OK	
MC445-B	9F	1	08/21/93	187	Pass	OK	1	08/21/93	187	NRI	OK	
MC446-T	17F	3	07/01/93	150	Pass	OK	2	07/14/93	160	NRI	OK	
MC446-B	17F	3	07/01/93	150	Pass	OK	2	07/14/93	160	NRI	OK	
MC447-T	17F	3	07/01/93	150	Pass	OK	2	07/14/93	160	NRI	OK	
MC447-B	17F	3	07/01/93	150	Pass	OK	2	07/14/93	160	NRI	OK	
MC448-T	17F	3	07/01/93	150	Fail	P	No UT Inspection - Failed Visual Inspection					
MC448-TR1	10F	3	07/01/93	150	Pass	OK	2	07/14/93	160	NRI	OK	
MC448-B	17F	3	07/01/93	150	Pass	OK	2	07/14/93	160	NRI	OK	
MC449-T	17F	3	07/01/93	150	Pass	OK	1	09/17/93	207	NRI	OK	
MC449-B	17F	3	07/01/93	150	Pass	OK	1	09/17/93	207	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC450-T	17F	3	07/01/93	150	Fail	UF,CL,UP	No UT Inspection - Failed Visual Inspection					
MC450-TR1	10F	3	07/01/93	150	Pass	OK	1	09/17/93	207	NRI	OK	
MC450-B	17F	3	07/01/93	150	Fail	UF,UP	No UT Inspection - Failed Visual Inspection					
MC450-BR1	10F	3	07/01/93	150	Pass	OK	1	09/17/93	207	NRI	OK	
MC451-T	17F	3	07/01/93	150	Fail	UF,UP	No UT Inspection - Failed Visual Inspection					
MC451-TR1	17F	3	07/07/93	154	Pass	OK	1	12/14/93	265	NRI	OK	
MC451-B	9F	3	07/19/93	164	Fail	EWB	No UT Inspection - Failed Visual Inspection					
MC451-BR1	9F	1	12/14/93	265	Pass	OK	1	12/14/93	265	NRI	OK	
MC452-T	16F	3	07/14/93	160	Pass	OK	2	07/14/93	160	NRI	OK	
MC452-M	16F	3	07/14/93	160	Pass	OK	2	07/14/93	160	NRI	OK	
MC452-B	16F	3	07/14/93	160	Pass	OK	2	07/14/93	160	NRI	OK	
MC453-T	16F	3	07/14/93	160	Pass	OK	2	07/14/93	160	NRI	OK	
MC453-M	16F	3	07/14/93	160	Pass	OK	2	07/14/93	160	NRI	OK	
MC453-B	16F	3	07/14/93	160	Pass	OK	2	07/14/93	160	NRI	OK	
MC454-T	16F	3	07/14/93	160	Pass	OK	2	07/14/93	160	NRI	OK	
MC454-M	16F	3	07/14/93	160	Pass	OK	2	07/14/93	160	NRI	OK	
MC454-B	16F	3	07/14/93	160	Pass	OK	2	07/14/93	160	NRI	OK	
MC455-T	16F	3	07/14/93	160	Pass	OK	2	07/14/93	160	NRI	OK	
MC455-B	16F	3	07/14/93	160	Pass	OK	2	07/14/93	160	NRI	OK	
MC456-T	16F	3	07/14/93	160	Pass	OK	2	07/14/93	160	NRI	OK	
MC456-B	16F	3	07/14/93	160	Pass	OK	2	07/14/93	160	NRI	OK	
MC457-T	16F	3	07/14/93	160	Pass	OK	2	07/14/93	160	NRI	OK	
MC457-M	16F	3	07/14/93	160	Pass	OK	2	07/14/93	160	NRI	OK	
MC457-B	16F	3	07/14/93	160	Pass	OK	2	07/14/93	160	NRI	OK	
MC458-T	16F	3	07/14/93	160	Pass	OK	2	07/14/93	160	NRI	OK	
MC458-M	16F	3	07/14/93	160	Pass	OK	2	07/14/93	160	NRI	OK	
MC458-B	16F	3	07/14/93	160	Pass	OK	2	07/14/93	160	NRI	OK	
MC459-T	16F	3	07/14/93	160	Pass	OK	2	07/14/93	160	NRI	OK	
MC459-M	16F	3	07/14/93	160	Pass	OK	2	07/14/93	160	NRI	OK	
MC459-B	16F	3	07/14/93	160	Pass	OK	2	07/14/93	160	NRI	OK	
MC460-T	17F	3	07/13/93	159	Pass	OK	1	09/14/93	204	NRI	OK	
MC460-B	17F	3	07/13/93	159	Pass	OK	1	09/14/93	204	Reject	Class A	
MC460-BR1	24F	1	11/04/93	246	Pass	OK	1	11/04/93	246	NRI	OK	
MC461-T	17F	3	07/13/93	159	Pass	OK	1	09/14/93	204	NRI	OK	
MC461-B	17F	3	07/13/93	159	Pass	OK	1	09/14/93	204	NRI	OK	
MC462-T	17F	3	07/13/93	159	Pass	OK	2	08/27/93	192	NRI	OK	
MC462-B	17F	3	07/13/93	159	Pass	OK	2	08/27/93	192	Reject	Class A	
MC462-BR1	17F	1	10/14/93	229	Pass	OK	1	10/14/93	229	Reject	Class A	
MC462-BR2	24F	1	11/04/93	246	Pass	OK	1	11/04/93	246	Reject	Class A	
MC462-BR3	24F	1	11/05/93	247	Pass	OK	1	11/05/93	247	NRI	OK	
MC463-T	17F	3	07/13/93	159	Pass	OK	2	08/27/93	192	NRI	OK	
MC463-B	17F	3	07/13/93	159	Pass	OK	2	08/27/93	192	NRI	OK	
MC464-T	17F	3	07/13/93	159	Pass	OK	2	08/27/93	192	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC464-B	17F	3	07/13/93	159	Pass	OK	2	08/27/93	192	NRI	OK	
MC465-T	17F	3	07/13/93	159	Pass	OK	1	09/17/93	207	NRI	OK	
MC465-B	17F	3	07/13/93	159	Pass	OK	1	09/17/93	207	NRI	OK	
MC466-T	17F	3	07/13/93	159	Pass	OK	1	08/27/93	192	NRI	OK	
MC466-B	9F	3	07/15/93	161	Pass	OK	1	08/27/93	192	NRI	OK	
MC467-T	17F	3	07/13/93	159	Pass	OK	1	08/27/93	192	NRI	OK	
MC467-B	9F	3	07/15/93	161	Pass	OK	1	08/27/93	192	NRI	OK	
MC468-T	17F	3	07/13/93	159	Pass	OK	1	08/27/93	192	NRI	OK	
MC468-B	9F	3	07/15/93	161	Pass	OK	1	08/27/93	192	NRI	OK	
MC469-T	9F	3	07/15/93	161	Pass	OK	1	07/17/93	163	NRI	OK	
MC469-B	9F	3	07/15/93	161	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC469-BR1	9F	3	07/22/93	167	Pass	OK	1	10/30/93	242	NRI	OK	
MC470-T	9F	3	07/15/93	161	Pass	OK	1	07/17/93	163	NRI	OK	
MC470-B	9F	3	07/15/93	161	Pass	OK	1	07/17/93	163	NRI	OK	
MC471-T	9F	3	07/15/93	161	Pass	OK	1	07/17/93	163	NRI	OK	
MC471-B	9F	3	07/15/93	161	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC471-BR1	9F	3	07/19/93	164	Pass	OK	1	10/30/93	242			
MC472-T	9F	3	07/15/93	161	Pass	OK	1	07/17/93	163	NRI	OK	
MC472-B	9F	3	07/15/93	161	Pass	OK	1	07/17/93	163	NRI	OK	
MC473-T	17F	3	07/16/93	162	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC473-TR1	17F	1	10/09/93	225	Pass	OK	1	10/09/93	225	NRI	OK	
MC473-B	17F	3	07/16/93	162	Pass	OK	1	10/09/93	225	NRI	OK	
MC473X-T	17F	3	07/19/93	164	Pass	OK	No Record of Ultrasonic Inspection					Incomplete Inspection
MC473X-B	9F	3	07/19/93	164	Pass	OK	No Record of Ultrasonic Inspection					Incomplete Inspection
MC474-T	17F	3	07/16/93	162	Fail	IRO	No UT Inspection - Failed Visual Inspection					
MC474-TR1	17F	3	07/20/93	165	Pass	OK	1	10/09/93	225	NRI	OK	
MC474-B	17F	3	07/16/93	162	Fail	IRO	No UT Inspection - Failed Visual Inspection					
MC474-BR1	17F	3	07/20/93	165	Pass	OK	1	10/09/93	225	NRI	OK	
MC474X-T	16F	3	07/19/93	164	Pass	OK	1	09/22/93	210	NRI	OK	
MC474X-B	16F	3	07/19/93	164	Pass	OK	1	09/22/93	210	Reject	Class A	
MC474X-BR1	24F	1	11/04/93	246	Pass	OK	1	11/04/93	246	NRI	OK	
MC475-T	17F	3	07/16/93	162	Pass	OK	1	10/09/93	225	NRI	OK	
MC475-B	17F	3	07/16/93	162	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC475-BR1	17F	3	07/20/93	165	Pass	OK	1	10/09/93	225	NRI	OK	
MC475X-T	18F	3	07/19/93	164	Pass	OK	1	09/22/93	210	Reject	Class A	
MC475X-TR1	24F	1	11/04/93	246	Pass	OK	1	11/04/93	246	NRI	OK	
MC475X-B	18F	3	07/19/93	164	Pass	OK	1	09/22/93	210	NRI	OK	
MC476-T	17F	3	07/16/93	162	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC476-TR1	17F	3	07/20/93	165	Pass	OK	1	10/09/93	225	NRI	OK	
MC476-B	17F	3	07/16/93	162	Pass	OK	1	10/09/93	225	NRI	OK	
MC476X-T	1F	3	07/19/93	164	Pass	OK	1	11/04/93	246	NRI	OK	
MC476X-B	1F	3	07/19/93	164	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC476X-BR1	1F	1	11/04/93	246	Pass	OK	1	11/04/93	246	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC477-T	17F	3	07/16/93	162	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC477-TR1	17F	1	10/09/93	225	Pass	OK	1	10/09/93	225	NRI	OK	
MC477-B	17F	3	07/16/93	162	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC477-BR1	17F	3	07/20/93	165	Pass	OK	1	10/09/93	225	NRI	OK	
MC477X-T	NS	3	07/19/93	164	Pass	OK	1	09/22/93	210	Reject	Class A	
MC477X-TR1	24F	1	11/04/93	246	Pass	OK	1	11/04/93	246	NRI	OK	
MC477X-B	NS	3	07/19/93	164	Pass	OK	1	09/22/93	210	NRI	OK	
MC478-T	17F	3	07/16/93	162	Pass	OK	1	10/09/93	225	NRI	OK	
MC478-B	17F	3	07/16/93	162	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC478-BR1	17F	1	10/09/93	225	Pass	OK	1	10/09/93	225	NRI	OK	
MC478X-T	NS	3	07/19/93	164	Pass	OK	1	09/23/93	211	Reject	Class A	
MC478X-TR1	24F	1	11/04/93	246	Pass	OK	1	11/04/93	246	Reject	Class A	
MC478X-TR2	24F	1	11/05/93	247	Pass	OK	1	11/05/93	247	NRI	OK	
MC478X-B	NS	3	07/19/93	164	Pass	OK	1	09/23/93	211	NRI	OK	
MC479-T	17F	3	07/16/93	162	Pass	OK	1	10/09/93	225	NRI	OK	
MC479-B	17F	3	07/16/93	162	Pass	OK	1	10/09/93	225	NRI	OK	
MC479X-T	20F	3	07/22/93	167	Pass	OK	1	10/09/93	225	NRI	OK	
MC479X-B	20F	3	07/22/93	167	Pass	OK	1	10/09/93	225	NRI	OK	
MC480-T	17F	3	07/16/93	162	Pass	OK	1	10/09/93	225	NRI	OK	
MC480-B	17F	3	07/16/93	162	Pass	OK	1	10/09/93	225	NRI	OK	
MC480X-T	20F	3	07/22/93	167	Pass	OK	1	10/09/93	225	NRI	OK	
MC480X-B	20F	3	07/22/93	167	Pass	OK	1	10/09/93	225	NRI	OK	
MC481-T	17F	3	07/16/93	162	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC481-TR1	17F	3	07/20/93	165	Pass	OK	1	10/09/93	225	NRI	OK	
MC481-B	17F	3	07/16/93	162	Pass	OK	1	10/09/93	225	NRI	OK	
MC481X-T	20F	3	07/22/93	167	Pass	OK	1	10/09/93	225	NRI	OK	
MC481X-B	20F	3	07/22/93	167	Pass	OK	1	10/09/93	225	NRI	OK	
MC482-T	17F	3	07/16/93	162	Pass	OK	1	10/09/93	225	NRI	OK	
MC482-B	17F	3	07/16/93	162	Pass	OK	1	10/09/93	225	NRI	OK	
MC482X-T	20F	3	07/22/93	167	Pass	OK	1	10/09/93	225	NRI	OK	
MC482X-B	20F	3	07/22/93	167	Pass	OK	1	10/09/93	225	NRI	OK	
MC483-T	17F	3	07/16/93	162	Pass	OK	1	10/09/93	225	NRI	OK	
MC483-B	17F	3	07/16/93	162	Pass	OK	1	10/09/93	225	NRI	OK	
MC483X-T	20F	3	07/23/93	168	Pass	OK	1	10/09/93	225	NRI	OK	
MC483X-B	20F	3	07/23/93	168	Pass	OK	1	10/09/93	225	NRI	OK	
MC484-T	20F	3	07/23/93	168	Pass	OK	1	10/09/93	225	NRI	OK	
MC484-B	20F	3	07/23/93	168	Pass	OK	1	10/09/93	225	NRI	OK	
MC485-T	20F	3	07/23/93	168	Pass	OK	1	10/09/93	225	NRI	OK	
MC485-B	20F	3	07/23/93	168	Pass	OK	1	10/09/93	225	NRI	OK	
MC486-T	20F	3	07/23/93	168	Pass	OK	1	10/09/93	225	NRI	OK	
MC486-B	20F	3	07/23/93	168	Pass	OK	1	10/09/93	225	NRI	OK	
MC487-T	20F	3	07/23/93	168	Pass	OK	1	10/09/93	225	NRI	OK	
MC487-B	20F	3	07/23/93	168	Pass	OK	1	10/09/93	225	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC488-T	1F	3	07/23/93	168	Pass	OK	1	08/06/93	178	NRI	OK	
MC488-B	1F	3	07/23/93	168	Pass	OK	1	08/06/93	178	NRI	OK	
MC489-T	1F	3	07/23/93	168	Pass	OK	1	08/06/93	178	NRI	OK	
MC489-B	1F	3	07/23/93	168	Pass	OK	1	08/06/93	178	NRI	OK	
MC490-T	1F	3	07/23/93	168	Pass	OK	1	09/27/93	214	Reject	Class A	
MC490-TR1	24F	1	02/17/94	275	Pass	OK	1	02/17/94	275	NRI	OK	
MC490-M	1F	3	07/23/93	168	Pass	OK	1	09/27/93	214	Reject	Class A	
MC490-MR1	24F	1	11/04/93	246	Pass	OK	1	11/04/93	246	NRI	OK	
MC490-B	1F	3	07/23/93	168	Pass	OK	1	09/27/93	214	NRI	OK	
MC491-T	1F	3	07/23/93	168	Pass	OK	1	10/27/93	239	NRI	OK	
MC491-M	1F	3	07/23/93	168	Pass	OK	1	10/27/93	239	Reject	Class A	
MC491-MR1	24F	1	11/04/93	246	Pass	OK	1	11/04/93	246	NRI	OK	
MC491-B	1F	3	07/23/93	168	Pass	OK	1	10/27/93	239	NRI	OK	
MC492-T	1F	3	07/23/93	168	Pass	OK	1	09/27/93	214	NRI	OK	
MC492-B	1F	3	07/23/93	168	Pass	OK	1	09/27/93	214	NRI	OK	
MC493-T	1F	3	07/23/93	168	Pass	OK	1	09/27/93	214	NRI	OK	
MC493-B	1F	3	07/23/93	168	Pass	OK	1	09/27/93	214	NRI	OK	
MC494-T	1F	3	07/23/93	168	Pass	OK	1	09/27/93	214	NRI	OK	
MC494-B	1F	3	07/23/93	168	Pass	OK	1	09/27/93	214	NRI	OK	
MC495-T	1F	3	07/23/93	168	Pass	OK	1	09/27/93	214	NRI	OK	
MC495-B	1F	3	07/23/93	168	Pass	OK	1	09/27/93	214	NRI	OK	
MC496-T	1F	3	07/23/93	168	Pass	OK	No Record of Ultrasonic Inspection					Incomplete Inspection
MC496-M	19F	3	07/23/93	168	Pass	OK	No Record of Ultrasonic Inspection					Incomplete Inspection
MC496-B	19F	3	07/23/93	168	Pass	OK	No Record of Ultrasonic Inspection					Incomplete Inspection
MC497-T	1F	3	07/23/93	168	Pass	OK	1	10/27/93	239	NRI	OK	
MC497-M	19F	3	07/23/93	168	Pass	OK	1	10/27/93	239	NRI	OK	
MC497-B	19F	3	07/23/93	168	Pass	OK	1	10/27/93	239	NRI	OK	
MC498-T	1F	3	07/26/93	169	Pass	OK	1	09/27/93	214	NRI	OK	
MC498-M	19F	3	07/26/93	169	Pass	OK	1	09/27/93	214	Reject	Class A	
MC498-MR1	24F	1	11/05/93	247	Pass	OK	1	11/05/93	247	NRI	OK	
MC498-B	19F	3	07/26/93	169	Pass	OK	1	09/27/93	214	Reject	Class A	
MC498-BR1	24F	1	11/05/93	247	Pass	OK	1	11/05/93	247	NRI	OK	
MC499-T	NS	3	07/26/93	169	Pass	OK	1	10/09/93	225	NRI	OK	
MC499-B	NS	3	07/26/93	169	Pass	OK	1	10/09/93	225	NRI	OK	
MC500-T	20F	3	07/27/93	170	Pass	OK	2	09/23/93	211	NRI	OK	
MC500-B	20F	3	07/27/93	170	Pass	OK	2	09/23/93	211	Reject	Class A	
MC500-BR1	24F	1	11/05/93	247	Pass	OK	1	11/05/93	247	NRI	OK	
MC501-T	20F	3	07/27/93	170	Pass	OK	2	09/23/93	211	NRI	OK	
MC501-B	20F	3	07/27/93	170	Pass	OK	2	09/23/93	211	NRI	OK	
MC502-T	NS	3	07/27/93	170	Pass	OK	2	09/23/93	211	NRI	OK	
MC502-B	NS	3	07/27/93	170	Pass	OK	2	09/23/93	211	NRI	OK	
MC502A-T	NS	2	09/23/93	211	Pass	OK	2	09/23/93	211	NRI	OK	
MC502A-B	NS	2	09/23/93	211	Pass	OK	2	09/23/93	211	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC502B-T	NS	2	09/23/93	211	Pass	OK	2	09/23/93	211	NRI	OK	
MC502B-B	NS	2	09/23/93	211	Fail	UC	No UT Inspection - Failed Visual Inspection					
MC502B-BR1	24F	1	11/05/93	247	Pass	OK	1	11/05/93	247	NRI	OK	
MC503-T	NS	3	07/27/93	170	Pass	OK	2	09/23/93	211	NRI	OK	
MC503-B	NS	3	07/27/93	170	Pass	OK	2	09/23/93	211	NRI	OK	
MC504-T	NS	3	07/27/93	170	Pass	OK	2	09/23/93	211	NRI	OK	
MC504-B	NS	3	07/27/93	170	Pass	OK	2	09/23/93	211	NRI	OK	
MC505-T	NS	3	07/27/93	170	Pass	OK	2	09/23/93	211	NRI	OK	
MC505-B	NS	3	07/27/93	170	Pass	OK	2	09/23/93	211	NRI	OK	
MC506-T	NS	3	07/28/93	171	Pass	OK	2	09/23/93	211	NRI	OK	
MC506-B	NS	3	07/28/93	171	Pass	OK	2	09/23/93	211	NRI	OK	
MC507-T	7F	3	07/28/93	171	Pass	OK	2	09/23/93	211	NRI	OK	
MC507-B	7F	3	07/28/93	171	Pass	OK	2	09/23/93	211	NRI	OK	
MC508-T	7F	3	07/28/93	171	Pass	OK	2	09/23/93	211	NRI	OK	
MC508-B	7F	3	07/28/93	171	Pass	OK	2	09/23/93	211	NRI	OK	
MC509-T	7F	3	07/28/93	171	Pass	OK	2	09/23/93	211	NRI	OK	
MC509-B	7F	3	07/28/93	171	Pass	OK	2	09/23/93	211	NRI	OK	
MC510-T	7F	3	07/28/93	171	Pass	OK	2	09/23/93	211	NRI	OK	
MC510-B	7F	3	07/28/93	171	Pass	OK	2	09/23/93	211	NRI	OK	
MC511-T	20F	3	07/28/93	171	Pass	OK	1	10/09/93	225	NRI	OK	
MC511-B	20F	3	07/28/93	171	Pass	OK	1	10/09/93	225	NRI	OK	
MC512-T	20F	3	07/28/93	171	Pass	OK	1	10/09/93	225	NRI	OK	
MC512-B	20F	3	07/28/93	171	Pass	OK	1	10/09/93	225	NRI	OK	
MC513-T	20F	3	07/28/93	171	Pass	OK	1	10/09/93	225	NRI	OK	
MC513-B	20F	3	07/28/93	171	Pass	OK	1	10/09/93	225	NRI	OK	
MC514-T	20F	3	07/28/93	171	Pass	OK	1	10/09/93	225	NRI	OK	
MC514-B	20F	3	07/28/93	171	Pass	OK	1	10/09/93	225	NRI	OK	
MC515-T	20F	3	07/28/93	171	Pass	OK	1	10/09/93	225	NRI	OK	
MC515-B	20F	3	07/28/93	171	Pass	OK	1	10/09/93	225	NRI	OK	
MC516-T	19F	3	07/29/93	172	Fail	UF	No UT Inspection - Failed Visual Inspection					Weld Not Repaired
MC516-B	19F	3	07/29/93	172	Pass	OK	1	10/30/93	242	NRI	OK	
MC517-T	19F	3	07/29/93	172	Pass	OK	1	10/30/93	242	NRI	OK	
MC517-B	19F	3	07/29/93	172	Pass	OK	1	10/30/93	242	NRI	OK	
MC518-T	19F	3	07/29/93	172	Pass	OK	No Record of Ultrasonic Inspection					Incomplete Inspection
MC518-B	19F	3	07/29/93	172	Pass	OK	No Record of Ultrasonic Inspection					Incomplete Inspection
MC519-T	19F	3	07/29/93	172	Pass	OK	No Record of Ultrasonic Inspection					Incomplete Inspection
MC519-B	19F	3	07/29/93	172	Pass	OK	No Record of Ultrasonic Inspection					Incomplete Inspection
MC520-T	20F	3	07/29/93	172	Pass	OK	1	10/26/93	238	NRI	OK	
MC520-B	20F	3	07/29/93	172	Pass	OK	1	10/26/93	238	NRI	OK	
MC521-T	20F	3	07/29/93	172	Pass	OK	1	10/26/93	238	Reject	Class A	
MC521-TR1	20F	1	11/24/93	255	Pass	OK	1	11/24/93	255	NRI	OK	
MC521-B	20F	3	07/29/93	172	Pass	OK	1	10/26/93	238	NRI	OK	
MC522-T	20F	3	07/30/93	173	Pass	OK	2	09/23/93	211	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC522-B	20F	3	07/30/93	173	Pass	OK	2	09/23/93	211	NRI	OK	
MC523-T	20F	3	07/30/93	173	Pass	OK	2	09/23/93	211	NRI	OK	
MC523-B	20F	3	07/30/93	173	Pass	OK	2	09/23/93	211	NRI	OK	
MC524-T	10F	3	07/30/93	173	Pass	OK	1	10/26/93	238	NRI	OK	
MC524-B	10F	3	07/30/93	173	Pass	OK	1	10/26/93	238	Reject	Class A	
MC524-BR1	10F	1	11/24/93	255	Pass	OK	1	11/24/93	255	NRI	OK	
MC525-T	10F	3	07/30/93	173	Pass	OK	1	10/26/93	238	NRI	OK	
MC525-B	10F	3	07/30/93	173	Pass	OK	1	10/26/93	238	Reject	Class A	
MC525-BR1	10F	1	11/24/93	255	Pass	OK	1	11/24/93	255	NRI	OK	
MC526-T	10F	3	07/30/93	173	Pass	OK	1	10/26/93	238	NRI	OK	
MC526-B	10F	3	07/30/93	173	Pass	OK	1	10/26/93	238	Reject	Class A	
MC526-BR1	10F	1	11/24/93	255	Pass	OK	1	11/24/93	255	NRI	OK	
MC527-T	20F	3	07/30/93	173	Pass	OK	1	10/26/93	238	NRI	OK	
MC527-B	20F	3	07/30/93	173	Pass	OK	1	10/26/93	238	NRI	OK	
MC528-T	20F	3	07/30/93	173	Pass	OK	1	10/26/93	238	NRI	OK	
MC528-B	20F	3	07/30/93	173	Pass	OK	1	10/26/93	238	NRI	OK	
MC529-T	22F	3	07/30/93	173	Pass	OK	2	09/23/93	211	NRI	OK	
MC529-B	22F	3	07/30/93	173	Pass	OK	2	09/23/93	211	NRI	OK	
MC530-T	10F	3	07/30/93	173	Pass	OK	1	10/26/93	238	NRI	OK	
MC530-B	10F	3	07/30/93	173	Pass	OK	1	10/26/93	238	NRI	OK	
MC531-T	20F	3	07/30/93	173	Pass	OK	1	10/26/93	238	NRI	OK	
MC531-B	20F	3	07/30/93	173	Pass	OK	1	10/26/93	238	NRI	OK	
MC532-T	20F	3	07/30/93	173	Pass	OK	1	10/26/93	238	NRI	OK	
MC532-B	20F	3	07/30/93	173	Pass	OK	1	10/26/93	238	NRI	OK	
MC533-T	1F	3	08/02/93	174	Pass	OK	1	10/30/93	242	NRI	OK	
MC533-B	1F	3	08/02/93	174	Pass	OK	1	10/30/93	242	NRI	OK	
MC534-T	20F	3	08/04/93	176	Pass	OK	2	09/22/93	210	NRI	OK	
MC534-B	20F	3	08/04/93	176	Pass	OK	2	09/22/93	210	NRI	OK	
MC535-T	20F	3	08/04/93	176	Pass	OK	2	09/22/93	210	NRI	OK	
MC535-B	20F	3	08/04/93	176	Pass	OK	2	09/22/93	210	NRI	OK	
MC536-T	20F	3	08/04/93	176	Pass	OK	2	09/22/93	210	NRI	OK	
MC536-B	20F	3	08/04/93	176	Pass	OK	2	09/22/93	210	NRI	OK	
MC537-T	20F	3	08/04/93	176	Pass	OK	2	09/22/93	210	NRI	OK	
MC537-B	20F	3	08/04/93	176	Pass	OK	2	09/22/93	210	NRI	OK	
MC538-T	20F	3	08/04/93	176	Pass	OK	2	09/22/93	210	NRI	OK	
MC538-B	20F	3	08/04/93	176	Pass	OK	2	09/22/93	210	NRI	OK	
MC539-T	20F	3	08/04/93	176	Pass	OK	2	09/22/93	210	NRI	OK	
MC539-B	20F	3	08/04/93	176	Pass	OK	2	09/22/93	210	NRI	OK	
MC540-T	7F	3	08/04/93	176	Pass	OK	2	09/22/93	210	NRI	OK	
MC540-B	7F	3	08/04/93	176	Pass	OK	2	09/22/93	210	NRI	OK	
MC541-T	7F	3	08/04/93	176	Pass	OK	2	09/22/93	210	NRI	OK	
MC541-B	7F	3	08/04/93	176	Pass	OK	2	09/22/93	210	NRI	OK	
MC542-T	7F	3	08/04/93	176	Pass	OK	2	09/22/93	210	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC542-B	7F	3	08/04/93	176	Pass	OK	2	09/22/93	210	NRI	OK	
MC543-T	10F	3	08/04/93	176	Pass	OK	2	09/22/93	210	NRI	OK	
MC543-B	10F	3	08/04/93	176	Pass	OK	2	09/22/93	210	NRI	OK	
MC544-T	20F	3	08/04/93	176	Pass	OK	2	09/22/93	210	NRI	OK	
MC544-B	20F	3	08/04/93	176	Pass	OK	2	09/22/93	210	NRI	OK	
MC545-T	20F	3	08/04/93	176	Pass	OK	2	09/22/93	210	NRI	OK	
MC545-B	20F	3	08/04/93	176	Pass	OK	2	09/22/93	210	NRI	OK	
MC546-T	20F	1	08/06/93	178	Pass	OK	1	08/06/93	178	NRI	OK	
MC546-B	20F	1	08/06/93	178	Pass	OK	1	08/06/93	178	NRI	OK	
MC547-T	20F	1	08/06/93	178	Pass	OK	1	08/06/93	178	NRI	OK	
MC547-B	20F	1	08/06/93	178	Pass	OK	1	08/06/93	178	NRI	OK	
MC548-T	20F	1	08/06/93	178	Pass	OK	1	08/06/93	178	NRI	OK	
MC548-B	20F	1	08/06/93	178	Pass	OK	1	08/06/93	178	NRI	OK	
MC548-BR1	24F	1	11/05/93	247	Pass	OK	1	08/06/93	178	Reject	Class A	
MC549-T	20F	1	08/06/93	178	Pass	OK	1	11/05/93	247	NRI	OK	
MC549-B	20F	1	08/06/93	178	Pass	OK	1	08/06/93	178	NRI	OK	
MC550-T	20F	1	08/06/93	178	Pass	OK	1	08/06/93	178	NRI	OK	
MC550-B	20F	1	08/06/93	178	Pass	OK	1	08/06/93	178	NRI	OK	
MC551-T	20F	1	08/06/93	178	Pass	OK	1	08/06/93	178	NRI	OK	
MC551-B	20F	1	08/06/93	178	Pass	OK	1	08/06/93	178	NRI	OK	
MC552-T	20F	1	08/06/93	178	Pass	OK	1	08/06/93	178	NRI	OK	
MC552-B	20F	1	08/06/93	178	Pass	OK	1	08/06/93	178	NRI	OK	
MC553-T	20F	1	08/06/93	178	Pass	OK	1	08/06/93	178	NRI	OK	
MC553-B	20F	1	08/06/93	178	Pass	OK	1	08/06/93	178	NRI	OK	
MC554-T	10F	3	08/11/93	179	Pass	OK	2	09/22/93	210	NRI	OK	
MC554-B	10F	3	08/11/93	179	Pass	OK	2	09/22/93	210	NRI	OK	
MC555-T	10F	3	08/11/93	179	Pass	OK	2	09/22/93	210	NRI	OK	
MC555-B	10F	3	08/11/93	179	Pass	OK	2	09/22/93	210	NRI	OK	
MC556-T	10F	3	08/11/93	179	Pass	OK	2	09/22/93	210	NRI	OK	
MC556-B	10F	3	08/11/93	179	Pass	OK	2	09/22/93	210	NRI	OK	
MC556A-T	NS	2	09/22/93	210	Pass	OK	2	09/22/93	210	NRI	OK	
MC556A-B	NS	2	09/22/93	210	Pass	OK	2	09/22/93	210	NRI	OK	
MC557-T	10F	3	08/11/93	179	Pass	OK	1	09/22/93	210	NRI	OK	
MC557-B	10F	3	08/11/93	179	Pass	OK	1	09/22/93	210	NRI	OK	
MC558-T	20F	3	08/11/93	179	Pass	OK	1	10/21/93	234	NRI	OK	
MC558-B	20F	3	08/11/93	179	Pass	OK	1	10/21/93	234	NRI	OK	
MC559-T	20F	3	08/11/93	179	Pass	OK	1	10/21/93	234	NRI	OK	
MC559-B	20F	3	08/11/93	179	Pass	OK	1	10/21/93	234	NRI	OK	
MC560-T	20F	3	08/11/93	179	Pass	OK	1	10/21/93	234	NRI	OK	
MC560-B	20F	3	08/11/93	179	Pass	OK	1	10/21/93	234	NRI	OK	
MC561-T	20F	3	08/11/93	179	Pass	OK	1	10/21/93	234	NRI	OK	
MC561-B	20F	3	08/11/93	179	Pass	OK	1	10/21/93	234	NRI	OK	
MC562-T	20F	3	08/11/93	179	Pass	OK	1	10/21/93	234	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC562-B	20F	3	08/11/93	179	Pass	OK	1	10/21/93	234	NRI	OK	
MC563-T	20F	3	08/11/93	179	Pass	OK	1	10/21/93	234	NRI	OK	
MC563-B	20F	3	08/11/93	179	Pass	OK	1	10/21/93	234	NRI	OK	
MC564-T	20F	3	08/12/93	180	Pass	OK	1	08/27/93	192	NRI	OK	
MC564-B	20F	3	08/12/93	180	Pass	OK	1	08/27/93	192	NRI	OK	
MC565-T	20F	3	08/12/93	180	Pass	OK	1	08/27/93	192	NRI	OK	
MC565-B	20F	3	08/12/93	180	Pass	OK	1	08/27/93	192	NRI	OK	
MC566-T	20F	3	08/12/93	180	Pass	OK	1	08/27/93	192	NRI	OK	
MC566-B	20F	3	08/12/93	180	Pass	OK	1	08/27/93	192	NRI	OK	
MC567-T	20F	3	08/12/93	180	Pass	OK	1	08/27/93	192	NRI	OK	
MC567-B	20F	3	08/12/93	180	Pass	OK	1	08/27/93	192	NRI	OK	
MC568-T	20F	3	08/12/93	180	Pass	OK	1	08/19/93	186	NRI	OK	
MC568-B	20F	3	08/12/93	180	Pass	OK	1	08/19/93	186	NRI	OK	
MC569-T	20F	3	08/12/93	180	Pass	OK	1	08/19/93	186	NRI	OK	
MC569-B	20F	3	08/12/93	180	Pass	OK	1	08/19/93	186	NRI	OK	
MC570-T	20F	3	08/12/93	180	Pass	OK	1	08/19/93	186	NRI	OK	
MC570-B	20F	3	08/12/93	180	Pass	OK	1	08/19/93	186	NRI	OK	
MC571-T	20F	3	08/12/93	180	Pass	OK	1	08/19/93	186	NRI	OK	
MC571-B	5F	3	08/18/93	185	Pass	OK	1	08/19/93	186	NRI	OK	
MC572-T	20F	3	08/13/93	181	Pass	OK	2	09/22/93	210	NRI	OK	
MC572-B	20F	3	08/13/93	181	Pass	OK	2	09/22/93	210	NRI	OK	
MC573-T	Albert	3	08/13/93	181	Pass	OK	2	09/22/93	210	NRI	OK	
MC573-B	Albert	3	08/13/93	181	Pass	OK	2	09/22/93	210	NRI	OK	
MC574-T	20F	3	08/13/93	181	Pass	OK	2	09/22/93	210	NRI	OK	
MC574-B	20F	3	08/13/93	181	Pass	OK	2	09/22/93	210	NRI	OK	
MC575-T	20F	3	08/13/93	181	Pass	OK	2	09/22/93	210	NRI	OK	
MC575-B	20F	3	08/13/93	181	Pass	OK	2	09/22/93	210	NRI	OK	
MC576-T	1F	3	08/17/93	184	Pass	OK	1	08/27/93	192	NRI	OK	
MC576-M	1F	3	08/27/93	192	Pass	OK	1	08/27/93	192	NRI	OK	
MC576-B	1F	3	08/27/93	192	Pass	OK	1	08/27/93	192	NRI	OK	
MC577-T	1F	3	08/17/93	184	Pass	OK	1	08/27/93	192	NRI	OK	
MC577-M	1F	3	08/27/93	192	Pass	OK	1	08/27/93	192	NRI	OK	
MC577-B	1F	3	08/27/93	192	Pass	OK	1	08/27/93	192	NRI	OK	
