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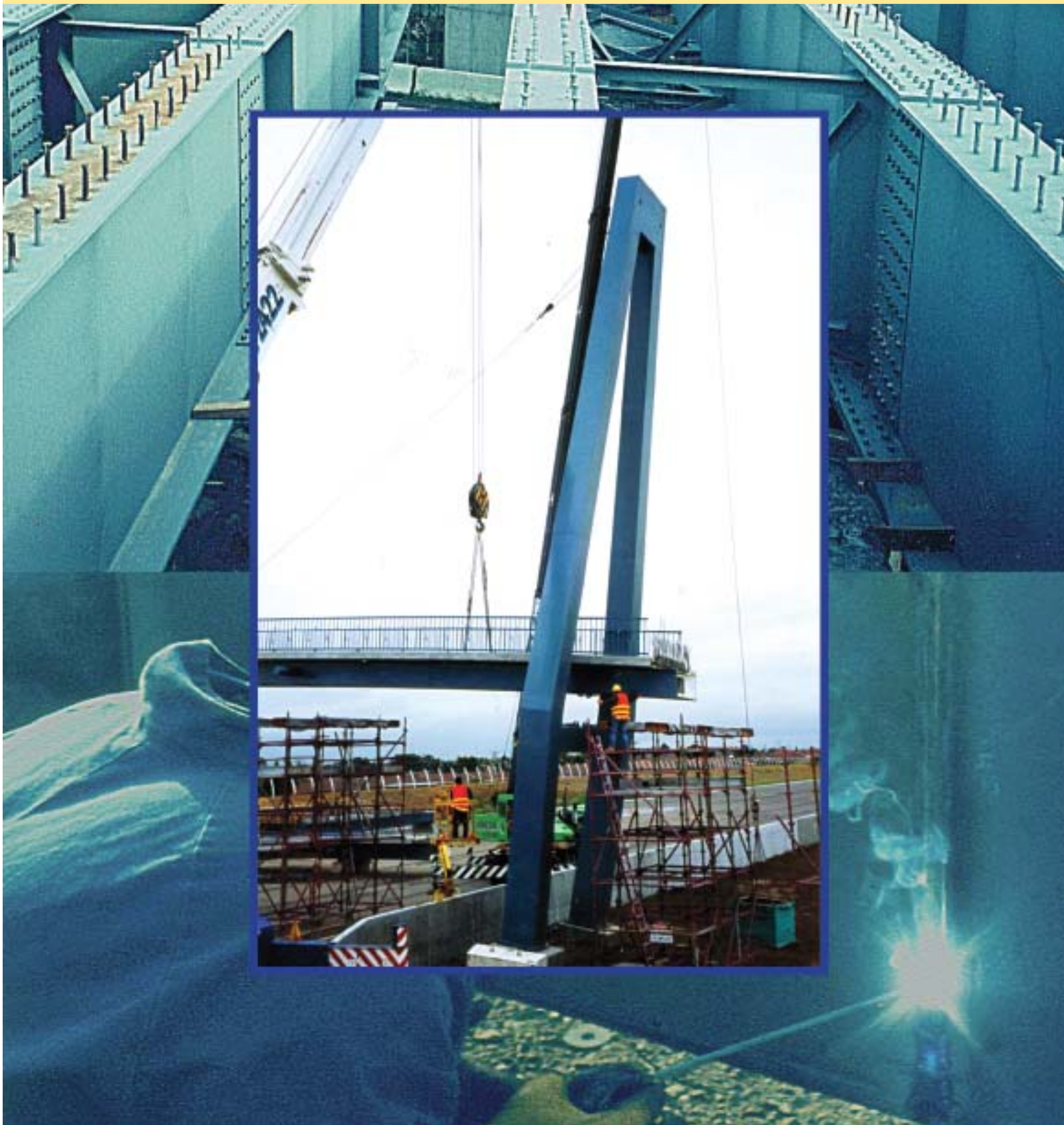
# Guide to Surveillance of Structural Steelwork

## Technical Bulletin No 46



# Guide to Surveillance of Structural Steelwork

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# Foreword

This Guide provides a methodology for quality surveillance of structural steelwork during fabrication and site work for VicRoads contracts and works. The main aims of the Guide are to ensure that:

- Surveillance is carried out in a uniform and consistent manner, following principles of quality management
- Observation records of workshop and on-site steelwork fabrication contain sufficient detail

## ABOUT VICROADS

VicRoads is the Victorian State Road Authority responsible for the management of the road network.

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## 1.1 Purpose

The purpose of this Guide is to:

- Set criteria for the qualification and accreditation of Structural Steelwork Surveillance Officers
- Provide guidance to Structural Steelwork Surveillance Officers in working with quality assurance contracts
- Promote consistency in the surveillance of quality assurance contracts
- Provide a training basis for Structural Steelwork Surveillance Officers

The Guide is intended for use in quality assessment of VicRoads construction and maintenance contracts, for structural steelwork.

## 1.2 Scope

This document puts in place a recommended system for the appointment and duties of a Structural Steelwork Surveillance Officer, and provides a set of checklist guides, to ensure quality standards, specifications and contract obligations are met.

