

1. Scope

AS/NZS ISO 3834:2008 and ISO 3834:2005 'Quality requirements for fusion welding of metallic materials' defines the various approaches to quality requirements in welded fabrication, construction and maintenance through the implementation of competent welding co-ordination. In Parts 2 and 3, paragraph 7.3 (of each standard), it states that "the manufacturer shall have at his disposal appropriate welding coordination personnel". Such personnel are defined in ISO Standard 14731:2006 'Welding coordination – Tasks and responsibilities' Section 4.2 'Specification of tasks and responsibilities' which also refers to Annex B. Section 4.2 states that "The manufacturer shall appoint at least one responsible welding coordinator". Section 6.2 defines the specific knowledge requirements of responsible welding coordination personnel and refers to Annex A.

The International Welding Engineer (IWE), International Welding Technologist (IWT) and International Welding Specialist (IWS) are the recommended minimum requirements for education, examination and qualification of welding coordination personnel. This is shown in Annex A in ISO 14731:2006 and Annex A in ISO 3834-5:2005 where minimum requirements for inspection personnel are also stated.

The purpose of this WTIA Technical Guidance Note (TGN) is to guide a manufacturing organisation on how to specify the tasks and responsibilities of Welding Coordination Team (WCT) to comply with ISO 14731, AS/NZS ISO 3834:2008 and ISO 3834:2005. A manufacturing organisation may be a company involved in fabrication, construction, repair or maintenance as a supplier of services, or an asset owner, purchaser, project manager etc.

The Technical Guidance Note includes a welding coordination activities and responsibilities Self-assessment Checklist (Table 2) and Task Allocation Checklist (Table 3,) based on activities and responsibilities detailed in ISO 14731 as tools for use by manufacturing organisations.

In accordance with ISO 3834, a Manufacturer is defined as a 'person or organisation responsible for the welding production'. The Standard uses this term to describe any such organisation involved in manufacturing, fabrication, construction, repair or maintenance as well as other organisations such as asset owners, project management and design companies where the requirements of ISO 3834 are applicable to activities such as weld design, contract development, and the review of technical requirements and competencies of subcontractors.

This is the fifth of seven WTIA Technical Guidance Notes making up an Expert Technology Tool (TGN-3834-01 to 07) for industry on the benefits and application of A AS/NZS ISO 3834:2008, ISO 3834:2005 and ISO 14731:2006 "Welding coordination - Tasks and responsibilities". A Power Point presentation of this material is available as TGN-3834-01. Detailed explanatory information on the two standards is given in the WTIA ETT and ISO 3834 Part 6.

Feedback is welcome from anybody who can add value to the Technical Guidance Notes. Please feel free to suggest amendments, deletions, additions etc. by emailing a.rorke@wtia.com.au.

2. Benefits of Welding Coordination

2.1 For the Manufacturer

- less rework
- jobs completed on time
- local and international recognition as a competent organisation
- meet the welding-related requirements of ISO 9001
- more efficient coordination of welding activities
- more pro-active and responsible work force
- increase opportunities and capability to bid on jobs
- cost savings - more efficient technology

- Reduced surveillance audits and inspections by purchasers with significant savings.

2.2 For the purchaser and specifier

- reduction in maintenance costs
- more assurance of contract delivery dates
- greater assurance of the quality of the welded product
- greater reliability and performance of plant
- reduction or elimination of third party inspection costs
- more competent suppliers of welded products

2.3 To the individual

- helps to do the job more satisfactorily
- greater job security
- higher regard by other people
- professional recognition
- satisfied employer and customer
- more rewarding job position
- develop team spirit

3. Welding Coordination Personnel

3.1 Introduction

Welding coordination personnel have responsibilities in the manufacturing operation for welding and welding related activities; and their competence and knowledge will be demonstrated e.g. by training, education and/or relevant manufacturing experience. Welding coordination personnel can range from e.g. welding supervisor, storeman, design engineer or sub-contractor. Guidance on training and qualification is provided in WTIA Guidance Note TGN-3834-04 "How to specify training and qualifications of welding coordination personnel to meet ISO 3834".

Welding coordination may be undertaken by one or a number of persons. Where welding coordination is carried out by a number of persons, tasks and responsibilities shall be allocated for each person.

A Responsible Welding Coordinator (RWC) must be authorised to oversee, and possibly be responsible for, the welding-related activities of all welding coordination personnel (see 3.2 below).

Welding coordination requirements can be specified by a manufacturer, contract or an application standard. For some work activities, the coordination tasks and responsibilities may be carried out by subcontractors. Subcontracted activities shall remain subject to welding coordination in accordance with ISO 14731:2006. It is recommended that such subcontracted activities be the subject of a formal contract.

3.2 Specification of Tasks and Responsibilities

A job specification for the welding coordination personnel when required e.g. by contracting parties or an application standard, shall include their tasks and responsibilities.

Identification of the assigned responsibilities is dependent on the:

- position in the manufacturing organisation and responsibilities;
- extent of authorisation to accept by signing on behalf of the organisation;
- extent of authorisation to carry out the assigned tasks.