MC578-T	1F	1	11/03/93	245	Pass	OK	1	11/03/93	245	NRI	OK	
MC578-M	1F	1	11/03/93	245	Pass	OK	1	11/03/93	245	NRI	OK	
MC578-B	KS	1	11/03/93	245	Pass	OK	1	11/03/93	245	NRI	OK	
MC579-T	1F	1	11/03/93	245	Pass	OK	1	11/03/93	245	NRI	OK	
MC579-M	1F	1	11/03/93	245	Pass	OK	1	11/03/93	245	NRI	OK	
MC579-B	KS	1	11/03/93	245	Pass	OK	1	11/03/93	245	NRI	OK	
MC580-T	5F	3	08/17/93	184	Pass	OK	1	08/19/93	186	NRI	OK	
MC580-B	5F	3	08/17/93	184	Pass	OK	1	08/19/93	186	NRI	OK	
MC581-T	5F	3	08/17/93	184	Pass	OK	1	08/19/93	186	NRI	OK	
MC581-B	5F	3	08/17/93	184	Pass	OK	1	08/19/93	186	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC582-T	5F	3	08/17/93	184	Pass	OK	1	08/19/93	186	NRI	OK	
MC582-B	5F	3	08/17/93	184	Pass	OK	1	08/19/93	186	NRI	OK	
MC583-T	5F	3	08/17/93	184	Pass	OK	1	08/19/93	186	NRI	OK	
MC583-B	5F	3	08/17/93	184	Pass	OK	1	08/19/93	186	Reject	ClassA	
MC583-BR1	24F	1	11/05/93	247	Pass	OK	1	11/05/93	247	NRI	OK	
MC584-TN	1F	3	08/17/93	184	Pass	OK	1	08/27/93	192	NRI	OK	
MC584-BN	1F	3	08/17/93	184	Pass	OK	1	08/27/93	192	NRI	OK	
MC585-TS	1F	3	08/17/93	184	Pass	OK	1	08/27/93	192	NRI	OK	
MC585-BS	1F	3	08/17/93	184	Pass	OK	1	08/27/93	192	NRI	OK	
MC586-TN	1F	3	08/17/93	184	Pass	OK	1	10/24/93	236	NRI	OK	
MC586-BN	1F	3	08/17/93	184	Pass	OK	1	10/24/93	236	NRI	OK	
MC587-TS	1F	3	08/17/93	184	Pass	OK	1	10/24/93	236	NRI	OK	
MC587-BS	1F	3	08/17/93	184	Pass	OK	1	10/24/93	236	NRI	OK	
MC588-TE	20F	3	08/18/93	185	Pass	OK	1	08/19/93	186	NRI	OK	
MC588-BE	20F	3	08/18/93	185	Pass	OK	1	08/19/93	186	NRI	OK	
MC589-TW	20F	3	08/18/93	185	Pass	OK	1	08/19/93	186	NRI	OK	
MC589-BW	20F	3	08/18/93	185	Pass	OK	1	08/19/93	186	NRI	OK	
MC590-T	5F	3	08/18/93	185	Pass	OK	1	08/19/93	186	NRI	OK	
MC590-B	5F	3	08/18/93	185	Pass	OK	1	08/19/93	186	NRI	OK	
MC591-T	5F	3	08/18/93	185	Pass	OK	1	08/19/93	186	NRI	OK	
MC591-B	5F	3	08/18/93	185	Pass	OK	1	08/19/93	186	NRI	OK	
MC592-T	5F	3	08/18/93	185	Pass	OK	1	08/19/93	186	NRI	OK	
MC592-B	5F	3	08/18/93	185	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC592-BR1	5F	1	08/19/93	186	Pass	OK	1	08/19/93	186	NRI	OK	
MC593-T	5F	3	08/18/93	185	Pass	OK	1	08/19/93	186	NRI	OK	
MC593-B	5F	3	08/18/93	185	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC593-BR1	5F	1	08/19/93	186	Pass	OK	1	08/19/93	186	Reject	Class A	
MC593-BR2	5F	1	11/24/93	255	Pass	OK	1	11/24/93	255	NRI	OK	
MC594-T	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC594-B	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC595-T	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC595-B	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC596-T	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC596-B	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC597-T	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC597-B	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC598-T	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC598-B	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC599-T	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC599-B	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC600-T	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC600-B	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC601-T	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC601-B	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC602-T	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC602-B	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC603-T	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC603-B	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC604-T	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC604-B	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC605-T	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC605-B	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC606-T	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC606-B	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC607-T	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC607-B	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC608-T	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC608-B	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC609-T	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC609-B	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC610-T	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC610-B	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC611-T	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC611-B	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC612-T	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC612-B	24F	1	08/26/93	191	Pass	OK	1	08/26/93	191	NRI	OK	
MC613-T	24F	3	08/30/93	193	Pass	OK	1	09/02/93	196	NRI	OK	
MC613-B	24F	3	08/30/93	193	Pass	OK	1	09/02/93	196	NRI	OK	
MC614-T	24F	3	08/30/93	193	Pass	OK	1	09/02/93	196	NRI	OK	
MC614-B	24F	3	08/30/93	193	Pass	OK	1	09/02/93	196	NRI	OK	
MC615-T	24F	3	08/30/93	193	Pass	OK	1	10/24/93	236	NRI	OK	
MC615-B	24F	3	08/30/93	193	Pass	OK	1	10/24/93	236	NRI	OK	
MC616-T	24F	3	08/30/93	193	Pass	OK	1	10/24/93	236	NRI	OK	
MC616-B	24F	3	08/30/93	193	Pass	OK	1	10/24/93	236	NRI	OK	
MC617-T	24F	3	08/30/93	193	Pass	OK	1	10/24/93	236	NRI	OK	
MC617-B	24F	3	08/30/93	193	Pass	OK	1	10/24/93	236	NRI	OK	
MC618-T	24F	3	08/30/93	193	Pass	OK	1	10/24/93	236	NRI	OK	
MC618-B	24F	3	08/30/93	193	Pass	OK	1	10/24/93	236	NRI	OK	
MC619-T	24F	3	08/30/93	193	Pass	OK	1	10/24/93	236	NRI	OK	
MC619-B	24F	3	08/30/93	193	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC619-BR1	24F	1	09/02/93	196	Pass	OK	1	09/02/93	196	NRI	OK	
MC620-T	24F	3	08/30/93	193	Pass	OK	1	09/02/93	196	NRI	OK	
MC620-B	24F	3	08/30/93	193	Pass	OK	1	09/02/93	196	NRI	OK	
MC621-T	24F	1	09/02/93	196	Pass	OK	1	09/02/93	196	NRI	OK	
MC621-B	24F	1	09/02/93	196	Pass	OK	1	09/02/93	196	NRI	OK	
MC622-T	24F	1	09/02/93	196	Pass	OK	1	09/02/93	196	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC622-B	24F	1	09/02/93	196	Pass	OK	1	09/02/93	196	NRI	OK	
MC623-T	24F	1	09/02/93	196	Pass	OK	1	09/02/93	196	NRI	OK	
MC623-B	24F	1	09/02/93	196	Pass	OK	1	09/02/93	196	NRI	OK	
MC624-T	24F	1	09/02/93	196	Pass	OK	1	09/02/93	196	NRI	OK	
MC624-B	24F	1	09/02/93	196	Pass	OK	1	09/02/93	196	NRI	OK	
MC625-T	NS	3	09/09/93	200	Pass	OK	1	10/30/93	242	NRI	OK	
MC625-B	NS	3	09/09/93	200	Pass	OK	1	10/30/93	242	NRI	OK	
MC626-T	NS	3	09/09/93	200	Pass	OK	1	10/30/93	242	NRI	OK	
MC626-B	NS	3	09/09/93	200	Pass	OK	1	10/30/93	242	NRI	OK	
MC627-T	NS	3	09/09/93	200	Pass	OK	1	10/30/93	242	NRI	OK	
MC627-B	NS	3	09/09/93	200	Pass	OK	1	10/30/93	242	NRI	OK	
MC628-T	NS	3	09/09/93	200	Pass	OK	1	10/30/93	242	NRI	OK	
MC628-B	NS	3	09/09/93	200	Pass	OK	1	10/30/93	242	NRI	OK	
MC629-T	NS	3	09/09/93	200	Pass	OK	1	10/30/93	242	NRI	OK	
MC629-B	NS	3	09/09/93	200	Pass	OK	1	10/09/93	225	NRI	OK	
MC630-T	NS	3	09/09/93	200	Pass	OK	1	10/09/93	225	NRI	OK	
MC630-B	NS	3	09/09/93	200	Pass	OK	1	10/09/93	225	NRI	OK	
MC631-T	1F	3	09/11/93	202	Pass	OK	1	10/09/93	225	NRI	OK	
MC631-B	1F	3	09/11/93	202	Pass	OK	1	10/09/93	225	NRI	OK	
MC632-T	1F	3	09/11/93	202	Pass	OK	1	10/09/93	225	Reject	Class A	
MC632-TR1	24F	1	11/04/93	246	Pass	OK	1	11/04/93	246	NRI	OK	
MC632-B	1F	3	09/11/93	202	Pass	OK	1	10/09/93	225	NRI	OK	
MC633-T	1F	3	09/11/93	202	Pass	OK	1	10/09/93	225	Reject	Class A	
MC633-TR1	24F	1	11/04/93	246	Pass	OK	1	11/04/93	246	NRI	OK	
MC633-B	1F	3	09/11/93	202	Pass	OK	1	10/09/93	225	NRI	OK	
MC634-T	1F	3	09/11/93	202	Pass	OK	1	10/09/93	225	Reject	Class A	
MC634-TR1	24F	1	11/04/93	246	Pass	OK	1	11/04/93	246	NRI	OK	
MC634-B	1F	3	09/11/93	202	Pass	OK	1	10/09/93	225	NRI	OK	
MC635-T	NS	3	09/11/93	202	Pass	OK	1	09/27/93	214	Reject	Class A	
MC635-TR1	24F	1	11/04/93	246	Pass	OK	1	11/04/93	246	NRI	OK	
MC635-B	No Weld	3	09/11/93	202	Fail	INC	No UT Inspection - Failed Visual Inspection					
MC635-BR1	24F	1	09/27/93	214	Pass	OK	1	09/27/93	214	NRI	OK	
MC636-T	19F	3	09/11/93	202	Pass	OK	1	10/27/93	239	Reject	Class A	
MC636-TR1	24F	1	11/05/93	247	Pass	OK	1	11/05/93	247	NRI	OK	
MC636-B	19F	3	09/11/93	202	Pass	OK	1	10/27/93	239	Reject	Class A	
MC636-BR1	24F	1	11/05/93	247	Pass	OK	1	11/05/93	247	NRI	OK	
MC637-T	12F	3	09/14/93	204	Pass	OK	1	10/21/93	234	NRI	OK	
MC637-B	12F	3	09/14/93	204	Pass	OK	1	10/21/93	234	NRI	OK	
MC638-T	12F	3	09/14/93	204	Pass	OK	1	10/21/93	234	NRI	OK	
MC638-B	12F	3	09/14/93	204	Pass	OK	1	10/21/93	234	NRI	OK	
MC639-T	12F	3	09/14/93	204	Pass	OK	1	10/30/93	242	NRI	OK	
MC639-B	12F	3	09/14/93	204	Pass	OK	1	10/30/93	242	Reject	Class A	
MC639-BR1	12F	1	11/18/93	253	Pass	OK	1	11/18/93	253	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC640-T	12F	3	09/14/93	204	Pass	OK	1	10/30/93	242	NRI	OK	
MC640-B	12F	3	09/14/93	204	Pass	OK	1	10/30/93	242	Reject	Class A	
MC640-BR1	12F	1	11/24/93	255	Pass	OK	1	11/24/93	255	NRI	OK	
MC641-T	1F	1	09/23/93	211	Pass	OK	1	09/23/93	211	NRI	OK	
MC641-B	1F	1	09/23/93	211	Pass	OK	1	09/23/93	211	NRI	OK	
MC642-T	1F	1	09/23/93	211	Pass	OK	1	09/23/93	211	NRI	OK	
MC642-B	1F	1	09/23/93	211	Pass	OK	1	09/23/93	211	NRI	OK	
MC643-T	1F	1	09/23/93	211	Pass	OK	1	09/23/93	211	NRI	OK	
MC643-B	1F	1	09/23/93	211	Pass	OK	1	09/23/93	211	NRI	OK	
MC644-T	1F	1	09/23/93	211	Pass	OK	1	09/23/93	211	NRI	OK	
MC644-B	1F	1	09/23/93	211	Pass	OK	1	09/23/93	211	NRI	OK	
MC645-T	1F	1	09/23/93	211	Pass	OK	1	09/23/93	211	NRI	OK	
MC645-B	1F	1	09/23/93	211	Pass	OK	1	09/23/93	211	NRI	OK	
MC646-T	1F	1	09/23/93	211	Pass	OK	1	09/23/93	211	NRI	OK	
MC646-B	1F	1	09/23/93	211	Pass	OK	1	09/23/93	211	NRI	OK	
MC647-T	1F	1	09/23/93	211	Pass	OK	1	09/23/93	211	NRI	OK	
MC647-B	1F	1	09/23/93	211	Pass	OK	1	09/23/93	211	NRI	OK	
MC648-T	1F	1	09/23/93	211	Pass	OK	1	09/23/93	211	NRI	OK	
MC648-B	1F	1	09/23/93	211	Pass	OK	1	09/23/93	211	NRI	OK	
MC649-T	1F	1	09/23/93	211	Pass	OK	1	09/23/93	211	NRI	OK	
MC649-B	1F	1	09/23/93	211	Pass	OK	1	09/23/93	211	NRI	OK	
MC650-T	1F	1	09/23/93	211	Pass	OK	1	09/23/93	211	NRI	OK	
MC650-B	1F	1	09/23/93	211	Pass	OK	1	09/23/93	211	NRI	OK	
MC651-T	1F	1	09/23/93	211	Pass	OK	1	09/23/93	211	NRI	OK	
MC651-B	1F	1	09/23/93	211	Pass	OK	1	09/23/93	211	NRI	OK	
MC652-T	1F	1	09/23/93	211	Pass	OK	1	09/23/93	211	NRI	OK	
MC652-B	1F	1	09/23/93	211	Pass	OK	1	09/23/93	211	NRI	OK	
MC653-T	NS	1	10/09/93	225	Pass	OK	1	10/09/93	225	NRI	OK	
MC653-B	NS	1	10/09/93	225	Pass	OK	1	10/09/93	225	NRI	OK	
MC654-T	NS	1	10/09/93	225	Pass	OK	1	10/09/93	225	NRI	OK	
MC654-B	NS	1	10/09/93	225	Pass	OK	1	10/09/93	225	NRI	OK	
MC655-T	NS	1	10/09/93	225	Pass	OK	1	10/09/93	225	NRI	OK	
MC655-B	NS	1	10/09/93	225	Pass	OK	1	10/09/93	225	NRI	OK	
MC656-T	NS	1	10/09/93	225	Pass	OK	1	10/09/93	225	NRI	OK	
MC656-B	NS	1	10/09/93	225	Pass	OK	1	10/09/93	225	NRI	OK	
MC657-T	1F	3	10/21/93	234	Pass	OK	1	10/21/93	234	Reject	Class A	
MC657-TR1	24F	1	11/05/93	247	Pass	OK	1	11/05/93	247	NRI	OK	
MC657-B	1F	3	10/21/93	234	Pass	OK	1	10/21/93	234	NRI	OK	
MC658-T	1F	3	10/21/93	234	Pass	OK	1	10/21/93	234	Reject	Class A	
MC658-TR1	24F	1	11/05/93	247	Pass	OK	1	11/05/93	247	NRI	OK	
MC658-B	1F	3	10/21/93	234	Pass	OK	1	10/21/93	234	NRI	OK	
MC659-T	1F	1	10/24/93	236	Pass	OK	1	10/24/93	236	NRI	OK	
MC659-B	1F	1	10/24/93	236	Pass	OK	1	10/24/93	236	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC660-T	1F	1	10/24/93	236	Pass	OK	1	10/24/93	236	NRI	OK	
MC660-B	1F	1	10/24/93	236	Pass	OK	1	10/24/93	236	NRI	OK	
MC661-T	1F	1	10/28/93	240	Pass	OK	1	10/28/93	240	NRI	OK	
MC661-B	1F	1	10/28/93	240	Pass	OK	1	10/28/93	240	NRI	OK	
MC662-T	1F	1	10/28/93	240	Pass	OK	1	10/28/93	240	NRI	OK	
MC662-B	1F	1	10/28/93	240	Pass	OK	1	10/28/93	240	NRI	OK	
MC663-T	1F	1	10/28/93	240	Pass	OK	1	10/28/93	240	NRI	OK	
MC663-B	1F	1	10/28/93	240	Pass	OK	1	10/28/93	240	NRI	OK	
MC664-T	1F	1	10/28/93	240	Pass	OK	1	10/28/93	240	NRI	OK	
MC664-B	1F	1	10/28/93	240	Pass	OK	1	10/28/93	240	NRI	OK	
MC665-T	NS	1	10/28/93	240	Pass	OK	1	10/28/93	240	NRI	OK	
MC665-B	NS	1	10/28/93	240	Pass	OK	1	10/28/93	240	NRI	OK	
MC666-T	NS	1	10/28/93	240	Pass	OK	1	10/28/93	240	NRI	OK	
MC666-B	NS	1	10/28/93	240	Pass	OK	1	10/28/93	240	NRI	OK	
MC667-T	NS	1	10/28/93	240	Pass	OK	1	10/28/93	240	NRI	OK	
MC667-B	NS	1	10/28/93	240	Pass	OK	1	10/28/93	240	NRI	OK	
MC668-T	16F	1	10/30/93	242	Pass	OK	1	10/30/93	242	NRI	OK	
MC668-B	16F	1	10/30/93	242	Pass	OK	1	10/30/93	242	NRI	OK	
MC669-T	16F	1	10/30/93	242	Pass	OK	1	10/30/93	242	NRI	OK	
MC669-B	16F	1	10/30/93	242	Pass	OK	1	10/30/93	242	NRI	OK	
MC670-T	1F	1	11/03/93	245	Pass	OK	1	11/03/93	245	NRI	OK	
MC670-B	1F	1	11/03/93	245	Pass	OK	1	11/03/93	245	NRI	OK	
MC671-T	1F	1	11/03/93	245	Pass	OK	1	11/03/93	245	NRI	OK	
MC671-B	1F	1	11/03/93	245	Pass	OK	1	11/03/93	245	NRI	OK	
MC672-T	NS	3	11/08/93	248	Pass	OK	1	11/08/93	248	Reject	Class A	
MC672-TR1	NS	1	11/10/93	250	Pass	OK	1	11/10/93	250	NRI	OK	
MC672-B	NS	3	11/08/93	248	Pass	OK	1	11/08/93	248	Reject	Class A	
MC672-BR1	NS	1	11/10/93	250	Pass	OK	1	11/10/93	250	NRI	OK	
MC673-T	NS	3	11/08/93	248	Pass	OK	1	11/08/93	248	Reject	Class A	
MC673-TR1	NS	1	11/10/93	250	Pass	OK	1	11/10/93	250	NRI	OK	
MC673-B	NS	3	11/08/93	248	Pass	OK	1	11/08/93	248	Reject	Class A	
MC673-BR1	NS	1	11/10/93	250	Pass	OK	1	11/10/93	250	NRI	OK	
MC673B-T	NS	1	11/10/93	250	Pass	OK	1	11/10/93	250	NRI	OK	
MC673B-B	NS	1	11/10/93	250	Pass	OK	1	11/10/93	250	NRI	OK	
MC674-T	NS	3	11/08/93	248	Pass	OK	1	11/08/93	248	Reject	Class A	
MC674-TR1	NS	1	11/10/93	250	Pass	OK	1	11/10/93	250	Reject	Class A	
MC674-TR2	NS	1	11/29/93	256	Pass	OK	1	11/29/93	256	NRI	OK	
MC674-B	NS	3	11/08/93	248	Pass	OK	1	11/08/93	248	NRI	OK	
MC675-T	NS	1	11/10/93	250	Pass	OK	1	11/10/93	250	NRI	OK	
MC675-B	NS	1	11/10/93	250	Pass	OK	1	11/10/93	250	NRI	OK	
MC675B-T	NS	1	11/10/93	250	Pass	OK	1	11/10/93	250	NRI	OK	
MC675B-B	NS	1	11/10/93	250	Pass	OK	1	11/10/93	250	NRI	OK	
MC676-T	NS	1	11/10/93	250	Pass	OK	1	11/10/93	250	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC676-B	NS	1	11/10/93	250	Pass	OK	1	11/10/93	250	NRI	OK	
MC677-T	NS	1	11/10/93	250	Pass	OK	1	11/10/93	250	NRI	OK	
MC677-B	NS	1	11/10/93	250	Pass	OK	1	11/10/93	250	NRI	OK	
MC677B-T	NS	1	11/10/93	250	Pass	OK	1	11/10/93	250	NRI	OK	
MC677B-B	NS	1	11/10/93	250	Pass	OK	1	11/10/93	250	NRI	OK	
MC678-T	NS	1	11/10/93	250	Pass	OK	1	11/10/93	250	NRI	OK	
MC678-B	NS	1	11/10/93	250	Pass	OK	1	11/10/93	250	NRI	OK	
MC679-T	NS	1	11/10/93	250	Pass	OK	1	11/10/93	250	NRI	OK	
MC679-B	NS	1	11/10/93	250	Pass	OK	1	11/10/93	250	NRI	OK	
MC680-T	NS	1	11/11/93	251	Pass	OK	1	11/10/93	250	NRI	OK	
MC680-B	NS	1	11/11/93	251	Pass	OK	1	11/11/93	251	NRI	OK	
MC681-T	NS	1	11/11/93	251	Pass	OK	1	11/11/93	251	NRI	OK	
MC681-B	NS	1	11/11/93	251	Pass	OK	1	11/11/93	251	NRI	OK	
MC681B-T	NS	1	11/11/93	251	Pass	OK	1	11/11/93	251	NRI	OK	
MC681B-TR1	NS	1	11/17/93	252	Pass	OK	1	11/11/93	251	Reject	Class A	
MC681B-B	NS	1	11/11/93	251	Pass	OK	1	11/17/93	252	NRI	OK	
MC682-T	NS	1	11/11/93	251	Pass	OK	1	11/11/93	251	NRI	OK	
MC682-B	NS	1	11/11/93	251	Pass	OK	1	11/11/93	251	NRI	OK	
MC683-T	NS	1	11/11/93	251	Pass	OK	1	11/11/93	251	NRI	OK	
MC683-B	NS	1	11/11/93	251	Pass	OK	1	11/11/93	251	NRI	OK	
MC684-T	NS	1	11/17/93	252	Pass	OK	1	11/11/93	251	NRI	OK	
MC684-B	NS	1	11/17/93	252	Pass	OK	1	11/17/93	252	NRI	OK	
MC684B-T	NS	1	11/17/93	252	Pass	OK	1	11/17/93	252	NRI	OK	
MC684B-B	NS	1	11/17/93	252	Pass	OK	1	11/17/93	252	NRI	OK	
MC685-T	NS	1	11/17/93	252	Pass	OK	1	11/17/93	252	NRI	OK	
MC685-B	NS	1	11/17/93	252	Pass	OK	1	11/17/93	252	NRI	OK	
MC686-T	NS	1	11/17/93	252	Pass	OK	1	11/17/93	252	NRI	OK	
MC686-B	NS	1	11/17/93	252	Pass	OK	1	11/17/93	252	NRI	OK	
MC687-T	NS	1	11/17/93	252	Pass	OK	1	11/17/93	252	NRI	OK	
MC687-B	NS	1	11/17/93	252	Pass	OK	1	11/17/93	252	NRI	OK	
MC687B-T	NS	1	11/17/93	252	Pass	OK	1	11/17/93	252	NRI	OK	
MC687B-B	NS	1	11/17/93	252	Pass	OK	1	11/17/93	252	NRI	OK	
MC688-T	NS	1	11/17/93	252	Pass	OK	1	11/17/93	252	NRI	OK	
MC688-B	NS	1	11/17/93	252	Pass	OK	1	11/17/93	252	NRI	OK	
MC689-T	NS	1	11/19/93	254	Pass	OK	1	11/19/93	254	NRI	OK	
MC689-B	NS	1	11/19/93	254	Pass	OK	1	11/19/93	254	NRI	OK	
MC690-T	NS	1	11/19/93	254	Pass	OK	1	11/19/93	254	NRI	OK	
MC690-B	NS	1	11/19/93	254	Pass	OK	1	11/19/93	254	NRI	OK	
MC691-T	NS	1	11/19/93	254	Pass	OK	1	11/19/93	254	NRI	OK	
MC691-B	NS	1	11/19/93	254	Pass	OK	1	11/19/93	254	NRI	OK	
MC692-T	NS	1	11/19/93	254	Pass	OK	1	11/19/93	254	NRI	OK	
MC692-B	NS	1	11/19/93	254	Pass	OK	1	11/19/93	254	NRI	OK	
MC693-T	NS	1	11/29/93	256	Pass	OK	1	11/29/93	256	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC693-B	NS	1	11/29/93	256	Pass	OK	1	11/29/93	256	NRI	OK	
MC694-T	NS	1	11/29/93	256	Pass	OK	1	11/29/93	256	NRI	OK	
MC694-B	NS	1	11/29/93	256	Pass	OK	1	11/29/93	256	NRI	OK	
MC694B-T	NS	1	11/29/93	256	Pass	OK	1	11/29/93	256	NRI	OK	
MC694B-B	NS	1	11/29/93	256	Pass	OK	1	11/29/93	256	NRI	OK	
MC695-T	NS	1	11/29/93	256	Pass	OK	1	11/29/93	256	NRI	OK	
MC695-B	NS	1	11/29/93	256	Pass	OK	1	11/29/93	256	NRI	OK	
MC696-T	NS	1	11/29/93	256	Pass	OK	1	11/29/93	256	NRI	OK	
MC696-B	NS	1	11/29/93	256	Pass	OK	1	11/29/93	256	NRI	OK	
MC696B-T	NS	1	11/29/93	256	Pass	OK	1	11/29/93	256	NRI	OK	
MC696B-B	NS	1	11/29/93	256	Pass	OK	1	11/29/93	256	NRI	OK	
MC697-T	NS	1	12/08/93	261	Pass	OK	1	12/08/93	261	NRI	OK	
MC697-B	NS	1	12/08/93	261	Pass	OK	1	12/08/93	261	NRI	OK	
MC698-T	NS	1	12/08/93	261	Pass	OK	1	12/08/93	261	NRI	OK	
MC698-B	NS	1	12/08/93	261	Pass	OK	1	12/08/93	261	NRI	OK	
MC698B-T	NS	1	12/08/93	261	Pass	OK	1	12/08/93	261	NRI	OK	
MC698B-B	NS	1	12/08/93	261	Pass	OK	1	12/08/93	261	NRI	OK	
MC699-T	NS	1	12/08/93	261	Pass	OK	1	12/08/93	261	NRI	OK	
MC699-B	NS	1	12/08/93	261	Pass	OK	1	12/08/93	261	NRI	OK	
MC700-T	NS	1	12/08/93	261	Pass	OK	1	12/08/93	261	NRI	OK	
MC700-B	NS	1	12/08/93	261	Pass	OK	1	12/08/93	261	NRI	OK	
MC700B-T	NS	1	12/08/93	261	Pass	OK	1	12/08/93	261	NRI	OK	
MC700B-B	NS	1	12/08/93	261	Pass	OK	1	12/08/93	261	NRI	OK	
MC701-T	NS	1	12/08/93	261	Pass	OK	1	12/08/93	261	NRI	OK	
MC701-B	NS	1	12/08/93	261	Pass	OK	1	12/08/93	261	NRI	OK	
MC702-T	NS	1	12/08/93	261	Pass	OK	1	12/08/93	261	NRI	OK	
MC702-B	NS	1	12/08/93	261	Pass	OK	1	12/08/93	261	NRI	OK	
MC702B-T	NS	1	12/08/93	261	Pass	OK	1	12/08/93	261	NRI	OK	
MC702B-B	NS	1	12/08/93	261	Pass	OK	1	12/08/93	261	NRI	OK	
MC703-T	NS	1	12/08/93	261	Pass	OK	1	12/08/93	261	NRI	OK	
MC703-B	NS	1	12/08/93	261	Pass	OK	1	12/08/93	261	NRI	OK	
MC704-T	NS	1	12/18/93	267	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC704-TR1	NS	1	01/05/94	271	Pass	OK	1	01/05/94	271	NRI	OK	
MC704-B	NS	1	12/18/93	267	Pass	OK	1	12/30/93	270	Reject	Class A	
MC704-BR1	NS	1	01/10/94	272	Pass	OK	1	01/10/94	272	NRI	OK	
MC705-T	NS	1	12/18/93	267	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC705-TR1	NS	1	01/05/94	271	Pass	OK	1	01/05/94	271	NRI	OK	
MC705-B	NS	1	12/18/93	267	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC705-BR1	NS	1	12/30/93	270	Fail	CL,S	No UT Inspection - Failed Visual Inspection					
MC705-BR2	NS	1	01/10/94	272	Pass	OK	1	01/10/94	272	NRI	OK	
MC706-T	NS	1	12/18/93	267	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC706-TR1	NS	1	12/30/93	270	Pass	OK	1	12/30/93	270	Reject	Class A	
MC706-TR2	NS	1	01/10/94	272	Pass	OK	1	01/10/94	272	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MC706-B	NS	1	12/18/93	267	Pass	OK	1	12/30/93	270	Reject	Class A	
MC706-BR1	NS	1	01/10/94	272	Pass	OK	1	01/10/94	272	NRI	OK	
MC707-T	NS	1	12/18/93	267	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC707-TR1	NS	1	12/30/93	270	Pass	OK	1	12/30/93	270	Reject	Class A	
MC707-TR2	NS	1	01/10/94	272	Pass	OK	1	01/10/94	272	NRI	OK	
MC707-B	NS	1	12/18/93	267	Pass	OK	1	12/30/93	270	Reject	Class A	
MC707-BR1	NS	1	01/10/94	272	Pass	OK	1	01/10/94	272	NRI	OK	
MC708-T	NS	1	12/30/93	270	Pass	OK	1	12/30/93	270	NRI	OK	
MC708-B	NS	1	12/29/93	269	Pass	OK	1	12/29/93	269	NRI	OK	
MC709-T	NS	1	12/30/93	270	Pass	OK	1	12/30/93	270	NRI	OK	
MC709-B	NS	1	12/29/93	269	Pass	OK	1	12/29/93	269	Reject	Class A	
MC709-BR1	NS	1	01/10/94	272	Pass	OK	1	01/10/94	272	NRI	OK	
MC710-T	NS	1	12/18/93	267	Fail	UF	No UT Inspection - Failed Visual Inspection					
MC710-TR1	NS	1	01/05/94	271	Pass	OK	1	01/05/94	271	NRI	OK	
MC710-B	NS	1	01/05/94	271	Pass	OK	1	01/05/94	271	NRI	OK	
MC711-T	NS	1	12/18/93	267	Pass	OK	1	01/05/94	271	NRI	OK	
MC711-B	NS	1	01/05/94	271	Pass	OK	1	01/05/94	271	Reject	Class A	
MC711-BR1	NS	1	01/10/94	272	Pass	OK	1	01/10/94	272	NRI	OK	
MC712-T	NS	1	01/05/94	271	Pass	OK	1	01/05/94	271	NRI	OK	
MC712-B	NS	1	01/05/94	271	Pass	OK	1	01/05/94	271	NRI	OK	
MC713-T	NS	1	01/05/94	271	Pass	OK	1	01/05/94	271	NRI	OK	
MC713-B	NS	1	01/05/94	271	Pass	OK	1	01/05/94	271	NRI	OK	
MC714-T	NS	1	01/05/94	271	Pass	OK	1	01/05/94	271	NRI	OK	
MC714-B	NS	1	01/05/94	271	Pass	OK	1	01/05/94	271	NRI	OK	
MC715-T	NS	1	01/05/94	271	Pass	OK	1	01/05/94	271	NRI	OK	
MC715-B	NS	1	01/05/94	271	Pass	OK	1	01/05/94	271	NRI	OK	
MC716-T	NS	1	01/05/94	271	Pass	OK	1	01/05/94	271	NRI	OK	
MC716-B	NS	1	01/05/94	271	Pass	OK	1	01/05/94	271	NRI	OK	
MC717-T	NS	1	01/05/94	271	Pass	OK	1	01/05/94	271	NRI	OK	
MC717-B	NS	1	01/05/94	271	Pass	OK	1	01/05/94	271	NRI	OK	
MC718-T	NS	1	01/05/94	271	Pass	OK	1	01/05/94	271	NRI	OK	
MC718-B	NS	1	01/05/94	271	Pass	OK	1	01/05/94	271	NRI	OK	
MC719-T	NS	1	01/05/94	271	Pass	OK	1	01/05/94	271	NRI	OK	
MC719-B	NS	1	01/05/94	271	Pass	OK	1	01/05/94	271	NRI	OK	
MCR1-T	28F	3	09/21/93	209	Pass	OK	2	09/23/93	211	NRI	OK	
MCR1-B	28F	3	09/21/93	209	Pass	OK	2	09/23/93	211	NRI	OK	
MCR2-T	28F	3	09/21/93	209	Pass	OK	2	09/23/93	211	NRI	OK	
MCR2-B	28F	3	09/21/93	209	Fail	UF	No UT Inspection - Failed Visual Inspection					
MCR2-BR1	28F	3	09/22/93	210	Pass	OK	2	09/23/93	211	NRI	OK	
MCR3-T	28F	3	09/21/93	209	Fail	UF,S	No UT Inspection - Failed Visual Inspection					
MCR3-TR1	28F	3	09/22/93	210	Pass	OK	2	09/23/93	211	NRI	OK	
MCR3-B	28F	3	09/21/93	209	Fail	UF	No UT Inspection - Failed Visual Inspection					