This Guide does not cover every possible contingency and the information herein can be expanded both in scope and depth as the need arises. There will always be the need for the Structural Steelwork Surveillance Officer to apply judgement, and, when in doubt, seek further specialist advice.

## 1.3 Structural Steelwork

Structural steelwork activities at the fabrication shop and during onsite works include supply of materials, material handling, cutting, assembly, welding, holing, bolting and transport.

Welding is generally an integral part of structural steelwork. It is regarded by AS/NZS ISO 9001:2000[1] as a process which requires validation to ensure planned results are achieved. In Australia, AS/NZS 1554 Part 1[2] is the normal welding standard for structural steelwork. AS/NZS 1554 Part 1 requires a weld to be made from known materials by a qualified welder, using an approved procedure and consumables of specified grade and quality. An appropriate level of inspection and supervision of the welding must be performed. AS/NZS ISO 3834[3] describes the quality system elements which should provide the required level of quality for welded structural steelwork.

## 2.1 The Quality Assurance Environment

Quality assurance is applied to the structural steel works as a part of a management system to ensure that:

- Contractor/sub-contractor relationships are working
- Processes are being managed
- People have sufficient empowerment and responsibility to do their jobs
- Products meet the specified criteria, i.e., standards and specifications are achieved.

## 2.2 The VicRoads Framework for Quality Assurance Contracting

This Guide has been produced by VicRoads to complement the Austroads publications *Quality Assurance in Contracts*[4] and *Guide to Field Surveillance of Quality Assurance Contracts*[5]. The second publication is referred to within this Guide as the Austroads Guide.

The contents of this Guide specifically address Contractor surveillance activities associated with the implementation of that portion of the Quality Plan covering processes associated with fabrication and erection of structural steelwork. The Quality Plan covering structural steelwork processes is generally owned by the Structural Steelwork Sub-contractor and is reviewed by the Contractor.

***Figure 2.1 Welding, including automated procedures such as submerged arc welding, requires assurance that it has been carried out according to quality specifications.***

## 2.3 Aim of Surveillance of Structural Steelwork

The surveillance of structural steelwork determines, in a systematic manner, that the Contractor's and Structural Steel Sub-contractor's Quality Plans are implemented, that the Contract Specification requirements for the manufacture and erection of structural steelwork are complied with, and that the specified quality is achieved. Surveillance is carried out both on the fabrication and erection of new structural steelwork, and on maintenance or repair of existing structural steelwork.

Each process used in the fabrication of structural steelwork should be observed for verification that the detail of the process has been carried out in accordance with written instructions and that the specified requirements have been achieved.

The personnel who carry out surveillance require detailed knowledge of steel fabrication and erection procedures and must be trained to observe and seek appropriate evidence of compliance with procedures. In particular these personnel must be conversant with the following VicRoads Standard Specifications for Roadworks and Bridgeworks:

- Section 630 – *Fabrication of Steelwork*
- Section 670 – *Steel Bridge Barriers*
- Section 671 – *Concrete and Combined Concrete and Steel Bridge Barriers*

The Structural Steelwork Surveillance Officer is retained by, and acts on behalf of, the Contractor and generally carries out surveillance of sub-contracted, structural steelwork. In the event that the structural steelwork is not sub-contracted then the Structural Steelwork Surveillance Officer will be retained by the Structural Steelwork Sub-contractor, who in this instance is also the Contractor.

All structural steelwork surveillance shall be carried out by Structural Steelwork Surveillance Officers who are authorized signatories employed by organizations holding inspection accreditation with the National Association of Testing Authorities, Australia (NATA). Accreditation shall be to AS/NZS ISO/IEC 17020 – *General Criteria for the Operation of Various Types of Bodies Performing Inspection*[6], for surveillance of structural steelwork, in accordance with the accreditation criteria in this Guide.

The criteria for accreditation of Structural Steelwork Surveillance Officers and companies offering these surveillance services are provided in Appendix A.

Under VicRoads' specifications, the Superintendent reserves the right to undertake independent audit and surveillance activities, notwithstanding the fact that a Structural Steelwork Surveillance Officer may be deployed on the works.

## 3.1 The Role of VicRoads in Structural Steelwork

A VicRoads officer is normally appointed as the Superintendent of VicRoads awarded contracts. The Superintendent will arrange surveillance and audits to verify the effectiveness of the Contractor's Quality System and compliance with the management plans and procedures.

## 3.2 The Role of the Contractor

Contractors have the responsibility for the conduct of regular surveillance and audit of all on-site and off-site sub-contractors. Contractors are responsible for establishing, undertaking and continuing control and process checks to ensure the specified criteria for structural steelwork are met.

Where structural steelwork is carried out as a sub-contract, the Contractor shall conduct surveillance of the sub-contracted works utilizing the services of a Structural Steelwork Surveillance Officer. It is the responsibility of the Contractor to procure the services of a Structural Steelwork Surveillance Officer to undertake surveillance of sub-contracted steel fabrication works. A specific aspect of the Contractor's Quality Plan should cover the surveillance of sub-contracted structural steelwork. The Structural Steelwork Sub-contractor shall prepare a separate Quality Plan covering processes associated with the structural steelwork. It is essential that the Structural Steelwork Sub-contractor's Quality Plan is reviewed by the Contractor.