MCR3-BR1	28F	3	09/22/93	210	Pass	OK	2	09/23/93	211	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MCR4-T	28F	3	09/21/93	209	Fail	S	No UT Inspection - Failed Visual Inspection					
MCR4-TR1	28F	2	09/23/93	211	Pass	OK	2	09/23/93	211	NRI	OK	
MCR4-B	28F	3	09/21/93	209	Fail	UF	No UT Inspection - Failed Visual Inspection					
MCR4-BR1	28F	2	09/23/93	211	Pass	OK	2	09/23/93	211	NRI	OK	
MCR5-T	28F	3	09/22/93	210	Pass	OK	2	09/23/93	211	NRI	OK	
MCR5-B	28F	3	09/22/93	210	Pass	OK	2	09/23/93	211	NRI	OK	
MCR6-T	28F	2	09/23/93	211	Pass	OK	2	09/23/93	211	NRI	OK	
MCR6-B	28F	2	09/23/93	211	Pass	OK	2	09/23/93	211	NRI	OK	
MCR7-T	28F	2	09/23/93	211	Pass	OK	2	09/23/93	211	NRI	OK	
MCR7-B	28F	2	09/23/93	211	Pass	OK	2	09/23/93	211	NRI	OK	
MCR8-T	28F	1	09/28/93	215	Pass	OK	1	09/28/93	215	NRI	OK	
MCR8-B	28F	1	09/28/93	215	Pass	OK	1	09/28/93	215	NRI	OK	
MCR9-T	28F	1	09/28/93	215	Pass	OK	1	09/28/93	215	NRI	OK	
MCR9-B	28F	1	09/28/93	215	Pass	OK	1	09/28/93	215	NRI	OK	
MCR10-T	1F	1	09/29/93	216	Pass	OK	1	09/29/93	216	NRI	OK	
MCR10-B	1F	1	09/29/93	216	Pass	OK	1	09/29/93	216	NRI	OK	
MCR11-T	1F	1	09/29/93	216	Pass	OK	1	09/29/93	216	NRI	OK	
MCR11-B	1F	1	09/29/93	216	Pass	OK	1	09/29/93	216	Reject	Class A	
MCR11-BR1	1F	1	11/18/93	253	Pass	OK	1	11/18/93	253	NRI	OK	
MCR12-T	1F	1	09/29/93	216	Pass	OK	1	09/29/93	216	NRI	OK	
MCR12-B	1F	1	09/29/93	216	Pass	OK	1	09/29/93	216	NRI	OK	
MCR13-T	1F	1	09/29/93	216	Pass	OK	1	09/29/93	216	NRI	OK	
MCR13-B	1F	1	09/29/93	216	Pass	OK	1	09/29/93	216	NRI	OK	
MCR14-T	1F	1	09/29/93	216	Pass	OK	1	09/29/93	216	NRI	OK	
MCR14-B	1F	1	09/29/93	216	Pass	OK	1	09/29/93	216	NRI	OK	
MCR15-T	1F	1	09/29/93	216	Pass	OK	1	09/29/93	216	NRI	OK	
MCR15-B	1F	1	09/29/93	216	Pass	OK	1	09/29/93	216	NRI	OK	
MCR16-T	1F	1	09/29/93	216	Pass	OK	1	09/29/93	216	NRI	OK	
MCR16-B	1F	1	09/29/93	216	Pass	OK	1	09/29/93	216	NRI	OK	
MCR17-T	1F	1	09/29/93	216	Pass	OK	1	09/29/93	216	NRI	OK	
MCR17-B	1F	1	09/29/93	216	Pass	OK	1	09/29/93	216	NRI	OK	
MCR18-T	1F	1	09/29/93	216	Pass	OK	1	09/29/93	216	NRI	OK	
MCR18-B	1F	1	09/29/93	216	Pass	OK	1	09/29/93	216	NRI	OK	
MCR19-T	1F	1	09/30/93	217	Pass	OK	1	09/30/93	217	NRI	OK	
MCR19-B	1F	1	09/30/93	217	Pass	OK	1	09/30/93	217	NRI	OK	
MCR20-T	1F	1	09/30/93	217	Pass	OK	1	09/30/93	217	NRI	OK	
MCR20-B	1F	1	09/30/93	217	Pass	OK	1	09/30/93	217	NRI	OK	
MCR21-T	1F	1	09/30/93	217	Pass	OK	1	09/30/93	217	NRI	OK	
MCR21-B	1F	1	09/30/93	217	Pass	OK	1	09/30/93	217	NRI	OK	
MCR22-T	1F	1	09/30/93	217	Pass	OK	1	09/30/93	217	NRI	OK	
MCR22-B	1F	1	09/30/93	217	Pass	OK	1	09/30/93	217	NRI	OK	
MCR23-T	1F	1	09/30/93	217	Pass	OK	1	09/30/93	217	NRI	OK	
MCR23-B	1F	1	09/30/93	217	Pass	OK	1	09/30/93	217	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MCR24-T	28F	1	09/30/93	217	Pass	OK	1	09/30/93	217	Reject	Class A	
MCR24-TR1	28F	1	10/07/93	222	Pass	OK	1	10/07/93	222	NRI	OK	
MCR24-B	28F	1	09/30/93	217	Pass	OK	1	09/30/93	217	Reject	Class A	Weld Not Repaired
MCR25-T	1F	3	10/04/93	219	Pass	OK	1	10/04/93	219	Reject	Class A	
MCR25-TR1	1F	1	10/07/93	222	Pass	OK	1	10/07/93	222	Reject	Class A	
MCR25-TR2	24F	1	11/09/93	249	Pass	OK	1	11/09/93	249	NRI	OK	
MCR25-B	1F	3	10/04/93	219	Pass	OK	1	10/04/93	219	NRI	OK	
MCR26-T	1F	3	10/04/93	219	Pass	OK	1	10/04/93	219	NRI	OK	
MCR26-B	1F	3	10/04/93	219	Pass	OK	1	10/04/93	219	NRI	OK	
MCR27-T	28F	3	10/04/93	219	Pass	OK	1	10/04/93	219	NRI	OK	
MCR27-B	28F	3	10/04/93	219	Pass	OK	1	10/04/93	219	NRI	OK	
MCR28-T	28F	3	10/04/93	219	Pass	OK	1	10/04/93	219	NRI	OK	
MCR28-B	28F	3	10/04/93	219	Pass	OK	1	10/04/93	219	NRI	OK	
MCR29-T	1F	3	10/04/93	219	Pass	OK	1	10/04/93	219	NRI	OK	
MCR29-B	1F	3	10/04/93	219	Pass	OK	1	10/04/93	219	NRI	OK	
MCR30-T	1F	3	10/04/93	219	Pass	OK	1	10/04/93	219	NRI	OK	
MCR30-B	1F	3	10/04/93	219	Pass	OK	1	10/04/93	219	NRI	OK	
MCR31-T	1F	3	10/04/93	219	Pass	OK	1	10/04/93	219	NRI	OK	
MCR31-B	1F	3	10/04/93	219	Pass	OK	1	10/04/93	219	NRI	OK	
MCR32-T	1F	3	10/04/93	219	Pass	OK	1	10/04/93	219	NRI	OK	
MCR32-B	1F	3	10/04/93	219	Pass	OK	1	10/04/93	219	NRI	OK	
MCR33-T	1F	3	10/04/93	219	Pass	OK	1	10/04/93	219	NRI	OK	
MCR33-B	1F	3	10/04/93	219	Pass	OK	1	10/04/93	219	NRI	OK	
MCR34-T	1F	3	10/04/93	219	Pass	OK	1	10/04/93	219	NRI	OK	
MCR34-B	1F	3	10/04/93	219	Pass	OK	1	10/04/93	219	NRI	OK	
MCR35-T	1F	3	10/04/93	219	Pass	OK	1	10/04/93	219	NRI	OK	
MCR35-B	1F	3	10/04/93	219	Pass	OK	1	10/04/93	219	NRI	OK	
MCR36-T	1F	3	10/04/93	219	Pass	OK	1	10/04/93	219	NRI	OK	
MCR36-B	1F	3	10/04/93	219	Pass	OK	1	10/04/93	219	NRI	OK	
MCR37-T	1F	3	10/04/93	219	Pass	OK	1	10/04/93	219	NRI	OK	
MCR37-B	1F	3	10/04/93	219	Pass	OK	1	10/04/93	219	NRI	OK	
MCR38-T	1F	3	10/04/93	219	Pass	OK	1	10/04/93	219	NRI	OK	
MCR38-B	1F	3	10/04/93	219	Pass	OK	1	10/04/93	219	NRI	OK	
MCR39-T	1F	3	10/04/93	219	Pass	OK	1	10/04/93	219	NRI	OK	
MCR39-B	1F	3	10/04/93	219	Pass	OK	1	10/04/93	219	NRI	OK	
MCR40-T	1F	3	10/04/93	219	Pass	OK	1	10/04/93	219	NRI	OK	
MCR40-B	1F	3	10/04/93	219	Pass	OK	1	10/04/93	219	NRI	OK	
MCR41-T	1F	3	10/04/93	219	Pass	OK	1	10/04/93	219	NRI	OK	
MCR41-B	1F	3	10/04/93	219	Pass	OK	1	10/04/93	219	NRI	OK	
MCR42-T	28F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR42-B	28F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR43-T	28F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR43-B	28F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MCR44-T	28F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR44-B	28F	1	10/05/93	220	Pass	OK	1	10/05/93	220	Reject	Class A	
MCR44-BR1	24F	1	11/09/93	249	Pass	OK	1	11/09/93	249	NRI	OK	
MCR45-T	28F	1	10/05/93	220	Pass	OK	1	10/05/93	220	Reject	Class A	
MCR45-TR1	28F	1	10/07/93	222	Pass	OK	1	10/07/93	222	NRI	OK	
MCR45-B	28F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR46-T	28F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR46-B	28F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR47-T	1F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR47-B	1F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR48-T	1F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR48-B	1F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR49-T	1F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR49-B	1F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR50-T	1F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR50-B	1F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR51-T	1F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR51-B	1F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR52-T	24F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR52-B	24F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR53-T	24F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR53-B	24F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR54-T	NS	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR54-B	NS	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR55-T	NS	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR55-B	NS	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR56-T	1F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR56-B	1F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR57-T	1F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR57-B	1F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR58-T	1F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR58-B	1F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR59-T	1F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR59-B	1F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR60-T	1F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR60-B	1F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR61-T	1F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR61-B	1F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR62-T	1F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR62-B	1F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR63-T	1F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR63-B	1F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR64-T	1F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MCR64-B	1F	1	10/05/93	220	Pass	OK	1	10/05/93	220	NRI	OK	
MCR65-T	NS	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR65-B	NS	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR66-T	NS	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR66-B	NS	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR67-T	NS	1	10/06/93	221	Fail	LOF,UP,S	No UT Inspection - Failed Visual Inspection					
MCR67-TR1	NS	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR67-B	NS	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR68-T	NS	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR68-B	NS	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR69-T	28F	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR69-B	28F	1	10/06/93	221	Pass	OK	1	10/06/93	221	Reject	Class A	
MCR69-BR1	24F	1	11/09/93	249	Pass	OK	1	11/09/93	249	NRI	OK	
MCR70-T	28F	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR70-B	28F	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR71-T	28F	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR71-B	28F	1	10/06/93	221	Pass	OK	1	10/06/93	221	Reject	Class A	
MCR71-BR1	24F	1	11/09/93	249	Pass	OK	1	11/09/93	249	Reject	Class A	
MCR71-BR2	24F	1	11/18/93	253	Pass	OK	1	11/18/93	253	NRI	OK	
MCR72-T	28F	1	10/06/93	221	Pass	OK	1	10/06/93	221	Reject	Class A	
MCR72-TR1	28F	1	10/14/93	229	Pass	OK	1	10/14/93	229	NRI	OK	
MCR72-B	28F	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR73-T	NS	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR73-B	NS	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR74-T	24F	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR74-B	24F	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR75-T	1F	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR75-B	1F	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR76-T	NS	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR76-B	NS	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR77-T	24F	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR77-B	24F	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR78-T	24F	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR78-B	24F	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR79-T	24F	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR79-B	24F	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR80-T	24F	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR80-B	24F	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR81-T	24F	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR81-B	24F	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR82-T	24F	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR82-B	24F	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR83-T	NS	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MCR83-B	NS	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR84-T	NS	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR84-B	NS	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR85-T	NS	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR85-B	NS	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR86-T	NS	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR86-B	NS	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR87-T	24F	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR87-B	24F	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR88-T	24F	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR88-B	24F	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR89-T	NS	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR89-B	NS	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR90-T	NS	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR90-B	NS	1	10/06/93	221	Pass	OK	1	10/06/93	221	NRI	OK	
MCR91-T	1F	2	10/09/93	225	Pass	OK	2	10/09/93	225	NRI	OK	
MCR91-B	1F	1	10/14/93	229	Pass	OK	1	10/14/93	229	Reject	Class A	
MCR91-BR1	1F	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR92-T	1F	2	10/09/93	225	Pass	OK	2	10/09/93	225	NRI	OK	
MCR92-B	1F	2	10/09/93	225	Pass	OK	2	10/09/93	225	NRI	OK	
MCR93-T	1F	2	10/09/93	225	Pass	OK	2	10/09/93	225	NRI	OK	
MCR93-B	1F	1	10/14/93	229	Pass	OK	2	10/09/93	225	NRI	OK	
MCR94-T	1F	2	10/09/93	225	Pass	OK	2	10/09/93	225	NRI	OK	
MCR94-B	1F	2	10/09/93	225	Pass	OK	2	10/09/93	225	NRI	OK	
MCR95-T	1F	2	10/09/93	225	Pass	OK	2	10/09/93	225	NRI	OK	
MCR95-B	1F	2	10/09/93	225	Pass	OK	2	10/09/93	225	NRI	OK	
MCR96-T	1F	2	10/09/93	225	Pass	OK	2	10/09/93	225	NRI	OK	
MCR96-B	1F	2	10/09/93	225	Pass	OK	2	10/09/93	225	NRI	OK	
MCR97-T	1F	2	10/09/93	225	Pass	OK	2	10/09/93	225	NRI	OK	
MCR97-B	1F	2	10/09/93	225	Pass	OK	2	10/09/93	225	NRI	OK	
MCR98-T	1F	2	10/09/93	225	Pass	OK	2	10/09/93	225	NRI	OK	
MCR98-B	1F	2	10/09/93	225	Pass	OK	2	10/09/93	225	NRI	OK	
MCR99-T	NS	1	10/14/93	229	Pass	OK	1	10/14/93	229	NRI	OK	
MCR99-B	NS	1	10/14/93	229	Pass	OK	1	10/14/93	229	NRI	OK	
MCR100-T	1F	1	10/14/93	229	Pass	OK	1	10/14/93	229	Reject	Class A	
MCR100-TR1	1F	2	10/15/93	230	Pass	OK	1	10/15/93	230	NRI	OK	
MCR100-B	1F	1	10/14/93	229	Pass	OK	1	10/14/93	229	NRI	OK	
MCR101-T	NS	1	10/14/93	229	Pass	OK	1	10/14/93	229	NRI	OK	
MCR101-B	NS	1	10/14/93	229	Pass	OK	1	10/14/93	229	NRI	OK	
MCR102-T	KS	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR102-B	KS	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR103-T	KS	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR103-B	KS	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MCR104-T	24F	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR104-B	24F	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR105-T	24F	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR105-B	24F	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR106-T	24F	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR106-B	24F	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR107-T	24F	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR107-B	24F	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR108-T	24F	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR108-B	24F	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR109-T	KS	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR109-B	KS	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR110-T	KS	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR110-B	KS	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR111-T	KS	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR111-B	KS	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR112-T	KS	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR112-B	KS	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR112-BR1	KS	2	10/15/93	230	Pass	OK	2	10/15/93	230	Reject	Class A	
MCR113-T	28F	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR113-B	28F	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR114-T	28F	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR114-B	28F	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR115-T	28F	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR115-B	28F	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR116-T	KS	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR116-B	KS	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR117-T	KS	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR117-B	KS	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR118-T	KS	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR118-B	KS	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR119-T	KS	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR119-B	KS	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR120-T	KS	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR120-B	KS	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR121-T	KS	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR121-B	KS	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR122-T	KS	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR122-B	KS	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR123-T	KS	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR123-B	KS	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR124-T	KS	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	
MCR124-B	KS	2	10/15/93	230	Pass	OK	2	10/15/93	230	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MCR125-T	1F	1	10/15/93	230	Pass	OK	1	10/15/93	230	Reject	Class A	
MCR125-TR1	1F	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR125-B	1F	1	10/15/93	230	Pass	OK	1	10/15/93	230	NRI	OK	
MCR126-T	1F	1	10/15/93	230	Pass	OK	1	10/15/93	230	NRI	OK	
MCR126-B	1F	1	10/15/93	230	Pass	OK	1	10/15/93	230	NRI	OK	
MCR127-T	1F	1	10/15/93	230	Pass	OK	1	10/15/93	230	NRI	OK	
MCR127-B	1F	1	10/15/93	230	Pass	OK	1	10/15/93	230	NRI	OK	
MCR128-T	1F	1	10/15/93	230	Pass	OK	1	10/15/93	230	NRI	OK	
MCR128-B	1F	1	10/15/93	230	Pass	OK	1	10/15/93	230	NRI	OK	
MCR129-T	24F	1	10/15/93	230	Pass	OK	1	10/15/93	230	NRI	OK	
MCR129-B	24F	1	10/15/93	230	Pass	OK	1	10/15/93	230	NRI	OK	
MCR130-T	24F	1	10/15/93	230	Pass	OK	1	10/15/93	230	NRI	OK	
MCR130-B	24F	1	10/15/93	230	Pass	OK	1	10/15/93	230	NRI	OK	
MCR131-T	24F	1	10/15/93	230	Pass	OK	1	10/15/93	230	NRI	OK	
MCR131-B	24F	1	10/15/93	230	Pass	OK	1	10/15/93	230	NRI	OK	
MCR132-T	24F	1	10/15/93	230	Pass	OK	1	10/15/93	230	NRI	OK	
MCR132-B	24F	1	10/15/93	230	Pass	OK	1	10/15/93	230	NRI	OK	
MCR133-T	24F	1	10/15/93	230	Pass	OK	1	10/15/93	230	NRI	OK	
MCR133-B	24F	1	10/15/93	230	Pass	OK	1	10/15/93	230	NRI	OK	
MCR134-T	24F	1	10/15/93	230	Pass	OK	1	10/15/93	230	NRI	OK	
MCR134-B	24F	1	10/15/93	230	Pass	OK	1	10/15/93	230	NRI	OK	
MCR135-T	24F	1	10/15/93	230	Pass	OK	1	10/15/93	230	NRI	OK	
MCR135-B	24F	1	10/15/93	230	Pass	OK	1	10/15/93	230	NRI	OK	
MCR136-T	24F	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR136-B	24F	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR137-T	24F	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR137-B	24F	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR138-T	24F	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR138-B	24F	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR139-T	24F	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR139-B	24F	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR140-T	NS	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR140-B	NS	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR141-T	NS	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR141-B	NS	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR142-T	NS	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR142-B	NS	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR143-T	NS	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR143-B	NS	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR144-T	24F	1	10/18/93	231	Fail	ER	No UT Inspection - Failed Visual Inspection					
MCR144-TR1	24F	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR144-B	24F	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR145-T	24F	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MCR145-B	24F	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR146-T	24F	1	10/18/93	231	Fail	ER	No UT Inspection - Failed Visual Inspection					
MCR146-TR1	24F	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR146-B	24F	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR147-T	24F	1	10/18/93	231	Fail	ER	No UT Inspection - Failed Visual Inspection					
MCR147-TR1	24F	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR147-B	24F	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR148-T	24F	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR148-B	24F	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR149-T	NS	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR149-B	NS	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR150-T	NS	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR150-B	NS	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR151-T	NS	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR151-B	NS	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR152-T	1F	1	10/18/93	231	Fail	FM	No UT Inspection - Failed Visual Inspection					
MCR152-TR1	1F	1	10/19/93	232	Pass	OK	1	10/18/93	231	NRI	OK	
MCR152-B	1F	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR153-T	NS	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR153-B	NS	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR154-T	NS	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR154-B	NS	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR155-T	NS	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR155-B	NS	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR156-T	NS	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR156-B	NS	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR157-T	NS	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR157-B	NS	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR158-T	24F	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR158-B	24F	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR159-T	24F	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR159-B	24F	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR160-T	24F	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR160-B	24F	1	10/18/93	231	Pass	OK	1	10/18/93	231	NRI	OK	
MCR161-T	24F	1	10/19/93	232	Pass	OK	1	10/19/93	232	NRI	OK	
MCR161-B	24F	1	10/19/93	232	Pass	OK	1	10/19/93	232	NRI	OK	
MCR162-T	NS	1	10/19/93	232	Pass	OK	1	10/19/93	232	NRI	OK	
MCR162-B	NS	1	10/19/93	232	Pass	OK	1	10/19/93	232	NRI	OK	
MCR163-T	NS	1	10/19/93	232	Pass	OK	1	10/19/93	232	NRI	OK	
MCR163-B	NS	1	10/19/93	232	Pass	OK	1	10/19/93	232	NRI	OK	
MCR164-T	NS	1	10/19/93	232	Pass	OK	1	10/19/93	232	NRI	OK	
MCR164-B	NS	1	10/19/93	232	Pass	OK	1	10/19/93	232	NRI	OK	
MCR165-T	28F	1	10/19/93	232	Pass	OK	1	10/19/93	232	NRI	OK	