The Contractor must monitor the performance of the Sub-contractor by surveillance of structural steelwork to obtain assurance that the Sub-contractor complies with the quality system and meets the specified quality criteria.

## 3.3 The Role of the Structural Steelwork Surveillance Officer

The Structural Steelwork Surveillance Officer generally acts on behalf of the Contractor and carries out surveillance of sub-contracted, structural steelwork.

The Structural Steelwork Surveillance Officer verifies the implementation of the Structural Steelwork Sub-contractor's Quality Plan, the conduct of the fabrication process and verification of specified requirements for structural steelwork during the contract delivery process. The general role of surveillance officers in Contract Delivery is described in the Austroads Guide.

Where specifications nominate 'Hold Points' during the course of a contract, these can only be released by a Structural Steelwork Surveillance Officer.

## 4.1 General

In a construction process for structural steelwork, the activities undertaken by the Contractor and the Structural Steelwork Surveillance Officer involve the following:

- Preparation of Contractor's Quality Plan (Contractor activity)
- Review of the Structural Steelwork Sub-contractor's Quality Plan (Contractor activity)
- Pre-construction activities (Contractor & Surveillance Officer activity)
- Field surveillance activities (Surveillance Officer activity)

## 4.2 Quality Plans

Under AS/NZS ISO 9001:2000 *"The organization shall establish, document, implement and maintain a quality management system and continually improve its effectiveness in accordance with the requirements of this International Standard.*
*The organization shall:*

*(a) identify the processes needed for the quality management system and their application throughout the organization,*
*(b) determine the sequence and interaction of these processes,*
*(c) determine criteria and methods needed to ensure that both the operation and control of these processes are effective,*
*(d) ensure the availability of resources and information necessary to support the operation and monitoring of these processes,*
*(e) monitor measure and analyse these processes, and*
*(f) implement actions necessary to achieve planned results and continual improvement of these processes.*

*Where an organization chooses to outsource any process that affects product conformity with requirements, the organization shall ensure control over such processes. Control of such outsourced processes shall be identified within the quality management system.*

*The organization shall plan and carry out production and service provision under controlled conditions".*

To demonstrate compliance with AS/NZS ISO 9001:2000 both the Contractor and Structural Steelwork Sub-contractor normally prepare a Quality Plan for each job, which becomes the basis for surveillance and technical audit. The Quality Plan covering processes associated with structural steelwork fabrication is generally prepared and owned by the Structural Steelwork Sub-contractor and is reviewed by the Contractor.

For structural steelwork, the Quality Plan covering processes for each job shall:

- Be site or contract specific
- Describe the processes and reference the standards for structural steelwork that the Contractor will follow to achieve the agreed standard of work
- Specifically describe the areas of responsibility and accountability

of the Contractor's personnel
- Provide details of materials such as steel, bolts, welding consumables, etc and names of suppliers
- Provide details of manufacturing processes and procedures
- Provide details of any sub-contractors to be used and their responsibility in the process
- List the quality records to be kept which provide evidence of compliance
- Provide inspection and testing plans and checklists for materials and processes
- Provide for identification of non-conformances and methods to deal with them
- Contain or refer to other relevant documents such as the Contractor's Quality Manual and Operating Procedures Manual
- Provide certificates of material performance and outline process for traceability and identification.

When used during the fabrication process, the above documents collect information which demonstrate that the Quality Plan has been followed.

## 4.3 Surveillance Checklists

When surveillance of structural steelwork is conducted, surveillance checklists should be used to ensure all relevant items are covered. Appendix B contains checklists based on the system elements of AS/NZS ISO 3834, Part 3 Standard Quality Requirements. The checklists in Appendix B are considered a minimum standard and shall be supplemented to include items specific to the particular contract.

## 4.4 Surveillance Processes

The Structural Steelwork Surveillance Officer conducts surveillance of the Structural Steelwork Sub-contractor's processes by observing each process, at a frequency determined by the surveillance schedule. Verification shall be made that the details of the process have been carried out in accordance with the written instructions and that the specified requirements have been achieved. The use of checklists is recommended. Reporting of the results of surveillance should be made to the contract party that is one level above that which is being surveilled.

Pre-construction activities, field surveillance activities and reporting are described in Sections 5, 6 and 7 of this Guide, respectively.

## 5.1 Introduction

This section describes activities that the Structural Steelwork Surveillance Officer should carry out prior to commencement of fabrication of structural steelwork. These activities are covered generally in Section 6 of the Austroads Guide.

## 5.2 Contract Quality Plan

The Quality Plan will detail requirements for the activities to be carried out by the Structural Steelwork Surveillance Officer. These requirements will cover, for example, the conduct of communications between parties, a process for reporting and resolution of non-conformances, maintenance of diary records, etc.

| Steps | Actions |
|---|---|
| 1 | Review the contents of the project Contract Quality Plan to understand what is required |
| 2 | Identify and become familiar with all the requirements of the contract procedures that relate to the duties of a Structural Steelwork Surveillance Officer |

## 5.3 Surveillance Documentation and Reporting System

The Structural Steelwork Surveillance Officer shall use a secure system for reporting and storing information collected during the course of the surveillance. Each surveillance shall have a unique identification code.

| Steps | Actions |
|---|---|
| 1 | Establish an appropriate system for storing information and reports |

## 5.4 Contract Documentation (Quality Plan, Drawings, Specification)

The Structural Steelwork Surveillance Officer must have a thorough understanding of all relevant documentation applicable to structural steelwork. This documentation includes:

- Contractor's Quality Plan relating to structural steelwork
- Quality Plan from the Structural Steelwork Sub-contractor
- Drawings and specification for the structural steelwork
- Relevant standards and guidelines

| Steps | Actions |
|---|---|
| 1 | Obtain all documentation related to structural steelwork |
| 2 | Review documentation to obtain an understanding of technical and specification requirements |

## 5.5 Manufacturing Processes

The Structural Steelwork Surveillance Officer must be familiar with the processes related to steelwork fabrication and subsequent transport and onsite works, particularly for processes where the results or quality cannot be verified by subsequent inspection and testing of the product and where, for example, processing deficiencies may become apparent only after the product is in use. The sequence and interation of these processes shall also be determined. For structural steelwork, such processes include welding, cutting and the application of heat to steel.

| Steps | Actions |
|---|---|
| 1 | Identify any processes |
| 2 | Identify the particular requirements for assessment of the process, for example:<br>• Verifying the process in production or as a procedure test<br>• Sighting evidence provided by the structural steelwork contractor |

## 6.1 Introduction

This section describes the activities a Structural Steelwork Surveillance Officer may carry out during the fabrication and erection of structural steelwork. Some of these activities are covered generally in Section 7 of the Austroads Guide.

## 6.2 Surveillance Schedule

The Structural Steelwork Surveillance Officer shall develop a surveillance schedule for the approval of the Contractor. This schedule should be based on the risk of specific aspects of the process and requirements of the specification.

Surveillance frequency should be higher in the early stages of fabrication. An initial surveillance is required at the commencement of the contract to assess compliance with supervision, qualification of personnel and procedures, material supply and inspection requirements. As fabrication procedures are observed to be in place and delivering the required product quality, the frequency of surveillance could be reduced. However, both the frequency and duration of surveillance should be increased where non-conformances arise which are detrimental to product quality or the potential service life, or both of these aspects.

The Structural Steelwork Surveillance Officer attends the Structural Steelwork Sub-contractor's works or worksite in accordance with the surveillance schedule.

Surveillance near contract completion is required to assess compliance with inspection and testing, and resolution of non-conformances.

Surveillance is required to observe critical production activities, including weld joint preparations, welding, witnessing of weld test plates, checks of camber, non-destructive inspection, plate edge treatments, tensioning of bolts, erection of steelwork, site welding and use of re-work procedures.

| Steps | Actions |
|---|---|
| 1 | Conduct surveillance at intervals to cover contract start-up, completion and any intermediate stages |
| 2 | Witness specific activities as required by the schedule |

## 6.3 Surveillance Record

Surveillance carried out by the Structural Steelwork Surveillance Officer shall be recorded on check lists and Surveillance Record and Report Forms.

Other activities and important site events during the contract are to be recorded to provide an accurate account of events and resources, as observed during surveillance. Photographic and video methods may be used to record progress of the works and significant events or products.

| Steps | Actions |
|---|---|
| 1 | Maintain a record of each surveillance<br>• Completed after each surveillance<br>• Legible and understandable by others<br>• Relevant, comprehensive and unbiased |

## 6.4 Contract Review – Welding

At the initial surveillance, the Structural Steelwork Surveillance Officer should assess that the Structural Steelwork Sub-contractor has completed a contract review process. This review identifies specific requirements for the contract regarding:

- Application standards to be used
- Welding procedures required for the contract and if specific procedures require qualification and approval prior to use in production
- Method for obtaining welding procedure approval
- Welder qualification and welding supervisor qualification
- Inspection and testing procedures
- Selection, identification and traceability of materials
- Specification requirements, including contract specific clauses

| Steps | Actions |
|---|---|
| 1 | Assess the adequacy of the contract review for welding and fabrication, following the checklist of AS/NZS ISO 3834 Part 3 for Contract Review (Item 4.2) and Design Review (Item 4.3). See also items 2.4 and 2.5 of Appendix B to this Guide |

## 6.5 Sub-Contracting

In structural steelwork, some activities are supplied by sub-contractors to the Structural Steelwork Sub-contractor. The Structural Steelwork Surveillance Officer should assess that the Structural Steelwork Sub-contractor has evaluated and selected sub-contractors/suppliers on their ability to meet specified requirements, including quality.

| Steps | Actions |
|---|---|
| 1 | Review structural steelwork contractor's records of approval of sub-contractors and suppliers |
| 2 | Participate in surveillance of activities of sub-contractors and suppliers |

## 6.6 Welding, Inspection and Testing Personnel – Qualifications and Competencies

All personnel involved in welding, inspection and testing require qualification in their field. The Structural Steelwork Surveillance Officer shall assess that qualification of the following personnel meet the specification requirements:

- Welders
- Welding supervisors
- Welding inspectors
- Non-destructive inspection personnel
- Mechanical testing companies

| Steps | Actions |
|---|---|
| 1 | Review structural steelwork contractor's records of welding personnel qualifications |
| 2 | Assess whether qualifications meet specification requirements |
| 3 | Review qualification and accreditation of testying and inspection personnel, including sub-contracted services |

***Figure 6.1 A surveillance officer must ascertain specified testing is carried out, such as this ultrasonic inspection of a butt weld***

## 6.7 Materials and Welding Consumables

The Structural Steelwork Sub-contractor has responsibility to ensure that steelwork is supplied in accordance with the specification.