TABLE A1 (CONT'D): SUMMARY OF VISUAL AND ULTRASONIC WELD INSPECTION REPORTS FOR FIELD WELDED MOMENT CONNECTIONS

		Visual Inspection					Ultrasonic Inspection					
Connection	Welder ID	VT Insp	Insp Date	Report #	Result	Remarks	UT Insp	Insp Date	Report #	Result	Remarks	Notes
MCR165-B	28F	1	10/19/93	232	Pass	OK	1	10/19/93	232	NRI	OK	

APPENDIX B - Tables

TABLE B1: SUMMARY OF WELD INSPECTION RESULTS

Total Number of Field Welded Moment Connections: 918
Total Number of Welded Moment Connection Joints: 1883
Total Number of Moment Connection Welds Made (Includes Repairs): 2064

Total Number of Rejected Welds: 185
Total Number of Visually Rejected Welds: 74
Total Number of Ultrasonically Rejected Welds: 111
Number of Rejected Welds Repaired 1st Time: 159
Number of Rejected Welds Requiring 2nd Repair: 20
Number of Rejected Welds Requiring 3rd Repair: 2
Number of Rejected Welds with No Record of Repair: 4
Rejected Welds as a % of Total Welds Made: 8.96%
Rejected Welds as a % of Total Joints: 9.82%

Number of Moment Connections with Rejected Welds: 141 (15.4%)
Number of Moment Connections with Visually Rejected Welds: 62 (6.8%)
Number of Moment Connections with Ultrasonically Rejected Welds: 80 (8.7%)
Number of Moment Connections with Unrepaired Rejected Welds: 4 (0.44%)

Number of Moment Connection Welds Not Visually Inspected: 4 (0.29%)
Number of Moment Connection Welds Not Ultrasonically Inspected: 18 (0.90%)
Number of Moment Connection Welds With No Record of Any Inspection: 4 (0.19%)

Number of Moment Connections Having Deficient Inspection: 10 (1.1%)
Number of Moment Connections Having Some Welds Not Visually Inspected: 0 (0.0%)
Number of Moment Connections Having No Record of Any Visual Inspection : 2 (0.22%)
Number of Moment Connections Having One Weld Not Ultrasonically Inspected: 3 (0.33%)
Number of Moment Connections Having No Record of Any Ultrasonic Inspection : 7 (0.76%)
Number of Moment Connections Having One Weld Completely Uninspected: 0 (0.0%)
Number of Moment Connections Completely Uninspected: 2 (0.22%)

Note: Numbers in parenthesis are % of total category
e.g. - number of moment connections with rejected welds: 141 (141 of 918 = 15.4%)