Traceability of materials (such as steel plates, sections and bolts) and consumables (such as welding electrodes, flux and gas) is often lost after the materials are incorporated into the structure or the welds. Traceability is the responsibility of the Structural Steelwork Sub-contractor, who must demonstrate that materials and consumables of the specified grade and quality have been acquired for, assigned to and used in the works.

| Steps | Actions |
|---|---|
| 1 | Verify that the Structural Steelwork Sub-contractor has determined/assessed that the material supplied for the works complies with the requirements |
| 2 | Examine certification and test records for the supply of steel, bolting hardware and welding consumables and verify traceability of materials supplied for the works |
| 3 | Verify that certifications meet specification requirements for test values and testing accreditation |
| 4 | Verify that the acquired material has been assigned to and used in the works |
| 5 | Assess any drawings or documents relating to location of particular materials (eg., high strength steel, cables, bolts) within the structure |

## 6.8 Welding Activities

The Structural Steelwork Surveillance Officer verifies that appropriate technical procedures are in place prior to the commencement of work; that these procedures are followed and that the appropriate level of inspection has been carried.

| Steps | Actions |
|---|---|
| 1 | Verify welding procedure documentation for each joint type, including level of approval of the procedure |
| 2 | Witness any welding of weld test plates where required |
| 3 | Verify production welding conforms to approved procedure |
| 4 | Verify appropriately qualified operators perform all welding |
| 5 | Verify that the appropriate checks for edge preparation, alignment of joined plates, and preheating have been done |
| 6 | Verify that tack welding is done to a qualified procedure |
| 7 | Verify the correct use of hydrogen controlled electrodes, run-on/off tabs, ground or earth clamps, use of vertical up welding, when appropriate |
| 8 | Observe occurrence of repair grinding, weld spatter, stray arc strikes and other damage |
| 9 | Verify inspection of welding activities |

## 6.9 Cutting and Edge Treatment Activities

Cutting of steel can influence the quality of the finished structure, particularly at edges that are not fully fused in welding.

| Steps | Actions |
|---|---|
| 1 | Verify cutting procedure documentation for each plate thickness |
| 2 | When steel is supplied cut to size by sub-contract steel supplier, verify dimensional check certification |
| 3 | Observe cutting operations to verify that procedures are followed, that any edge defects are repaired to a procedure, and that workshop practice produces components that are not warped, twisted or out of shape |
| 4 | Verify that inappropriate cutting techniques, as excluded by the specification, are not used such as hand-held flame cutting and shearing and cropping of plates thicker than 12 mm |
| 5 | Verify that requirements for re-entrant corners and arris edges are achieved |
| 6 | Verify inspection of cutting and edge treatment |

*Figure 6.2 As part of surveillance, procedures such as balanced flame cutting of flange plates to avoid distortion, should be observed.*

## 6.10 Assembly Activities

A variety of activities may be used in the assembly of structural steelwork. These depend on the detail design of each structure and any sub-assemblies.

| Steps | Actions |
|---|---|
| 1 | Verify cambering of members and review checks of camber measurement |
| 2 | Verify the use of match drilling of bolted splices |
| 3 | Verify measurements and examine records of dimensional and location checks for compliance with drawings |
| 4 | Verify tensioning of bolts |
| 5 | Verify the use of jigs, level beds, restraining systems and lifting techniques |
| 6 | Verify that inappropriate holing techniques, as excluded by the specification, are not used, such as punching of certain plate thicknesses and hand-held flame cutting |
| 7 | Verify inspection records of assembly activities |

***Figure 6.3 The Surveillance Officer must verify that the camber is within specifications and tolerances.***

## 6.11 Erection Activities

Erection of structural steelwork on-site may be carried out by a sub-contractor with specialised equipment or methods. Erection is often carried out under conditions involving time restrictions, adverse weather, poor visibility during night work and traffic management.

| Steps | Actions |
|---|---|
| 1 | Verify that lifting equipment and the attachment points for lifting comply with the requirements of the lifting procedure approved by the structural designer |
| 2 | Verify that lifting operations do not cause damage to the steelwork or the protective coating |
| 3 | Verify on-site welding procedure documentation |
| 4 | Verify that site welding complies with procedures |
| 5 | Verify erection sequence procedures and that they are complied with, particularly any bolt tensioning sequence |
| 6 | Verify inspection records for erection activities |

## 6.12 Inspection Activities

The Structural Steelwork Sub-contractor is required to perform the necessary level of inspections to provide assurance that steelwork of the specified quality will be supplied. The Structural Steelwork Surveillance Officer verifies that these inspections have occurred during the works and that they have been performed by competent personnel. Inspection records should be available for welding, cutting, edge treatment, assembly and erection activities.

| Steps | Actions |
|---|---|
| 1 | Verify that the inspection results comply with requirements and the required frequencies have been achieved |
| 2 | Verify that any repair work has been re-inspected |
| 3 | Verify visual scanning, visual inspection, and non-destructive testing |
| 4 | Verify that inspection work has been performed by appropriately accredited or qualified personnel |

## 6.13 Non-Conformance

The Structural Steelwork Sub-contractor shall raise non-conformance reports when work is not in accordance with the specification or drawings.