TABLE B2: SUMMARY OF REJECTED WELDS WITH NO RECORD OF REPAIR

Connection	Location	VT Report	VT Remarks	UT Report	UT Result	Type & Size	Remarks
MC286-T	K.2/11-1	101	INC	No UT - Failed VT		3 - W27x84	At Exp Joint Haunch - Accessible
MC423-T	M.6/10-4	149	UF	No UT - Failed VT		2 - W16x26	At False Pilaster - Accessible
MC516-T	L.2/9-5E	172	UF	No UT - Failed VT		2 - W27x146	In Shaft - Inaccessible
MCR24-B	KR/6R-2S	217	OK	217	Reject	1 - W30x99	Accessible

Connection Notes: T or B indicates top or bottom flange

Location Notes: Location ID is column line/column line - floor (side, if applicable)

VT Remarks: INC = incomplete/missing weld; UF = underfill

Type and Size Notes: Type is the type of moment connection; Size is the size of the beam being moment welded

1 = moment frame (beam-to-column)

2 = torsion counterbalance (beam-to-beam)

3 = cantilever balance (beam-to-column)

TABLE B3: SUMMARY OF WELDS HAVING NO RECORD OF ANY INSPECTION

Connection	Probable Location	Probable Welder ID	Type & Size	Remarks
MC24-T	D/23-2	1F	2 - W16x31	At False Pilaster - Accessible
MC24-B	D/23-2	1F	2 - W16x31	At False Pilaster - Accessible
MC70-T	C.9/19-3N	1F or 10F	2 - W27x84	At Mall Deck - Accessible
MC70-B	C.9/19-3N	1F or 10F	2 - W27x84	At Mall Deck - Accessible

Connection Notes: T or B indicates top or bottom flange

Location Notes: Location ID is column line/column line - floor (side, if applicable)

Type and Size Notes: Type is type of moment connection; Size is size of the beam being moment welded

2 = torsion counterbalance (beam-to-beam)

TABLE B4: SUMMARY OF WELDS HAVING NO RECORD OF ULTRASONIC INSPECTION

Connection	Location	Welder ID	Type & Size	Remarks
MC248-TR1	B/8.9-1	1F	2 - W21x44	At Loading Dock - Accessible
MC314-TR1	SS/DD.5-2	NS	2 - W16x31	At False Pilaster - Accessible
MC314-BR1	SS/DD.5-2	NS	2 - W16x31	At False Pilaster - Accessible
MC393-BR1	J.6/11-3S	18F	2 - W27x84	At Exp Joint - Accessible
MC437-BR1	T/10.5-4	NS	2 - W16x26	At False Pilaster - Accessible
MC473X-T	M/13.5-4	17F	2 - W16x26	At False Pilaster - Accessible
MC473X-B	M/13.5-4	9F	2 - W16x26	At False Pilaster - Accessible
MC496-T	J/11-5E	1F	3 - W36x160	At Exp Joint Haunch - Accessible
MC496-M	J/11-5E	19F	3 - W36x160	At Exp Joint Haunch - Accessible
MC496-B	J/11-5E	19F	3 - W24x68	At Exp Joint Haunch - Accessible
MC518-T	H.8/9-5E	19F	4 - W30x99	In Shaft - Inaccessible
MC518-B	H.8/9-5E	19F	4 - W30x99	In Shaft - Inaccessible
MC519-T	H.8/9-5W	19F	3 - W30x99	In Shaft - Inaccessible
MC519-B	H.8/9-5W	19F	3 - W30x99	In Shaft - Inaccessible

Note: These welds all passed visual inspection

Connection Notes: T or B indicates top or bottom flange; R# indicates the number of the repair attempt

Location Notes: Location ID is column line/column line - floor (side, if applicable)

Type and Size Notes: Type is type of moment connection; Size is size of the beam being moment welded

2 = torsion counterbalance (beam-to-beam)

3 = cantilever balance (beam-to-column)

4 = cantilever connection (beam-to-column)

TABLE B5: SUMMARY OF VISUALLY REJECTED WELDS

Connection	Welder ID	VT Insp	Result	Remarks
MC3-TR1	1F	1	Fail	UC,S
MC68-BR1	1F	2	Fail	UF
MC74-B	NS	3	Fail	UF
MC82-T	7F	2	Fail	UF
MC82-B	7F	2	Fail	UF
MC83-T	7F	2	Fail	UF
MC83-B	7F	2	Fail	UF
MC84-B	7F	2	Fail	UF
MC86-B	7F	2	Fail	UF
MC87-T	7F	2	Fail	UF
MC87-B	7F	2	Fail	UF
MC88-B	7F	2	Fail	UF
MC119-T	NS	2	Fail	FG
MC140-T	10F	1	Fail	FG
MC142-B	NS	2	Fail	UF
MC143-B	NS	2	Fail	UF
MC162-B	NS	2	Fail	UF
MC248-T	1F	3	Fail	ER
MC314-T	NS	2	Fail	FM
MC314-B	NS	2	Fail	FM
MC393-B	18F	2	Fail	INC
MC413-B	10F	3	Fail	UF
MC414-T	10F	3	Fail	UF
MC423-T	17F	3	Fail	UF
MC426-B	17F	3	Fail	UF
MC428-T	17F	3	Fail	ER
MC430-T	17F	3	Fail	UF
MC437-B	17F	3	Fail	UF
MC439-B	9F	3	Fail	UF
MC441-T	13F	3	Fail	UF
MC442-T	13F	3	Fail	UF
MC444-T	NS	3	Fail	P
MC445-M	9F	1	Fail	UC
MC448-T	17F	3	Fail	P
MC450-T	17F	3	Fail	UF,CL,UP
MC450-B	17F	3	Fail	UF,UP
MC451-T	17F	3	Fail	UF,UP
MC451-B	9F	3	Fail	EWB
MC469-B	9F	3	Fail	UF
MC471-B	9F	3	Fail	UF
MC473-T	17F	3	Fail	UF
MC474-T	17F	3	Fail	IRO
MC474-B	17F	3	Fail	IRO
MC475-B	17F	3	Fail	UF
MC476-T	17F	3	Fail	UF

Notes on Remarks:

- UC = Undercut
- S = Slag Inclusion
- UF = Underfill
- UC = Undercut
- FG = Flange Gouge
- ER = Excessive Reinforcement
- FM = Flange Misalignment
- INC = Incomplete/Missing Weld
- P = Porosity
- UP = Unacceptable Profile
- CL = Cold Lap
- EWB = Excessive Weld Bead
- IRO = Insufficient Root Opening
- LOF = Lack of Fusion

TABLE B5 (CONT'D): SUMMARY OF VISUALLY REJECTED WELDS

Connection	Welder ID	VT Insp	Result	Remarks
MC476X-B	1F	3	Fail	UF
MC477-T	17F	3	Fail	UF
MC477-B	17F	3	Fail	UF
MC478-B	17F	3	Fail	UF
MC481-T	17F	3	Fail	UF
MC502B-B	NS	2	Fail	UC
MC516-T	19F	3	Fail	UF
MC592-B	5F	3	Fail	UF
MC593-B	5F	3	Fail	UF
MC619-B	24F	3	Fail	UF
MC635-B	NS	3	Fail	INC
MC704-T	NS	1	Fail	UF
MC705-T	NS	1	Fail	UF
MC705-B	NS	1	Fail	UF
MC705-BR1	NS	1	Fail	CL,S
MC706-T	NS	1	Fail	UF
MC707-T	NS	1	Fail	UF
MC710-T	NS	1	Fail	UF
MCR2-B	28F	3	Fail	UF
MCR3-T	28F	3	Fail	UF,S
MCR3-B	28F	3	Fail	UF
MCR4-T	28F	3	Fail	S
MCR4-B	28F	3	Fail	UF
MCR67-T	NS	1	Fail	LOF,UP,S
MCR144-T	24F	1	Fail	ER
MCR146-T	24F	1	Fail	ER
MCR147-T	24F	1	Fail	ER
MCR152-T	1F	1	Fail	FM

TABLE B6: SUMMARY OF ULTRASONICALLY REJECTED WELDS

Connection	Welder ID	UT Insp	Result	Remarks
MC3-T	1F	1	Reject	Class A
MC3-M	1F	1	Reject	Class A
MC3-B	1F	1	Reject	Class A
MC3-BR1	1F	1	Reject	Class A
MC4-TE	1F	1	Reject	Class A
MC4-TER1	1F	1	Reject	Class A
MC4-TW	1F	1	Reject	Class A
MC4-TWR1	1F	1	Reject	Class A
MC67-B	10F	1	Reject	Class A
MC68-B	1F	1	Reject	Class A
MC104-B	3F	2	Reject	Class A
MC133-B	NS	1	Reject	Class A
MC225-B	16F	1	Reject	Class A
MC229-T	1F	1	Reject	Class A
MC229-TR1	1F	2	Reject	Class A
MC229-M	1F	2	Reject	Class A
MC229-B	1F	2	Reject	Class A
MC230-T	1F	1	Reject	Class A
MC230-M	1F	2	Reject	Class A
MC231-T	1F	1	Reject	Class A
MC233-T	1F	2	Reject	Class A
MC233-M	1F	1	Reject	Class A
MC236-T	16F	1	Reject	Class A
MC242-T	16F	1	Reject	Class A
MC255-T	1F	1	Reject	Class A
MC255-TR1	1F	2	Reject	Class A
MC255-TR2	1F	2	Reject	Class A
MC255-B	1F	1	Reject	Class A
MC261-B	1F	1	Reject	Class A
MC264-T	1F	2	Reject	Class A
MC272-M	1F	2	Reject	Class A
MC286-B	1F	1	Reject	Class A
MC299-T	16F	1	Reject	Class A
MC299-TR1	16F	1	Reject	Class A
MC303-T	16F	1	Reject	Class A
MC369-B	16F	1	Reject	Class A
MC369-BR1	16F	1	Reject	Class A
MC375-B	3F	2	Reject	Class A
MC384-B	16F	2	Reject	Class A
MC384-BR1	16F	1	Reject	Class A
MC402-B	10F	1	Reject	Class A
MC416-B	10F	2	Reject	Class A
MC417-B	10F	1	Reject	Class A
MC422-B	17F	1	Reject	Class A
MC423-B	17F	1	Reject	Class A

TABLE B6 (CONT'D): SUMMARY OF ULTRASONICALLY REJECTED WELDS

Connection	Welder ID	UT Insp	Result	Remarks
MC427-B	17F	1	Reject	Class A
MC428-B	17F	1	Reject	Class A
MC436-B	17F	1	Reject	Class A
MC442-B	9F	1	Reject	Class A
MC442-BR1	24F	1	Reject	Class A
MC460-B	17F	1	Reject	Class A
MC462-B	17F	2	Reject	Class A
MC462-BR1	17F	1	Reject	Class A
MC462-BR2	24F	1	Reject	Class A
MC474X-B	16F	1	Reject	Class A
MC475X-T	18F	1	Reject	Class A
MC477X-T	NS	1	Reject	Class A
MC478X-T	NS	1	Reject	Class A
MC478X-TR1	24F	1	Reject	Class A
MC490-T	1F	1	Reject	Class A
MC490-M	1F	1	Reject	Class A
MC491-M	1F	1	Reject	Class A
MC498-M	19F	1	Reject	Class A
MC498-B	19F	1	Reject	Class A
MC500-B	20F	2	Reject	Class A
MC521-T	20F	1	Reject	Class A
MC524-B	10F	1	Reject	Class A
MC525-B	10F	1	Reject	Class A
MC526-B	10F	1	Reject	Class A
MC548-B	20F	1	Reject	Class A
MC583-B	5F	1	Reject	ClassA
MC593-BR1	5F	1	Reject	Class A
MC632-T	1F	1	Reject	Class A
MC633-T	1F	1	Reject	Class A
MC634-T	1F	1	Reject	Class A
MC635-T	NS	1	Reject	Class A
MC636-T	19F	1	Reject	Class A
MC636-B	19F	1	Reject	Class A
MC639-B	12F	1	Reject	Class A
MC640-B	12F	1	Reject	Class A
MC657-T	1F	1	Reject	Class A
MC658-T	1F	1	Reject	Class A
MC672-T	NS	1	Reject	Class A
MC672-B	NS	1	Reject	Class A
MC673-T	NS	1	Reject	Class A
MC673-B	NS	1	Reject	Class A
MC674-T	NS	1	Reject	Class A
MC674-TR1	NS	1	Reject	Class A
MC681B-T	NS	1	Reject	Class A
MC704-B	NS	1	Reject	Class A

TABLE B6 (CONT'D): SUMMARY OF ULTRASONICALLY REJECTED WELDS

Connection	Welder ID	UT Insp	Result	Remarks
MC706-TR1	NS	1	Reject	Class A
MC706-B	NS	1	Reject	Class A
MC707-TR1	NS	1	Reject	Class A
MC707-B	NS	1	Reject	Class A
MC709-B	NS	1	Reject	Class A
MC711-B	NS	1	Reject	Class A
MCR11-B	1F	1	Reject	Class A
MCR24-T	28F	1	Reject	Class A
MCR24-B	28F	1	Reject	Class A
MCR25-T	1F	1	Reject	Class A
MCR25-TR1	1F	1	Reject	Class A
MCR44-B	28F	1	Reject	Class A
MCR45-T	28F	1	Reject	Class A
MCR69-B	28F	1	Reject	Class A
MCR71-B	28F	1	Reject	Class A
MCR71-BR1	24F	1	Reject	Class A
MCR72-T	28F	1	Reject	Class A
MCR91-B	1F	1	Reject	Class A
MCR100-T	1F	1	Reject	Class A
MCR112-B	KS	2	Reject	Class A
MCR125-T	1F	1	Reject	Class A

TABLE B7: NUMBER OF INSPECTIONS PERFORMED AND REJECTION RATES FOR EACH WELDING INSPECTOR

Inspector ID	Total VT Made	Total VT Rejects	Total UT Made	UT Rejected Welds	VT Reject Rate, %	UT Reject Rate, %	Gross Reject Rate, %
1	813	15	1383	95	1.85	6.87	5.01
2	360	18	589	16	5.00	2.72	3.58
3	887	41	None	None	4.62	None	4.62
All Inspectors	2060	74	1972	111	3.59	5.63	4.59

Notes:

Total VT made = 2064 welds - 4 not VT'd

Total UT made = 2064 welds - 74 failed VT - 18 not UT'd

TABLE B8: INSPECTION TIMELINESS - TIME DIFFERENCE IN DAYS BETWEEN VISUAL AND ULTRASONIC INSPECTIONS

Timeliness Category	Days Bet VT & UT	Inspections in Category	% of Welds Inspected
very timely	Same Day	1424	72.21
timely	1 to 3	96	4.87
marginally timely	4 to 7	36	1.83
late	7 to 10	6	0.30
very late	11 to 21	35	1.77
incredibly late	22 & Above	375	19.02

TABLE B9: SUMMARY OF INSPECTOR EXPOSURE TO EACH WELDER

	Visual Inspection			UT Inspection	
Welder ID	Insp #1	Insp #2	Insp #3	Insp #1	Insp #2
1F	265	152	243	432	219
3F	6	32	16	11	43
5F	3	0	17	18	0
7F	0	23	24	14	24
8F	0	8	6	0	14
9F	9	0	27	30	0
10F	21	11	89	104	14
12F	2	0	8	10	0
13F	0	0	7	5	0
16F	37	13	98	91	57
17F	6	0	82	58	11
18F	10	23	47	26	53
19F	0	0	16	9	0
20F	17	0	101	88	30
22F	0	0	2	0	2
24F	160	10	16	172	10
28F	29	12	17	33	20
KS	2	31	0	2	31
Albert	0	0	2	0	2
No Stencil	246	44	67	280	59

TABLE B10: SUMMARY OF MOMENT CONNECTION FIELD WELDER QUALIFICATIONS ON RECORD

Welder ID	Date Quals Submitted	Dates of Welding on Project		Date Qualified	Process	Backing	Electrode (Size)	Position	Mat'l Thickness	Qualified By	Remarks
1F	03/13/95	11/13/92	11/18/93	09/10/94	FCAW	Yes	E71T-7 (5/64)	3G & 4G	Unlimited	Erector	4,6,12
3F	03/13/95	12/28/92	05/28/93	06/29/90	FCAW	Yes	E70T-7 (5/64)	3G & 4G	Unlimited	Union Local	1,4,6,7
5F	03/13/95	02/15/93	11/24/93	04/17/87	SMAW	Yes	E7018 (5/32)	3G & 4G	Unlimited	Erector	1,4,6,7,8
7F	03/13/95	02/09/93	08/04/93	11/07/90	SMAW	No	E7018 (1/8)	3F	Unlimited	Erector	1,4,6,7,8,9
8F	03/13/95	02/23/93	04/28/93	01/30/85	FCAW	Yes	E71T-11 (5/64)	3G	Unlimited	Erector	1,4,6,7
9F	03/13/95	07/02/93	12/14/93	06/10/91	SMAW	Yes	E7018 (5/32)	3G	Unlimited	Union Local	1,4,6,7,8
10F	01/26/93	01/29/93	11/24/93	04/11/92	SMAW	No	E7018 (1/8)	6G	0.864" & Less	Union Local	1,7,8
12F	03/03/93	09/14/93	11/24/93	11/14/92	FCAW	Yes	E71T-7 (5/64)	3G	Unlimited	Union Local	2,13
13F	01/26/93	07/01/93	07/01/93	11/07/92	FCAW	Yes	E71T-7 (5/64)	3G	Unlimited	Union Local	2
16F	03/30/93	03/29/93	10/30/93	11/07/92	FCAW	Yes	E71T-7 (5/64)	3G & 4G	Unlimited	Union Local	2
17F	03/30/95	06/29/93	10/14/93	05/21/84	SMAW	Yes	E7018 (1/8)	3G & 4G	0.75" & Less	Unknown	1,4,6,7,8
18F	01/26/93	05/19/93	09/22/93	11/07/92	FCAW	Yes	E71T-7 (5/64)	3G & 4G	Unlimited	Union Local	2
19F	01/12/93	07/23/93	09/11/93	11/07/92	FCAW	Yes	E71T-7 (5/64)	3G & 4G	Unlimited	Union Local	2
20F	01/12/93	07/22/93	11/24/93	11/14/92	FCAW	Yes	E71T-7 (5/64)	3G & 4G	Unlimited	Union Local	2
22F	03/13/95	07/30/93	07/30/93	10/04/93	FCAW	Yes	E71T-7 (5/64)	3G & 4G	Unlimited	Erector	4,6,11,14
24F	03/13/95	08/26/93	02/17/94	07/20/91	FCAW	Yes	E71T-7 (5/64)	3G & 4G	Unlimited	Erector	1,4,6,7
28F	01/26/93	09/21/93	10/19/93	11/14/92	FCAW	Yes	E71T-7 (5/64)	3G & 4G	Unlimited	Union Local	2
KS	03/30/95	10/15/93	11/03/93	09/13/88	SMAW	Yes	E7018 (1/8)	2G	0.75" & Less	Erector	1,4,6,7,8,10
Albert	None Submitted	08/13/93	08/13/93								5

NOTES:

Position: G indicates groove welding and F indicates fillet welding; Qualified groove welders may weld fillets but not the reverse
Welders are qualified to weld in positions shown and in all numerically lower positions

Key to Remarks:

1. Qualification older than 6 months when submitted
2. Qualification older than 6 months when welder began welding on project; no continuity data provided
3. Qualifications not submitted until after welding began
4. Qualifications not submitted until after welding operations on this project were complete
5. No qualifications on record for this welder
6. Submitted qualifications not acknowledged as acceptable by Corps of Engineers
7. No continuity data provided for welder with old qualification test
8. Welder not qualified in FCAW process used for welding all moment connections
9. Welder not qualified to do groove welding
10. Records indicate welder welded thicker materials than qualified for
11. Date of qualification test after welding began
12. Date of qualification test after welding operations on this project were complete
13. Welder qualified by other employer other than Erector; No evidence of requalification after 12 months
14. Qualification test dated 4/17/91 also submitted for this welder but without continuity data

TABLE B11: TOTAL WELDS PERFORMED AND REJECT RATES FOR EACH FIELD WELDER

Welder ID	Total Welds Made	Visually Rejected Welds	UT Rejected Welds	VT Reject Rate, %	UT Reject Rate, %	Gross Reject Rate, %
1F	660	5	40	0.76	6.06	6.82
3F	54	0	2	0.00	3.70	3.70
5F	20	2	2	10.00	10.00	20.00
7F	47	9	0	19.15	0.00	19.15
8F	14	0	0	0.00	0.00	0.00
9F	36	5	1	13.89	2.78	16.67
10F	121	3	7	2.48	5.79	8.26
12F	10	0	2	0.00	20.00	20.00
13F	7	2	0	28.57	0.00	28.57
16F	148	0	11	0.00	7.43	7.43
17F	88	18	8	20.45	9.09	29.55
18F	80	0	1	0.00	1.25	1.25
19F	16	1	4	6.25	25.00	31.25
20F	118	0	3	0.00	2.54	2.54
22F	2	0	0	0.00	0.00	0.00
24F	186	4	4	2.15	2.15	4.30
28F	58	5	7	8.62	12.07	20.69
KS	33	0	1	0.00	3.03	3.03
Albert	2	0	0	0.00	0.00	0.00
No Stencil	357	17	18	4.76	5.04	9.80
All Welders	2057	71	111	3.45	5.40	8.85

Notes:

Total Welds Made: 2064 welds - 3 incomplete with no welder - 4 not VT'd

Visually Rejected Welds: 74 total rejects - 3 not attributable to a welder

TABLE B12: OVERALL AND PER WELDER VISUAL INSPECTION REJECTABLE DEFECT FREQUENCY DISTRIBUTION

Welder ID	UF	UC	UP	S	FG	FM	ER	EWB	P	CL	LOF	IRO	INC
1F	2	1		1		1	1						
3F													
5F	2												
7F	9												
8F													
9F	3	1						1					
10F	2				1								
12F													
13F	2												
16F													
17F	14		3				1		1	1		2	
18F													
19F	1												
20F													
22F													
24F	1						3						
28F	4			2									
KS													
Albert													
No Stencil	10	1	1	2	1	2			1	1	1		
No Welder													3
All Welders	50	3	4	5	2	3	5	1	2	2	1	2	3

Notes: May be multiple rejectable visual defects in a single weld

Key to Defects:

S = Slag Inclusion
UF = Underfill
UC = Undercut
FG = Flange Gouge
FM = Flange Misalignment
EWB = Excessive Weld Bead
IRO = Insufficient Root Opening
LOF = Lack of Fusion
ER = Excessive Reinforcement
INC = Incomplete/Missing Weld
P = Porosity
UP = Unacceptable Profile
CL = Cold Lap

APPENDIX C - Welding Procedure Specifications for Moment Connections

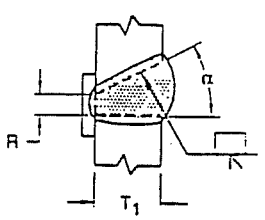
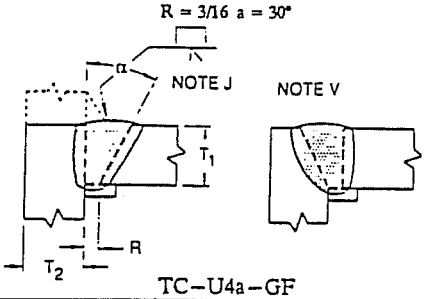
TITLE: Prequalified Welding Procedure No: B–U4a–GF & TC–U4a–GF

This procedure may vary due to fabrication sequence, fit–up, pass size, etc... within the limitations of variables given in 4B, C, or D and D5.1.2 of AWS D1.1.

See matching filler metal tables this specification

Material Specification: AWS D1.1–90 TABLE 4.1 GROUP I,II
Welding Process: FCAW
Manual or Machine: SEMI–AUTOMATIC
Position of Weld: FLAT AND HORIZONTAL
Filler Metal: E70T–1 & E71T–1 AWS A5.20
Flux: N/A
Sheilding Gas: C02 40CFM DEW POINT –40°
Welding Current: DCEP
Root Treatment: BACKING BAR
Preheat and Interpass Temperature: AWS D1.1–90 TABLE 4.3 GROUP A,B

See preheat tables this specification

Joint Geometry	Joint Geometry
T1 = UNLIMITED THICKNESS R = 3/16 a = 30°  B–U4a–GF	T1 & T2 UNLIMITED THICKNESS R = 3/16 a = 30°  TC–U4a–GF

Pass No.	Weld Type	Electrode	Welding Current Volts	Welding Current Amperes	Travel Speed
ALL	FCAW	A5.20 E70T–1 5/64	28	350	N/A
ALL	FCAW	A5.20 E70T–1 .052	26	260	N/A

Comments

1. THE MEMBER ORIENTATION MAY BE CHANGED PROVIDED THE ROOT OPENING, GROOVE ANGLE AND THE DESIGN WELD SIZE IS MAINTAINED.

NOTE J IF FILLET WELDS ARE USED TO REINFORCE GROOVE WELDS IN CORNER AND TEE JOINTS, THEY SHALL BE EQUAL TO 1/4 T1, BUT NEED NOT EXCEED 3/8 IN.

APPENDIX D - Typical Weld Inspection Report

FIELD REPORT

11009 Osgood, San Antonio, Texas 78233
Ph.: (512) 655-9516; FAX: (512) 655-9519

JOB NO.:	PROJECT: Brooke Army Medical Center
DATE: 3-19-93	LOCATION: San Antonio, Texas
CLIENT: GENERAL CONTRACTOR	CONTRACTOR

CONSTRUCTION: COLUMN SPLICES - LEVEL 3 VISUAL AND ULTRASONIC TESTING OF MOMENT CONNECTIONS 4th FLOOR FRAME Report # 76

WEATHER: CLOUDY

REPORTED TO: Phil Broom WITH: Hyman/Manhattan

COMMENTS:

ON FRIDAY, MARCH 19, 1993 A.K. WOJCIK, CWI, PERFORMED VISUAL TESTING OF COLUMN SPLICES ON LEVEL 3. ATTACHED ARE THE VISUAL REPORT FORMS.

MICHAEL W. MAY, CWI, NDE LEVEL II CONDUCTED ULTRASONIC TESTING OF MOMENT CONNECTIONS ON THE 4th FLOOR FRAME. A.K. WOJCIK CONDUCTED VISUAL TESTING OF THESE SAME MOMENT CONNECTIONS. ATTACHED ARE THE VISUAL AND ULTRASONIC REPORT FORMS.

MICHAEL W. MAY ALSO CONDUCTED ULTRASONIC TESTING OF MOMENT CONNECTIONS ON THE 3rd FLOOR FRAME. THESE CONNECTIONS HAD PREVIOUSLY BEEN VISUALLY REJECTED AND HAVE BEEN REPAIRED. FLAME CUT BOLT HOLES ARE STILL PRESENT IN THE WEB OF THESE CONNECTIONS. ATTACHED ARE THE ULTRASONIC REPORT FORMS.

By: A.K. WOJCIK	Regular Hours:	Mileage: X Miles
Approved:	Overtime Hours:	CC: ERECTOR FABRICATOR
Date: 3-19-93	Total Hours:	

FORM: SAT-0003(Rev. 9/1)

VISUAL INSPECTION REPORT FORM

X	MC - Moment Connection	WELD CONDITIO:
	IC - Imbed Connection	X AS WELDE!
	CS - Column Splice	SMOOTH
	Other (specify) 4TH FLOOR FRAME	

P - POROSITY
U - UNDERCUT
LOF - LACK OF FUSION
IP - INCOMPLETE PENETRATION
ER - EXCESSIVE REINFORCEMENT
WC - WELD CRATER
CL - COLD LAP
UP - UNACCEPTABLE PROFILE
C - CRACK
S - SLAG INCLUSION
UF - UNDERFIL.
F - FIT-UP

WELD NUMBER	GRID LOCATION	WELDER ID	RESULTS	REMARKS
MC-200T	M.7/17	10F	SATISFACTORY	NO BOLTS DUE TO BOLT HOLE MISALIGNMENT
MC-200B	M.7/17	10F	SATISFACTORY	
MC 201T	N.7/17	10F	SATISFACTORY	
MC 201B	N.7/17	10F	SATISFACTORY	
MC 202T	R.1/17	10F	SATISFACTORY	
MC 202B	R.1/17	10F	SATISFACTORY	
MC 203T	R.5/17	10F	SATISFACTORY	
MC 203B	R.5/17	10F	SATISFACTORY	
MC 204T	S.5/17	10F	SATISFACTORY	3 LOOSE BOLTS IN CONNECTION
MC 204B	S.5/17	10F	SATISFACTORY	
MC 205T	T/16.5	10F	SATISFACTORY	
MC 205B	T/16.5	10F	SATISFACTORY	
MC 206T	T/15.5	10F	SATISFACTORY	
MC 206B	T/15.5	10F	SATISFACTORY	
MC 207T	T/14.5	10F	SATISFACTORY	3/4" WIDE BEAD WIDTH
MC 207B	T/14.5	10F	SATISFACTORY	
MC 208T	S.5/14	10F	SATISFACTORY	
MC 208B	S.5/14	10F	SATISFACTORY	

PAGE 10F 2

DATE 3-19-93

INSPECTOR

VISUAL INSPECTION REPORT FORM

X MC - Moment Connection
____ IC - Imbed Connection
____ CS - Column Splice
____ Other (specify) 4th FLOOR FRAME

WELD CONDITIO
X AS WELDE
____ SMOOTH

P - POROSITY
U - UNDERCUT
LOF - LACK OF FUSION
IP - INCOMPLETE PENETRATION
ER - EXCESSIVE REINFORCEMENT
WC - WELD CRATER
CL - COLD LAP
UP - UNACCEPTABLE PROFILE
C - CRACK
S - SLAG INCLUSION
UF - UNDERFIL
F - FIT-UP

WELD NUMBER	GRID LOCATION	WELDER ID	RESULTS	REMARKS
MC 209 T	R.5/14	10F	SATISFACTORY	
MC 209 B	R.5/14	10F	SATISFACTORY	
MC 210 T	R.1/14	10F	SATISFACTORY	
MC 210 B	R.1/14	10F	SATISFACTORY	

PAGE 2 OF 2

DATE 3-19-93

A. E. Wood
INSPECTOR

11009 Osgood, San Antonio, Texas 78230
Ph.: (512) 655-9516; FAX: (512) 655-9519

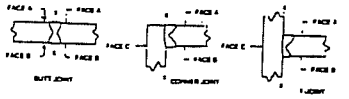
REPORT OF ULTRASONIC TESTING OF WELDS

Job No. _____

Date 3-19-93

REPORTED TO: GENERAL CONTRACTOR
PROJECT REFERENCE: BROOKE ARMY MEDICAL CENTER
PURPOSE OF TEST: WELD INSPECTION - 4th FLOOR FRAME
SPECIFICATION: AWS D1.1-92
WITNESSED BY:
DATE OF TEST: 3-19-93

INSTRUMENT: EPOCH 2002
LONGITUDINAL FREQ: 2.25 MHz SIZE: .750 DIA.
SHEAR WAVE FREQ: 2.25 MHz SIZE: .625 x .625
CALIBRATION: DSC AND IIW BLOCK
COUPLANT: CELEGEL
SCANNING SENSITIVITY: +19 db



Piece Mark	Weld Identification or Weld Number	Thickness	Indication number	Transducer angle	From Face	Leg	Decibels: Indication level a	Decibels: Reference level b	Decibels: Attenuation factor c	Decibels: Indication rating d	Discontinuity: Length	Discontinuity: Angular distance (sound path)	Discontinuity: Depth from "A" surface	Discontinuity: Distance From X	Discontinuity: Distance From Y	Discontinuity evaluation	Remarks
MC 200 T	M.7\17	.375	–	70°	A	1-3	–	63.0	–	–	–	–	–	–	–	NRI	ACCEPT
MC 200 B	M.7\17	.375	–	70°	A	1-3	–	63.0	–	–	–	–	–	–	–	NRI	ACCEPT
MC 201 T	N.7\17	.375	–	70°	A	1-3	–	63.0	–	–	–	–	–	–	–	NRI	ACCEPT
MC 201 B	N.7\17	.375	–	70°	A	1-3	–	63.0	–	–	–	–	–	–	–	NRI	ACCEPT
MC 202 T	R.1\17	.375	–	70°	A	1-3	–	63.0	–	–	–	–	–	–	–	NRI	ACCEPT
MC 202 B	R.1\17	.375	–	70°	A	1-3	–	63.0	–	–	–	–	–	–	–	NRI	ACCEPT
MC 203 T	R.5\17	.375	–	70°	A	1-3	–	63.0	–	–	–	–	–	–	–	NRI	ACCEPT
MC 203 B	R.5\17	.375	–	70°	A	1-3	–	63.0	–	–	–	–	–	–	–	NRI	ACCEPT
MC 204 T	S.5\17	.420	–	70°	A	1-3	–	63.0	–	–	–	–	–	–	–	NRI	ACCEPT
MC 204 B	S.5\17	.420	–	70°	A	1-3	–	63.0	–	–	–	–	–	–	–	NRI	ACCEPT
MC 205 T	T\16.5	.375	–	70°	A	1-3	–	63.0	–	–	–	–	–	–	–	NRI	ACCEPT
MC 205 B	T\16.5	.375	–	70°	B	1-3	–	63.0	–	–	–	–	–	–	–	NRI	ACCEPT
MC 206 T	T\15.5	.400	–	70°	A	1-3	–	63.0	–	–	–	–	–	–	–	NRI	ACCEPT
MC 206 B	T\15.5	.400	–	70°	B	1-3	–	63.0	–	–	–	–	–	–	–	NRI	ACCEPT
MC 207 T	T\14.5	.350	–	70°	A	1-3	–	63.0	–	–	–	–	–	–	–	NRI	ACCEPT
MC 207 B	T\14.5	.350	–	70°	B	1-3	–	63.0	–	–	–	–	–	–	–	NRI	ACCEPT
MC 208 T	S.5\14	.400	–	70°	A	1-3	–	63.0	–	–	–	–	–	–	–	NRI	ACCEPT
MC 208 B	S.5\14	.400	–	70°	A	1-3	–	63.0	–	–	–	–	–	–	–	NRI	ACCEPT
MC 209 T	R.5\14	.350	–	70°	A	1-3	–	63.0	–	–	–	–	–	–	–	NRI	ACCEPT
MC 209 B	R.5\14	.350	–	70°	A	1-3	–	63.0	–	–	–	–	–	–	–	NRI	ACCEPT
MC 210 T	R.1\14	.300	–	70°	A	1-3	–	63.0	–	–	–	–	–	–	–	NRI	ACCEPT
MC 210 B	R.1\14	.300	–	70°	A	1-3	–	63.0	–	–	–	–	–	–	–	NRI	ACCEPT

NOTES: _____

We, the undersigned, certify that the statements in this record are correct and that the welds were prepared and tested in accordance with the requirements of section 6, Part C of ANSI/AWS D1.1, (1992 year) Structural Welding Code-Steel.

Test date 3-19-93

Inspected by Michael W Mayo, CWI, NDE Level II

Manufacturer or contractor _____

Authorized by _____

Date _____

11009 Osgood, San Antonio, Texas 78233
Ph.: (512) 655-9516; FAX: (512) 655-9519

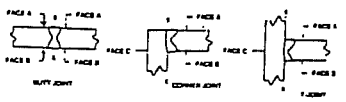
REPORT OF ULTRASONIC TESTING OF WELDS

Job No. _____

Date 3-19-92

REPORTED TO: GENERAL CONTRACTOR
PROJECT REFERENCE: BROOKE ARMY MEDICAL CENTER
PURPOSE OF TEST: WELD INSPECTION - 3rd FLOOR FRAME
SPECIFICATION: AWS D1.1-92
WITNESSED BY:
DATE OF TEST: 3-19-93

INSTRUMENT: EPOCH 2002
LONGITUDINAL FREQ: 2.25 MHz SIZE: .750 DIA.
SHEAR WAVE FREQ: 2.25 MHz SIZE: .625 X .625
CALIBRATION: DSC AND IIW BLOCK
COUPLANT: CELEGEL
SCANNING SENSITIVITY: +19 db



Piece Mark	Weld Identification or Weld Number	Thickness	Indication number	Transducer angle	From Face	Leg	Decibels: Indication level (a)	Decibels: Reference level (b)	Decibels: Attenuation factor (c)	Decibels: Indication rating (d)	Discontinuity: Length	Discontinuity: Angular distance (sound path)	Discontinuity: Depth from "A" surface	Discontinuity: Distance From X	Discontinuity: Distance From Y	Discontinuity evaluation	Remarks
MC 141T	P.3/23.8 N	.650	—	70°	B	1-3	—	63.6	—	—	—	—	—	—	—	NRI	ACCEPT
MC 141B	P.3/23.8 N	.650	—	70°	A	1-3	—	63.0	—	—	—	—	—	—	—	NRI	ACCEPT
MC 140T	P.2/23.8 N	.620	—	70°	B	1-3	—	63.0	—	—	—	—	—	—	—	NRI	ACCEPT
MC 140B	P.2/23.8 N	.620	—	70°	A	1-3	—	63.0	—	—	—	—	—	—	—	NRI	ACCEPT

NOTES: _____

We, the undersigned, certify that the statements in this record are correct and that the welds were prepared and tested in accordance with the requirements of section 6, Part C of ANSI/AWS D1.1, (1992 year) Structural Welding Code-Steel.

Test date 3-19-93

Inspected by Michael W May, CWI, NDE Level II

Manufacturer or contractor _____

Authorized by _____

Date _____

APPENDIX E - Contract Specifications

SECTION 05055 - WELDING, STRUCTURAL

PART 1 - GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC S326 (Nov. 1, 1978) Specification for the Design, Fabrication and Erection of Structural Steel for Buildings (with Commentary).

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Z49.1 (1983) Safety in Welding and Cutting.

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT)

ASNT No. SNT-TC (Aug. 1984; Rev. 1A) Personnel Qualification and Certification in Nondestructive Testing.

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4 (1986) Symbols for Welding and Nondestructive Testing.

AWS A3.0 (1985) Welding Terms and Definitions.

AWS D1.1 (1988) Structural Welding Code - Steel.

AWS D1.3 Specification for Welding Sheet Steel.

AWS D1.4 Structural Welding Code - Reinforcing Steel.

1.2 DEFINITIONS

Definitions of welding terms shall be in accordance with AWS A3.0.

1.3 GENERAL REQUIREMENTS

The design of welded connections shall conform to AISC S 326 unless otherwise indicated or specified. Material with welds will not be accepted unless the welding is specified or indicated on the drawings or otherwise approved. Welding shall be as specified in this section, except where additional requirements are shown on the drawings or are specified in other sections. Welding shall not be started until welding procedures, welders, welding operators, and tackers have been qualified and the submittals furnished to the Contracting Officer. Qualification testing shall be performed at or near the work site. Each Contractor

performing welding shall maintain records of the test results obtained in welding procedure, welder, welding operator, and tacker performance qualifications.

1.4 SUBMITTALS

The following shall be submitted in accordance with SECTION 01300 - SUBMITTALS:

SD-31, Detail Drawings

Detail drawings consisting of fabrication and assembly drawings for all parts of the work in sufficient detail to enable the Government to check conformity with the requirements of the contract documents.

SD-39, Qualifications

Qualifications of welding inspector.

SD-64, Quality Assurance Plan

Detailed procedures defining methods to ensure compliance to contract drawings and specifications by drawing control, inspection and procurement records, system and material testing, and certification records.

SD-70, Test Reports

An independent testing agency's certified reports of inspections and laboratory tests, including analysis and interpretation of test results. Each report shall be properly identified. Test methods used and compliance with recognized test standards shall be described.

SD-74, Welding Procedures and Qualifications

Copies of the welding procedure specifications, the procedure qualification test records, and the welder, welding operator, or tacker qualification test records shall be submitted.

SD-91, Records

Letters of record expressing Contractor and Contracting Officer communication and records of historical field data.

1.5 WELDING PROCEDURE QUALIFICATION

Except for prequalified (per AWS D1.1) and previously qualified procedures, each Contractor performing welding shall record in detail and shall qualify the welding procedure specification for any welding procedure followed in the fabrication of weldments. Qualification of welding procedures shall conform to AWS D1.1 and to the specifications in this section. Copies of the welding procedure specification and the results of the procedure qualification test for each type of welding which requires procedure qualification shall be submitted. Approval of any procedure, however, will not relieve the Contractor of the sole responsibility for producing a finished structure meeting all the requirements of these specifications. This information shall be submitted on the forms in Appendix E of AWS

D1.1. Welding procedure specifications shall be individually identified and shall be referenced on the detail drawings and erection drawings, or shall be suitably keyed to the contract drawings. In case of conflict between this specification and AWS D1.1, this specification governs.

1.5.1 Previous Qualifications: Welding procedures previously qualified by test may be accepted for this contract without requalification if the following conditions are met:

a. Testing was performed by an approved testing laboratory, technical consultant, or the Contractor's approved quality control organization.

b. The qualified welding procedure conforms to the requirements of this specification and is applicable to welding conditions encountered under this contract.

c. The welder, welding operator, and tacker qualification tests conform to the requirements of this specification and are applicable to welding conditions encountered under this contract.

1.5.2 Prequalified Procedures: Welding procedures which are considered prequalified as specified in AWS D1.1 will be accepted without further qualification. The Contractor shall submit a listing or an annotated drawing to indicate the joints not prequalified. Procedure qualification shall be required for these joints.

1.5.3 Retests: If welding procedure fails to meet the requirements of AWS D1.1, the procedure specification shall be revised and requalified, or at the Contractor's option, welding procedure may be retested in accordance with AWS D1.1. If the welding procedure is qualified through retesting, all test results, including those of test welds that failed to meet the requirements, shall be submitted with the welding procedure.

1.6 WELDER, WELDING OPERATOR, AND TACKER QUALIFICATION

Each welder, welding operator, and tacker assigned to work on this contract shall be qualified in accordance with the applicable requirements of AWS D1.1 and as specified in this section. Welders, welding operators, and tackers who make acceptable procedure qualification test welds will be considered qualified for the welding procedure used.

1.6.1 Previous Qualifications: At the discretion of the Contracting Officer, welders, welding operators, and tackers qualified by test within the previous 6 months may be accepted for this contract without requalification if all the following conditions are met:

a. Copies of the welding procedure specifications, the procedure qualification test records, and the welder, welding operator, and tacker qualification test records are submitted in accordance with the requirements for detail drawings.

b. Testing was performed by an approved testing laboratory, technical consultant, or the Contractor's approved quality control organization.

c. The previously qualified welding procedure conforms to the requirements of this specification and is applicable to welding conditions encountered under this contract.

d. The welder, welding operator, and tacker qualification tests conform to the requirements of this specification and are applicable to welding conditions encountered under this contract.

1.6.2 Certificates: Before assigning any welder, welding operator, or tacker to work under this contract, the Contractor shall submit the names of the welders, welding operators, and tackers to be employed, and certification that each individual is qualified as specified. The certification shall state the type of welding and positions for which the welder, welding operator, or tacker is qualified, the code and procedure under which the individual is qualified, the date qualified, and the name of the firm and person certifying the qualification tests. The certification shall be kept on file, and 3 copies shall be furnished. The certification shall be kept current for the duration of the contract.

1.6.3 Renewal of Qualification: Requalification of a welder or welding operator shall be required under any of the following conditions:

a. It has been more than 6 months since the welder or welding operator has used the specific welding process for which he is qualified.

b. There is specific reason to question the welder or welding operator's ability to make welds that meet the requirements of these specifications.

c. The welder or welding operator was qualified by an employer other than those firms performing work under this contract, and a qualification test has not been taken within the past 12 months. Records showing periods of employment, name of employer where welder, or welding operator, was last employed, and the process for which qualified shall be submitted as evidence of conformance.

d. A tacker who passes the qualification test shall be considered eligible to perform tack welding indefinitely in the positions and with the processes for which he is qualified, unless there is some specific reason to question the tacker's ability. In such a case, the tacker shall be required to pass the prescribed tack welding test.

1.7 INSPECTOR QUALIFICATION

The inspector will be an independent, established commercial consultant or employed by an independent testing laboratory. Inspection and nondestructive testing personnel shall be qualified in accordance with the requirements of ASNT No. SNT-TC for Levels I or II in the applicable nondestructive testing method. The inspector may be supported by assistant welding inspectors who are not qualified to ASNT No. SNT-TC, and assistant inspectors may perform specific inspection functions under the supervision of the qualified inspector.

1.8 SYMBOLS

Symbols shall be in accordance with AWS A2.4, unless otherwise indicated.

1.9 SAFETY

Safety precautions during welding shall conform to ANSI Z49.1.

PART 2 - PRODUCTS

2.1 WELDING EQUIPMENT AND MATERIALS

All welding equipment, electrodes, welding wire, and fluxes shall be capable of producing satisfactory welds when used by a qualified welder or welding operator performing qualified welding procedures. All welding equipment and materials shall comply with the applicable requirements of AWS D1.1, AWS D1.3 and AWS D1.4.

PART 3 - EXECUTION

3.1 WELDING OPERATIONS

3.1.1 Requirements: Workmanship and techniques for welded construction shall conform to the requirements of AWS D1.1 and AISC S 326. When AWS D1.1 and the AISC S 326 specification conflict, the requirements of AWS D1.1 shall govern.

3.1.2 Identification: Welds shall be identified in one of the following ways:

a. Written records shall be submitted to indicate the location of welds made by each welder, welding operator, or tacker.

b. Each welder, welding operator, or tacker shall be assigned a number, letter, or symbol to identify welds made by that individual. Each welder, welding operator and tacker shall apply their symbol next to the weld by means of rubber stamp, felt-tipped marker with waterproof ink, or other methods that do not cause an indentation in the metal. For seam welds, the identification mark shall be adjacent to the weld at 3-foot intervals. Identification with die stamps or electric etchers shall not be allowed.

3.2 QUALITY CONTROL

Testing shall be done by an independent, approved inspection or testing laboratory or technical consultant, and shall be within the Contractor's contract. Visual and ultrasonic inspection shall be performed to determine conformance with paragraph "STANDARDS OF ACCEPTANCE." Procedures and techniques for inspection shall be in accordance with applicable requirements of AWS D1.1.

3.3 STANDARDS OF ACCEPTANCE

Dimensional tolerances for welded construction, details of welds, and quality of welds shall be in accordance with the applicable requirements of AWS D1.1 and the contract drawings. Nondestructive testing shall be by visual inspection and ultrasonic methods. The minimum extent of nondestructive testing shall be as indicated on the drawings.

3.3.1 Nondestructive Examination: The welding shall be subject to inspection and tests in the mill, shop, and field. Inspection and tests in the mill or shop will not relieve the Contractor of the responsibility to furnish weldments of satisfactory quality. When materials or workmanship do not conform to the specification requirements, the Government reserves

the right to reject material or workmanship or both at any time before final acceptance of the structure containing the weldment.

3.3.2 Destructive Tests: When metallographic specimens are required to be removed from any part of a structure, the Contractor shall make repairs. The Contractor shall employ qualified welders or welding operators, and shall use the proper joints and welding procedures, including peening or heat treatment if required, to develop the full strength of the members and joints cut and to relieve residual stress.