If the Structural Steelwork Surveillance Officer discovers a non-conformance, this shall be raised as a non-conformance with the Contractor. The Contractor will then deal with the issue in accordance with the contract.

| Steps | Actions |
|---|---|
| 1 | Raise any non-conformance with the Contractor, to allow the issue to be dealt with in accordance with the Contractor's quality |
| 2 | When required, comment on the practicality of the disposition and actions to prevent recurrence |
| 3 | Conduct surveillance to verify that the agreed disposition has occurred prior to close-out of the Non-Conformance Report |
| 4 | Complete the required record and documentation |

***Figure 6.4***

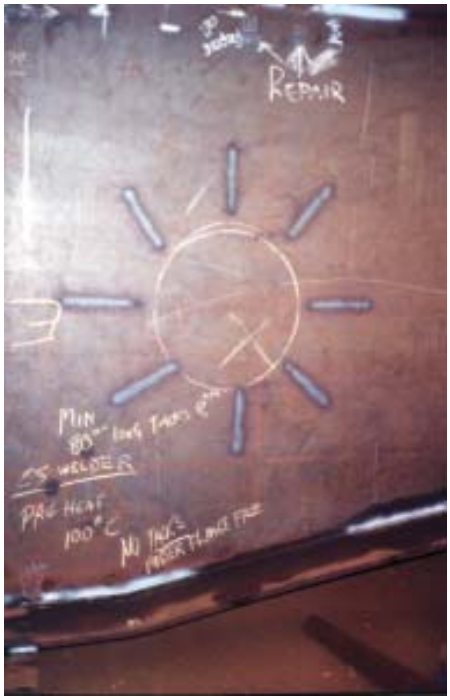


***Figure 6.5***

***A Surveillance Officer finding products outside tolerances, such as damage to the web (Figure 6.4), should raise non-conformances and where appropriate, verify corrective techniques, such as the flame straightening (Figure 6.5).***

Surveillance reports shall include any requirements for the National Association for Testing Authorities Australia (NATA) endorsement of the report, as well as specific information resulting from the surveillance. Surveillance reports shall be made within two working days of conducting the surveillance.

The Structural Steelwork Surveillance Officer shall make available to the Contractor and to VicRoads, at the request of the Superintendent, all relevant documentation collected during the course of the surveillance.

Appendix C of this document contains an example of a basic Surveillance Record and Report Form.

| Steps | Actions |
|---|---|
| 1 | Report surveillance in accordance with the standard reporting requirements and any contract specific requirements. Include verification of activities, verification of inspections and any remedial action completed, and details of non-conformances and achievement of agreed dispositions |
| 2 | Issue surveillance reports within 2 working days of surveillance |
| 3 | Issue reports only to the Contractor and to the Superintendent upon request |

*Figure 7.1*

*Figure 7.2*

***Surveillance reports may include comment on observation of lifting and storage methods, such as those used in the photographs above (Figures 7.1 & 7.2)***

# 8

## References


1 Standards Australia, AS/NZS ISO 9001:2000 — *Quality Mangement Systems — Requirements*

2 Standards Australia, AS/NZS 1554, Part 1 — *Welding of Steel Structures*

3 Standards Australia, AS/NZS ISO 3834, *Quality Systems for Welding — Standard quality requirements*

4 Austroads, *Quality Assurance in Contracts,* Sydney 1994, AP–115/94

5 Austroads, *Guide to Field Surveillance of Quality Assurance Contracts,* Sydney 1995, AP-38/95

6 Standards Australia, AS/NZS ISO/IEC 17020, *General Criteria for the Operation of Various Types of Bodies Performing Inspection*

7 Standards Australia, AS 1796, *Certification of Welders and Welding Supervisors*

8 Standards Australia, AS 2214, *Certification of Welding Supervisors–Structural Steel Welding*

# 9

## Additional Reading

National Association of Australian State Road Authorities, *Bridge Welding Practice*, Sydney, 1980

Standards Australia, AS/NZS ISO/IEC 17020 — *General Criteria for the Operation of Various Types of Bodies Performing Inspection*

Welding Technology Institute of Australia, Technical Note 11, *Commentary on the Structural Steel Welding Standard AS/NZS 1554 — TN11 — 98*

Welding Technology Institute of Australia, Technical Note 19, *Cost Effective Quality Management for Welding — TN19 — 95*

## Company Accreditation

All companies conducting surveillance of structural steelwork shall hold inspection accreditation with the National Association of Testing Authorities, Australia (NATA). Accreditation shall be to AS/NZS ISO/IEC 17020 – *General Criteria for the Operation of Various Types of Bodies Performing Inspection*[6], for surveillance of structural steelwork, in accordance with this Guide.