3.4 GOVERNMENT INSPECTION AND TESTING

In addition to the inspection and tests performed by the Contractor's independent testing laboratory or technical consultant for quality control, the Government will perform inspection and testing for acceptance to the extent determined by the Contracting Officer. The costs of such inspection and testing will be borne by the Contractor if unsatisfactory welds are discovered, or by the Government if the welds are satisfactory. The work may be performed by the Government's own forces or under a separate contract for supplemental inspection and testing. The Government reserves the right to perform supplemental nondestructive and destructive tests to determine compliance with paragraph "STANDARDS OF ACCEPTANCE."

3.5 CORRECTIONS AND REPAIRS

When inspection or testing indicates defects in the weld joints, the welds shall be repaired using a qualified welder or welding operator as applicable. Corrections shall be in accordance with the requirements of AWS D1.1 and the specifications. Defects shall be repaired in accordance with the approved procedures. Defects discovered between passes shall be repaired before additional weld material is deposited. Wherever a defect is removed and repair by welding is not required, the affected area shall be blended into the surrounding surface to eliminate sharp notches, crevices, or corners. After a defect is thought to have been removed, and before rewelding, the area shall be examined by suitable methods to insure that the defect has been eliminated. Repair welds shall meet the inspection requirements for the original welds. Any indication of a defect shall be regarded as a defect, unless reevaluation by nondestructive methods or by surface conditioning shows that no unacceptable defect is present.

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SECTION 05061 - ULTRASONIC INSPECTION OF WELDMENTS

PART 1 - GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

MILITARY STANDARDS (MIL. STD.):

MIL-STD-271E Nondestructive Testing Requirements & Notice 1for Metals

MIL-STD-410D Nondestructive Testing Personnel & Notices 1, 2Qualification and Certification (Eddy Current, Liquid Penetrant, Magnetic Particle, Radiographic and Ultrasonic)

DEPARTMENT OF THE NAVY, NAVAL SEA SYSTEMS COMMAND (NAVSHIPS) PUBLICATION:

0900-006-3010 Ultrasonic Inspection Procedure and Acceptance Standards for Hull Structure Production and Repair Welds (January 1966)

AMERICAN SOCIETY FOR NONDESTRUCTIVE TESTING (ASNT) RECOMMENDED PRACTICE:

SNT-TC-1A Personnel Qualification and Certification in Nondestructive Testing (August 1984)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) PUBLICATIONS:

E 165-80 (R. 1983) Liquid Penetrant Inspection Method

E 709-80 (R. 1985) Magnetic Particle Examination

AMERICAN WELDING SOCIETY (AWS) PUBLICATION:

D1.1-86 Structural Welding Code - Steel

1.2 GENERAL REQUIREMENTS

The procedures, methods, standards, and description of equipment specified herein that shall be used for inspection of weldments specified. Ultrasonic inspections shall be made to detect the following defects:

a. Cracks or crack-like faults.

b. Root defects, including lack of penetration and fusion.

c. Lack of fusion between passes on the sidewall.

d. Porosity or inclusions and excessive undercutting.

1.2.1 Ultrasonic Equipment: The ultrasonic equipment shall conform to the requirements listed in AWS D1.1 section inspection, subsection Ultrasonic Equipment, with the following exceptions:

1.2.1.1 The ultrasonic test instruments shall be able to generate, receive, and present pulses in the frequency range from 1 to 10 megahertz (MHz).

1.2.1.2 The horizontal linearity of the ultrasonic instrument shall be measured in accordance with paragraph EQUIPMENT QUALIFICATION REQUIREMENTS.

1.2.1.3 In addition to the resolution test specified in AWS D1.1, subsection Ultrasonic Equipment, both near- and far-surface resolution tests shall be conducted in accordance with the tests specified for these characteristics in the paragraph EQUIPMENT QUALIFICATION REQUIREMENTS.

1.2.2 Procedures and Methods: The pulse echo contact method with an A scan presentation shall be used for the ultrasonic inspection of welded joints except that immersion techniques may be used for some applications when approved by the Contracting Officer. The Contractor shall provide a standard reference block and working standards as described in paragraphs REFERENCE STANDARDS FOR EQUIPMENT, QUALIFICATIONS, AND CALIBRATION. The procedures to be used for personnel and equipment qualification, equipment calibration and inspection shall be submitted to the Contracting Officer for approval at least 30 days prior to their intended use. Approval by the Government will in no way affect the obligation of the Contractor to employ qualified personnel, equipment, and procedures, and to perform the inspection as specified. The procedure description shall include the following:

a. Couplant.

b. Search unit characteristics including angle, size, shape, nominal frequency, type designation.

c. Method and type of wave.

d. Equipment and accessories including manufacturer, model number, date of manufacture, last date of calibration and the manufacturer's electrical, physical and performance specifications.

e. Decibel (dB) compensation system for distance-amplitude correction.

1.2.3 Test Frequency: The test frequency for ferrous materials shall be as specified in AWS D1.1 section Inspection, subsection Ultrasonic Equipment, except for thicknesses below 1/2-inch, frequencies between 2.25 and 5 MHz may be used to obtain increased sensitivity. For materials that are difficult to penetrate, any frequency within the operating range of the

equipment may be used. The effective depth of penetration and sound beam divergency shall be demonstrated to the Contracting Officer.

1.2.4 Wave Types: The types of waves and the conditions under which they shall be used are specified below:

1.2.4.1 Shear waves shall be used unless conditions prohibit their use. A longitudinal wave procedure may be used instead, if approved by the Contracting Officer. Refracted waves between 40 degrees and 70 degrees shall be used except where different angles are indicated in approved procedures, such as for materials less than 1/2-inch thick, for materials with sound velocities greater than in steel, when the weldments are not readily accessible, or when existing backing rings or backing strips are not removed. For inspection of weldments containing backing rings or backing strips, the instrument shall be adjusted and the refracted angles shall be selected in a way to separate the weldment and the backing ring reflections. The search unit angle and the resulting shear wave angle in the material to be inspected shall be established by the Contractor for each application and this information shall be included in the procedure submitted for approval.

1.2.4.2 Longitudinal waves may be used when conditions prohibit the use of shear waves. The procedure shall be specially developed to suit the application and shall have the prior approval of the Contracting Officer.

1.2.5 Changes in Procedure: Should application of an approved procedure not provide for good resolution or adequate ultrasonic penetration in the items to be inspected (see paragraph EQUIPMENT QUALIFICATION REQUIREMENTS), changes in procedure or equipment such as frequency, pulse repetition rate, angle of search unit, couplant, or oscilloscope shall be made by the Contractor. Adequacy of the new procedure shall be demonstrated to the Contracting Officer. The Government reserves the right to require a change in test equipment during these tests if any of the following test system characteristics fall below the levels listed in paragraph EQUIPMENT QUALIFICATION REQUIREMENTS: sensitivity, amplitude and distance linearity, signal-to-noise ratio, entry and back surface resolution and penetration.

1.3 SUBMITTALS

The following shall be submitted in accordance with SECTION 01300 - SUBMITTALS:

SD-39, Qualifications of Inspectors

Provide names of persons to perform ultrasonic inspection of weldments along with certification that each person meets the minimum qualifications specified under paragraph 2.1.

SD-62, Work Plan

Provide detailed procedures to be employee for the ultrasonic inspection of weldments required by the contract documents.

SD-91, Records of Identification and Inspection of Weldments

Identify all welds requiring ultrasonic inspection in accordance with the requirements of "Non-Destructive Welding Notes" in structural document S1 series. Provide appropriate record of all ultrasonic inspections performed indicating acceptance/non-acceptance. Provide appropriate record of repair for all unacceptable areas. Reports and records shall conform to the requirements of paragraph 3.5 REPORTS AND RECORDS.

PART 2 - PRODUCTS

2.1 PERSONNEL CLASSIFICATION AND REQUIREMENTS

2.1.1 Personnel Classification: The three levels of responsibility associated with ultrasonic inspection are defined in MIL-STD-410 as follows:

2.1.1.1 Level I - Special ultrasonic operator for inspecting specific products.

2.1.1.2 Level II - Ultrasonic inspector.

2.1.1.3 Level III - Ultrasonic supervisor.

2.1.2 Personnel Qualification: For qualification to perform ultrasonic inspection, personnel shall show evidence of having satisfactorily worked in accordance with MIL-STD-271, or shall be certified under NAVSHIPS 0900-006- 3010, or under ASNT SNT-TC-1A, Supplement C for ultrasonic inspection, within a period of 1 year before the date of contract. Other qualification or certification may be accepted at the Contracting Officer's discretion. Personnel with only an operator or inspector trainee certification will not be considered qualified to pass judgement on the acceptability of inspected items, but may work under the direct supervision of a qualified ultrasonic inspector. Qualified ultrasonic inspectors shall be able to judge the acceptability of the item in accordance with paragraph ACCEPTANCE/REJECTION LIMITS.

2.1.3 Personnel Certification: Personnel not qualified as noted in paragraph PERSONNEL CLASSIFICATION AND REQUIREMENTS may be certified by meeting the requirements of MIL-STD-410 for the particular level at which they are to operate in fulfilling the terms of the contract.

2.1.4 Examinations: If the Contracting Officer doubts an individual's ability as an operator, inspector, or supervisor, the individual shall be recertified in accordance with MIL-STD-410. At the option of the Government, the Contracting Officer may participate in administering the examination and in evaluating of the results.

2.2 REFERENCE STANDARDS FOR EQUIPMENT, QUALIFICATIONS, AND CALIBRATION

Reference standards shall be used to calibrate the inspection equipment, test its operating conditions and record the sensitivity or response of the equipment during the inspection in accordance with paragraph EQUIPMENT QUALIFICATION REQUIREMENTS. The

standards shall comprise a standard reference block and reference specimens as noted below.

2.2.1 Standard Reference Block: The standard reference block or primary standard shall be provided by the Contractor and shall consist of the IIW block in AWS D1.1, section Inspection, subsection Reference Standards. The standard reference block also shall be used in any reinspection on the same basis as the original inspection, even though the reinspection is to be performed by other ultrasonic instruments and accessories.

2.2.2 Working Standards: The Contractor may use other recognized working standards detailed with the IIW block in AWS D1.1 such as the Sensitivity Calibration (SC) block. However, such blocks must be referenced to the IIW block as noted in paragraph SENSITIVITY CALIBRATION OF LONGITUDINAL AND ANGLE WAVE SYSTEMS. Details of their use must be included in the procedure description submitted to the Contracting Officer. These blocks are the secondary standards. They shall be of acoustically similar material to the welds to be inspected. The secondary standards shall be suited for the applicable tests specified in paragraph EQUIPMENT QUALIFICATION REQUIREMENTS and shall be used as follows, except where the IIW block is specifically required:

a. To assure adequate penetration of the base material.

b. To provide a secondary field standard.

c. To calibrate the equipment and establish the standard reference level.

2.2.3 Resolution Test Block: The Contractor shall furnish a resolution test block in accordance with the details shown in AWS D1.1 section Inspection, subsection Ultrasonic Equipment.

2.3 EQUIPMENT QUALIFICATION REQUIREMENTS

The ultrasonic instrument and accessories shall be evaluated on their arrival at the shop and/or jobsite just before the start of inspection. They shall be evaluated using the Contractor's furnished primary standard and shall meet or exceed the requirements listed in paragraph EQUIPMENT QUALIFICATION REQUIREMENTS. Equipment that does not meet these requirements shall not be used in the inspection.

2.3.1 Requalifications: The equipment shall be requalified after normal use at intervals not to exceed 40 hours except as noted. The equipment also shall be requalified immediately after maintenance or repair or when the Contracting Officer considers its operation questionable.

2.3.2 Longitudinal Wave System:

2.3.2.1 Vertical Amplitude Linearity: Two adjacent reflections of different amplitudes obtained through the thickness of the primary or secondary standard shall vary in the same proportion as the amplitude of the first reflection is increased in descrete 2-dB increments between 20 percent and 80 percent to full screen height. For each gain setting, the amplitude

of each reflection shall vary by the same factor within plus or minus 5 percent. Requalification is required monthly or as otherwise stated in paragraph EQUIPMENT QUALIFICATION REQUIREMENTS.

2.3.2.2 Horizontal Linearity: The first three multiple reflections obtained through the thickness of the primary or secondary standard shall be equally spaced within plus or minus 5 percent when spread over 90 percent of the sweep length. Requalification is required monthly or as otherwise stated in paragraph EQUIPMENT QUALIFICATION REQUIREMENTS.

2.3.2.3 Near-Surface Resolution: Excessive ringing that appears on the CRT to the right of the sound entry point is not to exceed a 1/2-inch equivalent distance in steel with the search unit placed on the 4-inch edge of the IIW (primary) block and positioned for maximum amplitude reflection from the .06- inch reference hole of the primary standard. The reference reflector shall be set to mid-screen and the gain shall be increased 20 dB. The reference hole located at least 1/2-inch from one edge of the AW DSC or SC secondary standard shall be used similarly. Acceptability shall be on the same basis as in the primary standard.

2.3.2.4 Far-Surface Resolution: This property of the equipment will be verified by the method detailed in AWS D1.1 section Inspection, subsection Calibration of the Ultrasonic Unit with the IIW or Other Approved Calibration Blocks. In addition, the trailing edge of the third reflection shall return to the sweep line and be clearly discernible.

2.3.3 Angle Wave System:

2.3.3.1 Vertical (Amplitude) Linearity: Two adjacent multiple reflections from the .06-inch reference hole in the primary standard shall vary in the same proportion as the amplitude of the first reflection in discrete 2-dB increments between 20 percent and 80 percent of full screen height. For each gain setting, the amplitude of each adjacent reflection shall vary within plus or minus 5 percent. For testing with the AWS SC or DSC secondary standard, the same criteria shall apply. For the SC block, the transducer shall be placed on the longitudinal surface contiguous with the sound entry point lines whereas the 4-inch longitudinal surface of the DSC block shall be used for the same purpose. Requalification is required monthly or as otherwise stated in paragraph EQUIPMENT QUALIFICATION REQUIREMENTS.

2.3.3.2 Horizontal Linearity: The first three multiple echoes obtained from the .06-inch reference hole of the primary standard or from the reference hole in a secondary standard with the transducer positioned at a minimum of 1-inch sound path distance shall be equally spaced plus or minus 5 percent when spread over 90 percent of the sweep length. The gain shall be adjusted to give a mid-screen height first reflection. Requalification is required monthly or as otherwise stated in paragraph EQUIPMENT QUALIFICATION REQUIREMENTS.

2.3.3.3 Near-Surface Resolution: The search unit shall be positioned for maximum amplitude using the primary or secondary standard as in the horizontal linearity test. The gain shall be adjusted to give a mid-screen height first reflection and then shall be increased 20

dB. Excessive ringing that appears on the CRT to the right of the sound entry point is not to exceed 1/2-inch equivalent distance in steel.

2.3.3.4 Far-Surface Resolution: The equipment shall delineate the three resolution holes in the resolution block appropriate for the angle of the transducer to be used in the inspection.

2.3.3.5 Signal-to-Noise Ratio: With the search unit located as in the horizontal linearity test, the gain shall be set to obtain an 80 percent full screen height first reflection. The reference reflection-to-noise-amplitude ratio shall not be less than 10 to 1.

2.3.3.6 Exit Point: The search unit shall be placed on the graduated scale on the 12-inch edge of the primary standard and the ultrasound shall be beamed toward the curved edge of the block. The gain shall be set for a mid-screen first reflection. The search unit shall be moved back and forth until the first reflection is maximized. The index line on the side of the search unit shall be within 1/16-inch of the mid-point of the graduated scale in either direction. Requalification is required after 40 hours or as otherwise stated in paragraph EQUIPMENT QUALIFICATION REQUIREMENTS.

2.3.3.7 Transducer Angle: The established exit point of the probe shall be set over the applicable angle index line scribed on the 8-inch or 12-inch edge, as appropriate, of the primary standard. The gain shall be set to obtain a mid-screen first reflection from the 50 mm plexiglass-lined hole for search units up to 70 percent with the search unit placed on the 8-inch edge. Search units of large angles that have been approved specifically by the Contracting Officer shall be tested from the 12-inch edge using the .06-inch reference hole. The search unit shall be moved back and forth to maximize the first reflection. When the material to be inspected is not acoustically similar to the primary standard, the inspection angle shall be within plus or minus 2 degrees of the angle specified in the approved procedure. Requalification is required after 40 hours or as otherwise stated in paragraph EQUIPMENT QUALIFICATION REQUIREMENTS.

2.4 SENSITIVITY CALIBRATION OF LONGITUDINAL AND ANGLE WAVE SYSTEMS

Sensitivity calibration shall be done immediately after a change of operators and at least every 30 minutes thereafter as testing proceeds. Recalibration shall also be required after any power interruption, including a change of source, when the equipment is suspected of being in error, or after relocation of the jobsite. The 30-minute and relocation calibrations may coincide. Before calibration, the instrument shall be allowed to warm up before calibration is attempted. The instrument range and delay controls shall be adjusted to display signals from the reference hole in the primary (IIW block) or secondary standard (DSC or SC block or both) on the viewing screen for the range of distances to be inspected.

2.4.1 Calibration Procedure: The test instrument shall be calibrated as described below.

2.4.1.1 Longitudinal Wave System: In calibrating with the primary standard, the transducer shall be positioned on the 4-inch edge for maximum reflection from the .06-inch reference hole. The gain shall be adjusted so that the first reflection is at 50 percent full scale. The top of that indication shall be marked on the CRT with a wax pencil or by other means. This establishes the standard reference level. A point at 80 percent of the standard reference

level shall be calculated and marked. This locates the reject/repair line. If a secondary standard is to be used in the inspection, the reject/repair line will be established similarly. For the DSC block, the transducer shall be positioned on the 4-inch long surface and with the SC degrees sound entry point lines. Adjustment for loss of signal due to distance shall be compensated for as noted in paragraph SENSITIVITY CALIBRATION OF LONGITUDINAL AND ANGLE WAVE SYSTEMS.

2.4.1.2 Angle Wave System: In calibrating with either the primary or secondary standard, the transducer shall be positioned on the same surfaces as in the case of the longitudinal wave system but over the sound entry point lines appropriate for the angle of the transducer to be used in the inspection. The gain shall be adjusted to give a first reflection that is 50 percent of full-scale response. The top of that indication shall be marked with a wax pencil or by other means. This establishes the standard reference level. A point at 80 percent of the standard reference level shall be calculated and marked. This locates the reject/repair line. Loss of signal shall be compensated as noted in paragraph SENSITIVITY CALIBRATION OF LONGITUDINAL AND ANGLE WAVE SYSTEM.

2.4.2 Calibration of the Secondary Standards: After adjusting the first reflection from the reference hole in the secondary standard to 50 percent full-scale response for a sheer or longitudinal wave inspection, a maximized reflection from the .06-inch reference hole in the primary standard shall be obtained without changing the gain setting. Then this gain setting shall be readjusted to obtain a 50 percent full-scale reflection and the readjusted setting shall be recorded as required by paragraph REPORTS AND RECORDS to provide a basis for recalibration when the secondary standard is unavailable.

2.4.3 Equipment With a Calibrated Gain Control (Attenuator): When a calibrated gain control attenuator is used, the transducer shall be positioned for a maximum reflection from the reference hole in the secondary standard representing approximately 1/2 the longest inspection distance. This reflection shall be adjusted to mid-scale by varying the gain control accordingly. The difference in decibels between this amplitude and the signal obtained from the first, second, and longest distance reflection obtainable on the secondary standard shall be measured. The differences shall be recorded and plotted on a curve to determine the necessary correction to the amplitude at the various inspection distances. A level (80 percent of the primary level) obtained from the corrected signal heights is equivalent to the reject/repair line.

2.4.4 Equipment With Electronic Distance Compensation Circuitry: If the difference in amplitude between the first reflection and the reflection obtained from the maximum inspection distance is 1 dB or less, the instrument may be used as is. If not, the procedure used for equipment with a calibrated decibel control must be used to determine the necessary correction to the reflections obtained at the various inspection distances. This characteristic of the equipment must be reexamined on a monthly basis or as otherwise stated in paragraph REQUALIFICATION, and correction factors must be modified accordingly.

2.4.5 Longitudinal Wave Distance-Amplitude Correction Curve: A distance- amplitude correction curve may be used instead of the calibrated gain control or the electronic circuitry for either the shear or longitudinal wave system as described below.

2.4.5.1 A shear wave distance-amplitude correction curve shall be constructed and drawn on the face of the cathode ray tube (CRT) for inspection of weldments in excess of 1-1/2 inch thick when the design of the test equipment permits. The reference hole in the secondary standard [SC] [or DSC] shall be used to construct the distance-amplitude correction curve for a minimum of three node points, 1, 2, and 3. The sensitivity of the instrument shall be adjusted to produce 50 percent full-scale response for the maximized primary reflection and the reject/repair line shall be constructed at 80 percent of the established distance-amplitude curve.

2.4.5.2 A longitudinal wave distance-amplitude correction curve shall be constructed and drawn on the face of the CRT when longitudinal waves are to be used in the inspection for material thicknesses exceeding 1 inch, if design of the test equipment permits. The reference hole in the secondary standard shall be used. Instrument sensitivity shall be adjusted to 50 percent full- scale of the maximized response from the reference hole at 1/2-maximum inspection distance. A reject/repair line shall be constructed at 80 percent of the established distance-amplitude curve. The reflection amplitudes to define this curve shall be taken from the faces of the secondary sensitivity standards which are 1-inch, 2-inch and 1/2-maximum inspection distance, and the longest distance obtainable from the secondary standard, respectively, from the reference hole. When a correction curve cannot be drawn on the face of the CRT, one of the distance-amplitude correction methods noted above and submitted under the procedure description in accordance with paragraph GENERAL REQUIREMENTS shall be applied.

2.4.6 Longitudinal Wave Inspections Using Immersion Technique: The reference hole in a secondary standard shall be used for each different inspection distance. Repair/reject limits shall be established by immersing both the search unit and secondary standard in the liquid bath in which the inspection is to be conducted. The procedure noted below shall be used.

2.4.6.1 The longitudinal waves from the search unit shall be directed toward the face of the secondary standard closest to the reference hole.

2.4.6.2 The search unit shall be positioned for maximum response. The amplitude of reflection shall be adjusted to 50 percent full-scale. The top of that indication shall be marked on the CRT with a wax pencil or by other means. This establishes the standard reference level. A point at 80 percent of the standard reference level shall be calculated and marked. This locates the reject/repair point. The above shall be repeated for each different surface-to-hole distance to establish the reject/repair point. The above shall be repeated for each different surface-to-hole distance to establish the reject/repair line.

2.4.6.3 With the gain at the same setting and the primary standard and search unit in air, a maximized reflection shall be obtained from the .06-inch reference hole in the primary standard (IIW). Then, this gain setting shall be readjusted to obtain a 50 percent full-scale reflection. The readjusted setting shall be recorded as required by paragraph REPORTS AND RECORDS to provide a basis for recalibration when the secondary standard is unavailable.

PART 3 - EXECUTION

3.1 PREPARATION OF MATERIALS FOR INSPECTION

Surfaces shall be free from the following:

3.1.1 Weld Spatter: Spattering or any roughness that interferes with free movement of the search unit or impairs transmission of the ultrasonic vibrations.

3.1.2 Irregularities: Those which could mask or be confused with defect indications.

3.1.3 Weld Backing Strips: Strips that are not to remain in place shall be removed and all sharp edges and valleys shall be eliminated by grinding or other mechanical means.

3.1.4 Dirt: All loose scale, rust, paint, and dirt shall be removed from the coupling surface.

3.2 INSPECTION PROCEDURE

When possible, all welds shall be examined from both sides of the weld and from one surface. If complete inspection cannot be accomplished from one surface, inspection shall be made from another surface that is part of the same joint. Preliminary scanning techniques using an increased instrument gain shall be used to locate possible defects. When possible, gain shall be increased to a minimum of twice (6 dB) the reference level setting. Final acceptance or rejection shall be evaluated with the equipment properly calibrated and the gain control set at the reference level. The reject/repair line shall be used to evaluate quality of the weld. If a periodic calibration check shows that the equipment is not operating properly or that the system's sensitivity has decreased more than 20 percent (2 dB) from the established sensitivity level, all welds inspected since the prior calibration shall be reexamined. If penetration of the shear waves is questionable, the angle search unit shall be placed in position on one side of the weldment with the waves directed through the weldment. A disconnected angle search unit, plastic or metal wedge or disk, or any good reflector shall be placed in the wave path of the search unit on the far side of the weld to reflect the sound. When good reflections cannot be obtained by either shear or longitudinal waves, the Contractor shall modify the procedures in accordance with paragraph GENERAL REQUIREMENTS.

3.2.1 Couplants: The choice of couplant is optional with the Contractor except as follows:

3.2.1.1 The couplant shall be the same as that used for equipment qualification and calibration.

3.2.1.2 Couplants that may corrode the reference standards and material being tested or leave objectionable residues shall not be used.

3.2.1.3 Couplants shall be of the proper viscosity to give good coupling for the surface roughness.

3.2.2 Shear Wave Inspection: Shear wave inspection shall be performed as follows:

3.2.2.1 The search unit shall be placed on the contact surface at a distance from the weld equal to that used when calibrating the equipment.

3.2.2.2 To detect longitudinal flaws, the search unit shall be slowly moved toward and away from the weld far enough to cover its entire cross section, approximately 90 degrees to the weld centerline. The search unit shall be radially oscillated to the left and right, covering an angle of approximately 30 degrees. During the foregoing movement, the search unit shall be continually advanced parallel to the weld centerline. The rate of movement shall depend on the operator's ability to clearly see and identify all reflections. The amount of movement shall be calculated to insure that the inspection distance will be great enough to traverse the weld. [For plate thicknesses 2 inches and greater with an unmachined stainless steel overlay covering the welded joint, the inspection distance shall range from a minimum of one thickness (T) or the first node back from the near fusion line to a distance exceeding T plus 2/3, the maximum width of the weld deposit at the surface. The inspection shall be repeated from the other side of the weld on the same surface if accessible or if not, from another surface that is part of the same joint as indicated above. The surface of the weld metal in the joint shall be ground smooth and blended with the base metal.

3.2.2.3 To detect transverse flaws when the welded surface is ground flush, the search unit shall be moved along the weld surface in each direction parallel to the centerline of the weld metal with the wave radiating parallel to the weld centerline. To detect transverse flaws when the welded surface is not ground flush, the search unit shall be moved parallel to the weld in each direction, on the adjacent base metal at the top of the weld, with the wave directed at an angle of 30 degrees to the weld centerline.
3.2.3 Longitudinal Wave Inspection: This inspection shall be made as follows:

3.2.3.1 The search unit shall be placed on the contact surface with the wave directed in a straight line through any intervening base metal and through the weldment.

3.2.3.2 The search unit shall then be moved slowly in a direction parallel to the weld centerline and zigzagged across an area equivalent to the welded thickness to make sure that waves penetrate the entire welded cross section.

3.2.3.3 The rate of movement shall be dependent on the operator's ability to clearly see and identify all reflections.

3.3 GENERAL ACCEPTANCE/REJECTION REQUIREMENTS

Discontinuities shall be evaluated only when the ultrasonic equipment is calibrated properly. If discontinuities are detected, the sound beam shall be directed to maximize the signal amplitude. To determine the length of a discontinuity, the search unit shall be moved parallel to the discontinuity axis in both directions from the position of maximum signal amplitude. One- half the amplitude or a 6-dB increase in sensitivity from a point at which the discontinuity signal drops rapidly to the baseline shall be defined as the extremity of the discontinuity. At this point, the scanning surface shall be marked at the position indicated by the center of the transducer. This shall be repeated to determine the other extremity. The length of the discontinuity shall be defined as the distance between these two marks. For discontinuities with signal amplitudes exceeding full screen height, 50 percent of full screen shall be

considered half-peak amplitude. At this point, the scanning surface shall be marked at the position indicated by the center of the transducer. This shall be repeated to determine the other extremity. The length of the discontinuity shall be defined as the distance between these two marks. The maximum signal amplitude, length, depth, and position within the inspection zone shall be determined and reported as indicated in paragraph REPORTS AND RECORDS for discontinuities yielding a signal amplitude equal to or exceeding the reject/repair line. The minimum recordable length of a discontinuity shall be 1/8-inch. When evaluating welds joining two members with different thicknesses at the weld, the thickness T shall be the lesser of the two thicknesses. The criteria for acceptance or rejection based on ultrasonic inspection will supplement a visual inspection. The sizes and surface conditions of the welds shall conform to the requirements indicated on the applicable plans and drawings and other sections of the specification.

3.3.1 Inspection of Repairs: All repairs shall undergo the same inspection procedure that originally revealed the discontinuities. Before acceptance, the welds shall meet the standards required for the original weld.

3.4 ACCEPTANCE/REJECTION LIMITS

Welds shall be accepted or rejected by ultrasonic indication in accordance with the following:

3.4.1 Partial or full Penetration Butt Welds and/or Groove Welds:

3.4.1.1 Class III: Welds shall be rejected on the basis of the following:

3.4.1.1.1 Any discontinuity with a reflection exceeding the established reject/repair line and with a length exceeding 1/2-inch. Adjacent discontinuities separated by sound metal with a dimension less than twice the length of the longest discontinuity shall be considered a single discontinuity.

3.4.1.1.2 Any discontinuity with a reflection equal to or exceeding 50 percent of the reject/repair line or with the level 8 dB more than the reject/repair line or with the level 8 dB more than the reject/repair line and with a length (L) exceeding 2 inches or LT, whichever is greater.

3.4.1.1.3 If the total cumulative length of discontinuities in any 12 inches of weld length exceeds 3 inches or 2 T, whichever is greater, that weld length shall be rejected.

3.5 REPORTS AND RECORDS

Reports containing the following information shall be submitted to the Contracting Officer:

3.5.1 Identification and Location of Inspected Item: Name and place of the inspected item, the person performing the inspection, and the date of inspection.

3.5.2 Detail of Inspections: Details of methods, types of waves used, search units, frequencies, inspection equipment identification, and calibration data with enough information to permit duplication of the inspection at a later date.

3.5.3 Response in Calibration: The response from the DSC or SC block used in calibration and for acceptance/rejection in terms of the response from the .06-inch reference hole in the standard IIW block (primary standard).

3.5.4 Identification of Unacceptable Areas: Locations, dimensions, types, and area of unacceptable defects and discontinuities giving reflections over 50 percent of the reject/repair line. These may be noted on a sketch or marked-up drawing.

3.5.5 Record of Repair Areas: A record of repaired areas shall be furnished as well as test results for the repaired areas.

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SECTION 05120 - STRUCTURAL STEEL

PART 1 - GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extentreferenced. The publications are referred to in the text by basic designation only.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC) PUBLICATIONS:

AISC-01(Sep. 1, 1986, with Commentary) Code of Standard Practice for Steel Buildings and Bridges.

AISC-02(Jun. 1, 1989, with Commentary) Specification for the Design, Fabrication and Erection of Structural Steel for Buildings.

AISC-03(Nov. 13, 1985) Specification for Structural Joints Using ASTM A 325 or A 490 Bolts.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI):

ANSI B18.22.1(1965; R 1981) Plain Washers.

ANSI B46.1(1985) Surface Texture (Surface Roughness, Waviness and Lay).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) PUBLICATIONS:

ASTM A 6(1989) General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use.

ASTM A 36(1989) Structural Steel.

ASTM A 53(1989a) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

ASTM A 123(1989a) Zinc (Hot Galvanized) Coatings on Products.

ASTM A 153(1982; Revised 1987) Zinc Coating (Hot-Dip) on Iron and Steel.

ASTM A 307(1989) Carbon Steel Bolts and Studs, 60,000 psi, Tensile Strength.

ASTM A 325(1989) High-Strength Bolts for Structural Steel Joints.

ASTM A 490(1989) Heat Treated Steel Structural Bolts,
150 ksi Minimum Tensile Strength

ASTM A 500(1989) Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.

ASTM A 501(1989) Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.

ASTM A 108(1989) Steel Bars (Shear-Connectors and Headed Studs), Cold Finished, Standard Quality.
ASTM A 563(1989a) Carbon and Alloy Steel Nuts.

ASTM A 572(1988b) High-Strength Low-Alloy Columbium-Vanadium Steels of Structural Quality.

ASTM F 436(1989) Specification for Hardened Steel Washers.

ASTM F 959(1989a) Compressible-Washer-Type Direct Tension Indicators For Use with Structural Fasteners.

AMERICAN WELDING SOCIETY (AWS) PUBLICATION:

AWS A5.1(1981) Specification for Covered Carbon Steel Arc Welding Electrodes; DOD Adopted.

AWS A5.5(1981) Specification for Low Alloy Steel Covered Arc Welding Electrodes; DOD Adopted.

AWS D1.1(1988) Structural Welding Code - Steel.

FEDERAL SPECIFICATIONS (FS):

FS TT-P-86d(Rev. H) Paint, Red-Lead-Base, Ready-Mixed.

STEEL STRUCTURES PAINTING COUNCIL (SSPC):

SSPC-SP3(1982) Power Tool Cleaning

1.2 GENERAL REQUIREMENTS

The AISC-02 shall govern the work. Welding shall be in accordance with AWS D1.1. High-strength bolting shall be in accordance with the AISC-03. Paragraph 4.2.1 of AISC-01 is hereby modified by deletion of the following sentence: "This approval constitutes the Owner's acceptance of all responsibility for the design adequacy of any detail configuration of connections....".

1.3 SUBMITTALS

The following shall be submitted in accordance with SECTION 01300 - SUBMITTALS:

SD-10, Design Analysis and Calculations

All members and non-standard connections for any portion of the structure not shown on the Contract Drawings shall be designed by the Fabricator and the calculations shall be submitted with the Shop Drawings. Non-standard connections are those connections that require analysis and are not readily
selected from AISC Tables or other applicable publications. Examples are moment connections, connections with axial and/or horizontal shear loads, and connections with "X" bracing. Calculations shall be sealed by a professional engineer, registered in the state of Texas.

SD-31, Detail Drawings

Detail drawings shall include all shop and erection details. Members and connections for any portion of the structure not shown on the contract drawings shall be detailed by the fabricator and indicated on the detail
drawings. All welds shall be indicated by standard welding symbols of the AWS D1.1. Shear connector diagrams and arrangements shall be detailed by the fabricator and indicated on the detail drawings. Reproduction of the Contract Documents in any manner for use as detail drawings will not be allowed.

SD-62, Work Plan

Prior to erection, an erection plan of the structural steel framing is required. This erection plan shall conform to the requirements of the AISC-01. The erection plan shall describe all necessary temporary supports, including the sequence of installation and removal. Work plan shall include a section covering provisions to be taken to address steel erection safety and accident prevention provisions to be employed in the work. This work plan shall be submitted a minimum of 60 days prior to start of steel erection.

SD-70, Test Reports/Certificates

Certified copies of mill test reports for structural steel and other related structural steel items are required. Test certificates shall be furnished for bolts, nuts, washers, and direct tension indicators with each and every lot supplied. Certificates shall show tensile strength and hardness for bolts, hardness and proof load test for nuts, and hardness test for washers. For direct tension indicators, a minimum of eight tests per lot shipped to either fabricator or jobsite shall be performed by an independent commercial testing laboratory to demonstrate proper load measuring characteristics per ASTM F959. When directed by the Contracting Officer random chemical and physical tests shall be made on the bolts, nuts, washers, and direct tension indicators in accordance with ASTM procedures.

SD-76, Certificates of Compliance

Certification that each welder is qualified in accordance with AWS D1.1 shall be provided. Certification that shop primer paint meets or exceeds this specification shall be provided. The fabricator of the structural steel shall be currently certified under the AISC Quality Certification Program, Category II. A copy of the AISC Certification shall be submitted prior to fabrication.

SD-91, Records

Letters of record expressing Contractor and Contracting Officer communications and records of steel elevations prior to and after the completion of concreting operations.

1.4 STORAGE

Material shall be stored out of contact with the ground in such manner and location as will minimize deterioration.

1.5 RESPONSIBILITY FOR ERRORS

The Contractor shall be responsible for all errors of detailing, fabricating, and for the correct fitting of the structural members.

PART 2 - PRODUCTS

2.1 STRUCTURAL STEEL

2.1.1 Carbon Grade Steel: Carbon grade steel shall conform to ASTM A 36.

2.1.2 High-Strength Low-Alloy Steel: High-strength low-alloy steel shall conform to ASTM A 572, Grade 50.

2.2 STRUCTURAL TUBING

Structural tubing shall conform to ASTM A 500, Grade B.

2.3 STEEL PIPE

Steel pipe shall conform to ASTM A 501 or A53, Type E or S.

2.4 WELDING ELECTRODES

Welding electrodes shall conform to AWS A5.1 and AWS A5.5.

2.5 HIGH-STRENGTH BOLTS

High-strength bolts shall typically conform to ASTM A 325 Type 1 and shall be domestically manufactured. Use bearing type bolts at standard shear connections and friction type bolts at all slip critical connections indicated in the drawings. High-strength bolts conforming to ASTM A490 are acceptable at connections where their use will improve joint detailing.

2.6 CARBON STEEL BOLTS

Carbon steel bolts at base plate connections shall conform to ASTM A 307, Grade A.

2.7 CARBON STEEL NUTS

Carbon steel nuts shall conform to ASTM A 563, Grade A, Heavy Hex Style, and shall indicate manufacturer's mark and the relevant nut type symbol.

2.8 WASHERS

Washers shall conform to ASTM F 436 and shall indicate manufacturer's mark.

2.9 PAINT - (SHOP PRIMER)

Paint shall conform to FS TT-P-86d, Type I or II. Paint shall be tested and certified to produce no significant difference in strength of welds in accordance with allowable design loads from the American Welding Society's Structural Welding Code D1.1-88. Surface preparation shall conform to SSPC-SP3 power tool cleaning. The following product is referenced to establish quality and type. Products of other manufacturers may be submitted with supporting test data showing performance characteristics which meet or exceed the standards herein:

10-1009 Tnemec Primer (One Coat, Gray) (Solids by volume = 55+ 2%) (Dry film thickness = 2.5 - 3.5 mils)

2.10 DIRECT TENSION INDICATORS

Direct tension indicators shall meet the requirements of ASTM F959 and shall be domestically manufactured. Provide DTI's at all slip critical connections indicated in the drawings.

2.11 SHEAR CONNECTORS

Studs shall be of suitable design for arc welding to steel members with the use of automatically timed stud welding equipment. Type and size as indicated in the drawings, consisting of cold drawn bar stock conforming to the requirements of ASTM A 108 and AWS D1.1.

2.12 GALVANIZED BEAMS

Shall be in accordance with ASTM A123.

PART 3 - EXECUTION

3.1 FABRICATION

Fabrication shall be in accordance with the applicable provisions of the AISC-02. Fabrication and assembly shall be done in the shop to the greatest extent possible. Compression joints depending on contact bearing shall have a surface roughness not in excess of 500 micro inches as determined by ANSI B46.1, and ends shall be square within the tolerance for milled

ends specified in ASTM A6. Structural steelwork, except surfaces to be fireproofed, top flanges of beams to receive shear connectors, surfaces to be field welded, surfaces to receive metal deck welded attachment, and contact surfaces of friction-type high-strength bolted connections shall be prepared for painting and primed with the specified paint. All surfaces to be fireproofed shall receive surface preparation same as required for painted steelwork, whether required to be painted or not.

3.1.1 Fabrication Camber Recording: Measure and record the camber of all primary beams and girders in a manner which will allow that information to be compared to the as-erected condition of beams and girders. Attach this list of recorded cambers to the Shop Inspection Reports.

3.2 ERECTION

Erection of structural steel shall be in accordance with the applicable provisions of the AISC-02.

3.2.1 Base Plate Connections: Anchor bolts and other connections between the structural steel and foundations shall be provided and shall be properly located and built into connecting work. Use ASTM A307 bolts.

3.2.2 Base Plates and Connection Plates to Concrete: Column base plates for columns and connection plates for beams, girders, and similar members shall be provided. Base plates shall be provided with full bearing after the supported members have been plumbed and properly positioned, but prior to placing superimposed loads. Separate setting plates under column base plates will not be permitted. Tolerance on elevation of column base plates relative to design grade shall be 1/8 inch. The area under the plate shall be grouted solidly with non-shrink grout. Grout shall be as specified in SECTION 03300 - CONCRETE FOR BUILDING CONSTRUCTION.

3.2.3 Field Welded Connections: Field welded structural connections shall be completed before load is applied.

3.2.4 Beam to Beam and Beam to Column Connections: Standard shear connections shall utilize bearing-type bolts with threads allowed across the shear plane (Type N). Moment connections and torsional restraint connections shall be as indicated in the structural drawings.

3.2.5 Bearing-Type Bolt Tightening: Standard shear connections utilizing bearing-type bolts need only be tightened to the snug tight condition. This is the tightness that exists when all the plies in a joint are in firm contact, generally achieved by a few impacts of an impact wrench or the full effort of a man using an ordinary spud wrench.

3.2.6 Slip-Critical Connections: All connections specifically noted in the drawings as slip-critical shall utilize friction-type bolts (Type F) with Direct Tension Indicators. All bolts used in moment connections shall be considered as slip-critical fasteners and shall receive Direct Tension Indicators.

3.2.7 Shear Connector Welding: All areas to which studs are to be attached must be free of all foreign material, such as rust, oil, grease, paint, etc. When the mill scale is sufficiently thick to cause difficulty in obtaining proper welds, it must be removed by grinding or sandblasting. Ceramic ferrules used in stud welding process shall be completely removed from area where concrete is to be placed. Stud welding shall conform to the requirements of AWS D1.1.

3.2.8 Field Priming: After erection, the field bolt heads and nuts, field welds, other steel surfaces which do not receive fireproofing that have not been shop primed, and any abrasions in the shop coat shall be cleaned and primed with paint of the same quality as that used for the shop coat.

3.2.9 Fireproofing: After erection, apply fireproofing at required locations in accordance with SECTION 07265 - SPRAY APPLIED FIREPROOFING.

3.3 STRUCTURAL STEEL ELEVATIONS

At initial composite steel framing areas, (defined under paragraph 1.8.1 of SECTION 03300 - CONCRETE FOR BUILDING CONSTRUCTION), record top of steel elevations at each end and at midspan of members prior to and after the completion of concreting operations. Readings shall be taken from below the steel members. Locations of readings shall be marked in a manner which will allow subsequent elevations to be taken at the same points. These data shall be provided to the Floor Consultant and Contracting Officer for evaluation.

3.4 ERECTION TOLERANCES

Each individual member shall be erected, plumbed, leveled and aligned within the tolerance defined in Sec. 7.11 and Commentary of the AISC Code of Standard Practice, except as noted. The top surface of closure angles/plates at the building perimeter and at openings shall be within 1/4" of their proper location prior to commencement of concreting operations. Where this condition is not satisfied, 18 gage plate shall be attached to the angles/plates in manner sufficient to serve as a guide for strikeoff of the concrete floor surface. The top surface of steel beams and girders at connections to columns shall be within 3/8" of grade required by the contract documents prior to commencement of conreting operations. The Contractor shall record and submit this data to the Floor Consultant and Contracting Officer for evaluation prior to placement of concrete.

3.5 TEMPORARY BRACED FRAMES

3.5.1 Temporary braced frames shall be installed in Building B as indicated by detail S17.10/04. Fabricate and install bracing members in a manner that facilitates subsequent removal of these members.

3.5.2 Installation of temporary bracing shall proceed ahead of concrete floor placement. Temporary bracing shall not be interpreted as miscellaneous bracing (guy wires, etc...) that may be required to erect the structure.

3.5.3 Remove all temporary bracing members after temporary slab leave-out strips have been filled in with concrete and has achieved f'c = 3000 p.s.i. strength. Refer to SECTION 03300, paragraph 3.15 for information regarding temporary slab leave-out strips.

3.5.4 Temporary bracing members do not require application of cementitious fire proofing, or prime paint.

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STRUCTURAL STEEL GENERAL NOTES

Welding Notes

1. Welded construction shall conform to the American Welding Society "Structural Welding Code" - AWS D1.1, AWS D1.3 - Sheet Steel , and AWS D1.4 - Reinforcing Steel.

2. When welds are not called out on the drawings, they are minimum size continuous fillet welds in accordance with AWS D1.1. Fillet welds not specified as to length shall be continuous.

3. Unless noted otherwise on the drawings, all groove welds shall be full-penetration.

4. Only low-hydrogen electrodes shall be used on ASTM A572 Grade 50 and reinforcing steel.

5. Field welds shall receive touch-up galvanizing (or prime paint) to match finish of base material.

Non-destructive Welding Notes

1. All shop and field welds shall be visually inspected for size, length, and quality in accordance with AWS D1.1, section 8.15.1. Welds considered suspect shall be recorded and shall be further examined by ultrasonic testing. Welds not meeting acceptance criteria when examined by ultrasound shall be repaired.

2. 25% of all column splice groove welds shall be inspected at random, in the field, by ultrasonic testing in accordance with AWS D1.1, Section 8.15.3. For each connection that fails the UT inspection, an additional connection shall be inspected by UT.

3. Pre-production weld testing of shear connector studs shall conform to AWS D1.1, Section 7.7.

4. All shear connector studs shall be inspected in accordance with AWS D1.1.

5. All metal deck welds to supporting members shall be visually inspected for quality, location, and size to verify complete penetration through deck layers, good fusion to supporting members, and compliance with drawings. Welds shall be evaluated based on AWS D1.3, section 4.5. Welder qualifications and procedures shall meet AWS D1.3 requirements.

6. All field welded moment connections shall be inspected by ultrasonic testing in accordance with AWS D1.1, Section 8.15.3. All connections that fail the UT inspection shall be retested after corrections have been made.

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VITA

Erik Ivaan Moorhead was born in North East, Pennsylvania on November 13, 1961, the son of Douglas Patterson Moorhead and Marlene Boettcher Moorhead. After completeing his work at Harbor Creek High School, Harbor Creek, Pennsylvania, in 1979, he entered The Pennsylvania State University in University Park, Pennsylvania. He received the degrees of Bachelor of Science and Bachelor of Arts from the Pennsylvania State University in August, 1984. Until 1987 Mr. Moorhead was employed as an HVAC design engineer by Hellmuth, Obata and Kassabaum in St. Louis, Missouri. From 1987 through 1993 he was employed as a structural design engineer by the U.S. Army Corps of Engineers, Seattle District. In September, 1991, Mr. Moorhead entered the Graduate School at the University of Texas at Austin under the Corps of Engineers' Mission Related Graduate Studies Program. From 1993 through 1995 he was employed by the U.S. Army Corps of Engineers, Fort Worth District, as Chief Field Engineer for the construction of Brooke Army Medical Center, San Antonio, Texas. Mr. Moorhead is currently employed by the U.S. Army Corps of Engineers, Savannah District, as Chief Field Engineer for the construction of Womack Army Medical Center, Fort Bragg, North Carolina. Mr. Moorhead is a registered Civil Engineer in the State of Washington and an AWS Certified Welding Inspector.

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