## Business Rules

Companies conducting surveillance of structural steelwork shall evidence the following business information:

- Australian Business Number
- WorkCover Employer Registration Number
- Details of Public Liability and Professional Indemnity Insurance as specified in the primary VicRoads contract.

## Personnel Qualification

In addition to the general requirements specified by NATA, personnel shall meet the following requirements for qualifications and experience before gaining inspection accreditation as an authorized signatory for structural steelwork surveillance:

1. Attendance at a two day course on surveillance of construction works, conducted by a recognised training authority
2. Attendance at a two day course in auditing or quality management principles, conducted by a recognised quality training organisation

3. At least one of the following qualifications or certifications:

    - Welding/Fabrication Inspector (Welding Technology Institute of Australia (WTIA)/Australian Institute for Certification of Inspection Personnel (AICIP))
    - Senior Welding/Fabrication Inspector (WTIA/AICIP)
    - Welding Supervisor's Certificate (AS 1796 Certificate No. 10[7])
    - Welding Supervisor's Certificate – Structural Steel (AS 2214[8])
    - Welding Inspector Certificate recognised by WTIA

4. Practical experience in the fabrication of steelwork shall include:

    - Fabrication of heavy plate structures or vessels
    - Use of plate thicknesses greater than 20 mm
    - Use of higher tensile steels
    - Butt and T-butt welding
    - Erection and site welding
    - High strength friction grip bolting

Documented evidence of qualifications and courses shall be provided at the initial assessment by NATA. Accredited companies shall retain copies of this documentation for verification at subsequent re-assessments by NATA or at subsequent audits.

## Personnel Experience

All personnel conducting surveillance of structural steelwork shall meet the following experience requirements:

- Sound and demonstrated knowledge of material standards, application codes, specifications, fabrication procedures and work standards, including the application and use of AS/NZS 1554 Part 1 in welding of structural steelwork
- Demonstrated competence to read and understand contract and shop drawings, material compliance certificates, welding procedure specifications, mechanical testing reports, non-destructive testing reports, inspection and test reports, and the like, including the assessment of compliance of these documents with specification criteria
- Demonstrated competence in the development, preparation and approval of welding procedure specifications as defined in AS/NZS 1554 Part 1
- Ability to prepare surveillance reports
- Participation in at least three surveillance visits as a trainee surveillance officer, under the mentorship of a person trained in quality auditing and experienced in structural steelwork fabrication, prior to gaining NATA signatory status

Referee persons, such as a principal of the surveillance company or of the Contractor's company, shall independently verify experience by signing experience statements at the appropriate entries.

## Resources, Records and Reports

The accredited surveillance company shall establish and maintain a surveillance record and reporting system. All personnel conducting surveillance of structural steelwork shall use the surveillance reporting system established by the accredited surveillance company. Surveillance reports shall be issued to the Contractor within two working days of conduct of the surveillance. Security and confidentiality of records and reports shall be maintained. Records and reports shall be held for three years after expiry of the contract defects liability period.

Surveillance reports shall comply with the requirements of the NATA accreditation.

## Ethics and Independence

All surveillance companies and personnel conducting surveillance of structural steelwork shall:

- Exercise their professional and technical skills and judgement to the best of their ability and discharge their professional and technical responsibilities with honesty, integrity and thoroughness
- Accurately and impartially record and report surveillance findings without the influence of any internal or external pressures or considerations

- Disclose to the Contractor any commercial or other relationships they may have, or have had, with organizations to be assessed or related organizations or competitors
- Ensure that they do not disclose their surveillance findings, or any part of their findings, to any third party other than VicRoads.

# Appendix B

## Checklists for Surveillance of Structural Steelwork

| Item | Requirements and Reference | Comments | Evidence |
|---|---|---|---|
| **1.0** | **QUALITY SYSTEM** | | |
| 1.1 | Does the Structural Steelwork Sub-contractor have a Quality System, as evidenced by a Quality Manual? | | |
| 1.2 | Is the Quality System accredited to:<br>AS/NZS ISO 9001?<br>AS/NZS ISO 3834 part 3?<br>Certifying body is:<br>Certificate number:<br>Date of original certification:<br>Date of latest continuation audit: | | |
| 1.3 | Does a Quality Plan or Inspection & Test Plan from the Structural Steelwork Sub-contractor exist? | | |
| 1.4 | Is there a schedule of internal quality audits?<br>Do records exist for these audits? | | |
| 1.5 | Are non-conformances listed in a register? | | |
| 1.6 | Are non-conformances and corrective actions raised and closed out? | | |
| **2.0** | **CONTRACT DOCUMENTATION** | | |
| 2.1 | Is the Structural Steelwork Contractor using the latest approved drawings and specifications?<br>What is the revision status of the drawings? | | |
| **3.0** | **CONTRACT REVIEW** | | |
| 3.1 | Recognition of application standard(s) to be used (e.g., AS 1554.1, VicRoads Section 630) | | |
| 3.2 | Are there existing procedures for:<br>- welding?<br>- non-destructive testing?<br>- heat treatment?<br>- bolting?<br>- protective coating? | | |
| 3.3 | What is the approach to be used for welding procedure approval? (e.g., AS 1554.1 Cl 4.2) | | |
| 3.4 | Do existing qualifications meet the requirements for approval of personnel?<br>Welding supervisor (AS 1554.1 Cl 4.11)<br>Welder qualification | | |
| 3.5 | Who is to conduct inspection and testing? | | |
| 3.6 | Are there methods for the selection, identification and/or traceability for materials, welders & welds? | | |

| Item | Requirements and Reference | Comments | Evidence |
|---|---|---|---|
| **4.0** | **DESIGN REVIEW** | | |
| 4.1 | Consideration of location, accessibility & sequence of all welds | | |
| 4.2 | Have surface finish & weld profile requirements been assessed? | | |
| 4.3 | Parent metal specification<br>Welded joint properties | | |
| 4.4 | Is permanent backing required? | | |
| 4.5 | Assessment of shop welds versus site welds | | |
| 4.6 | Joint preparations required? | | |
| 4.7 | Use of special methods | | |
| 4.8 | Quality & acceptance requirements for welds | | |
| **5.0** | **SUB-CONTRACTING** | | |
| 5.1 | Sub-contractor(approval procedure)s for:<br>Plate cutting?<br>Inspection?<br>NDT?<br>Heat treatment?<br>Supply of fasteners?<br>Painting/Coating? | | |
| **6.0** | **PERSONNEL QUALIFICATION** | | |
| 6.1 | Welding supervisors<br>Record of qualification | | |
| 6.2 | Welders<br>Records of qualification of welding operators | | |
| 6.3 | Welding coordination personnel:<br>Are they nominated? | | |
| 6.4 | Status of inspection and testing personnel<br>Are reports NATA endorsed? | | |
| 6.5 | Qualification of NDT personnel<br>Are NDT reports NATA endorsed? | | |
| **7.0** | **EQUIPMENT** | | |
| 7.1 | Is equipment suitable for the task?<br>Are tapes and welding meters calibrated? | | |
| **8.0** | **FABRICATION ACTIVITIES** | | |
| 8.1 | Production Plans<br>Do these exist for:<br>- Sequence of assembly & construction?<br>- Referencing of weld procedures?<br>- Sequence and timing of welds?<br>- Specification of inspection and testing?<br>- Environment controls? | | |

| Item | Requirements and Reference | Comments | Evidence |
|---|---|---|---|
| 8.2 | Approval of weld procedures shall be done as required by the contract.<br>What is the approval process?<br>Who signs off the approval for use?<br>Are test reports NATA endorsed? | | |
| 8.3 | Are Work Instructions used?<br>Are WI's simply weld procedures? or<br>Do WI's detail the fabrication process? | | |
| 8.4 | Storage and handling of welding consumables:<br>Is this in accordance with the manufacturer's requirements? | | |
| 8.5 | Storage of parent metal and fasteners: | | |
| 8.6 | Post weld heat treatment | | |
| **9.0** | **INSPECTION AND TESTING** | | |
| 9.1 | Welding related testing shall be reported as required by the contract | | |
| 9.2 | Inspection & testing before welding:<br>- Parent material<br>- Welding consumables<br>- Joint preparation<br>- Fitup<br>- Environment (temperature, shelter, wind, precipitation) | | |
| 9.3 | Inspection & testing during welding:<br>- Preheating<br>- Welding variables (current, volts, speed)<br>- Cleaning and shape of runs & layers<br>- Back gouging<br>- Sequence of welding | | |
| 9.4 | Inspection & testing after welding:<br>- Visual inspection<br>- NDT<br>- Destructive testing<br>- Form, shape and dismensions<br>- Grinding, spatter removal<br>- Arc strikes | | |
| 9.5 | Calibration of tapes, welding meters, etc. | | |
| 9.6 | Identification and traceability of materials, welders and welds, including welding test status | | |
| **10.0** | **QUALITY RECORDS** | | |
| 10.1 | Quality records:<br>- Contract and design review<br>- Materials certificates<br>- Consumables certificates<br>- Welding procedure specifications<br>- Welding procedure approval test records<br>- Welding operator approval certificates<br>- NDT reports<br>- Destructive testing reports<br>- Dimensional reports | | |

# Appendix C

## Sample Surveillance Record and Report Form

| | | | |
|---|---|---|---|
| Contractor | | Surveillance No | |
| Sub-Contractor/Supplier | | | |
| Contract No. | | | |
| Job/Product | | | |
| Surveillance Officer | | Date of Surveillance | |
| Job Engineer | | | |
| Location of Surveillance | | | |
| Procedures/Plans/ Tests Checked | | | |
| Observations | | | |
| Checklists Used | | | |
| Number of Non-Conformances Observed | | | |
| Details of Non-Conformances | | | |
| Comments | | | |
| Number of Non-Conformances Resolved | | | |
| Date of Notification of Non-Conformance Resolutions | | | |
| Disposition of Non-Conformances | | | |
| Signature | | Date | |

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