The individual functions and responsibilities covered should show the individual's status within the organisation and the extent of the individual's authority, as well as who he/she reports or refers to, for welding/quality related decisions outside his/her competence.

The standard requires that all welding coordination staff shall be competent by virtue of general technical knowledge, and specialised technical knowledge relevant to the allotted tasks (via theoretical training and experience).

4. Manufacturing Organisation’s Responsibilities for the Welding Coordination Team

The organisation should clearly identify the position, responsibilities and extent of authorisation of each person allocated a welding coordination task. Table 1, shows a number of areas for which the tasks and responsibilities need to be defined and allocated:

Table 1 – Welding-related activities

Review of Requirements	Materials
Technical Review	Inspection and Testing Before Welding
Subcontracting	Inspection and Testing During Welding
Welding Personnel	Inspection and Testing After Welding Post-weld Heat Treatment
Equipment	Non-conformance and Corrective Actions
Production Planning	Calibration and Validation of Measuring, Inspection and Testing Equipment
Qualification of the Welding Procedures	Identification and Traceability
Welding Procedure Specifications	Quality Records
Work Instructions	
Welding Consumables	

The organisation should nominate at least one Responsible Welding Coordinator (RWC). In large organisations with different products or sites there may be more than one RWC. The RWC:

- should be competent to sign on behalf of the organisation;
- should be authorised to oversee, and could be responsible for, the work of other welding coordinators on the same site or in the same department;
- could have the title Responsible Welding Coordinator added to his/her normal job title and function, e.g. Technical Manager & RWC

5. Technical Knowledge

5.1 General for all Welding Coordination Personnel

For all tasks assigned, welding coordination personnel shall be able to demonstrate adequate technical knowledge to enable such tasks to be performed satisfactorily.

The following factors should be considered:

- general technical knowledge;
- specialised technical knowledge relevant to the assigned tasks. This may be attained by a combination of theoretical knowledge, training and/or experience.

The extent of required manufacturing experience, education and technical knowledge should be decided by the organisation and will depend on the assigned tasks and responsibilities.

5.2 Responsible Welding Coordination Personnel

A Responsible Welding Coordinator (RWC) must be nominated by the organisation. The responsibilities of the RWC to carry out, supervise and/or oversee welding engineering tasks will be clearly defined by the organisation. He/She must be authorised to sign on behalf of the organisation in contractual welding quality related matters, e.g. accepting technical welding requirements, or verifying that the organisation has complied with all relevant quality considerations in the production of the product.

Three different levels of RWC are given. The selection of RWC depends mainly on the variability and technical complexity of the welding procedures required.

- **Comprehensive Technical Knowledge**

Welding coordination personnel with full technical knowledge for planning, executing, supervising and testing of all tasks and responsibilities in welding fabrication, construction, repair, maintenance etc.

For example, where a broad range of materials, processes, thicknesses, procedures & NDT requirements is involved, where a wide variety of products are to be manufactured to differing codes, major fabrication projects etc.

- **Specific Technical Knowledge**

Welding coordination personnel where technical knowledge is sufficient for planning, executing, supervising and testing of the tasks and responsibilities in welding fabrication within a selective or limited technical field.

For example, where welding processes, procedures, materials and products do not change significantly etc.

- **Basic Technical Knowledge**

Welding coordination personnel where technical knowledge is sufficient for planning, executing, supervising and testing of the tasks and responsibilities in welding fabrication within a limited technical field involving simple welded constructions

For example, where the welding processes and procedures, materials etc. do not vary, the welds produced are not critical from safety aspects etc.

9. Minimum Requirements for Education, Examination and Certification

ISO 3834-5:2005(E) Annex A (informative) 'Guidelines on qualification/education scheme for personnel dealing with welding coordination and inspection' states that:

The International Institute of Welding (IIW) has, on a voluntary basis, prepared guidelines for minimum requirements for the education, training, examination and qualification of personnel dealing with welding coordination and inspection.

The minimum requirements for personnel dealing with welding coordination are stated in the following documents:

- International Welding Engineer (IWE) Doc. IAB-002-2000/EFW-409;
- International Welding Technologist (IWT) Doc. IAB-003-2000/EFW-410;
- International Welding Specialist (IWS) Doc. IAB-004-2000/EFW-411.

The minimum requirements for inspection personnel are stated in the following document:

- International Welding Inspection Personnel (IWIP) Doc. IAB-041-2001/EFW-450.

Personnel dealing with welding coordination and inspection fulfilling the requirements of these documents, or holding acceptable national qualifications, are considered to satisfy relevant requirements.

Put in section on certification

9. Establishment of Welding Coordination Tasks and Responsibilities

The 7 Steps in the process of establishing a Welding Coordination Team are:

Step 1

Review ISO 14731 and identify the roles within the organisation's structure and organisation that fall within Welding Coordination

Step 2

Draw up an organisation chart showing all relevant positions and their inter-relationships e.g. see page 8

Step 3

Decide on the number, types, levels of welding activities and tasks to be coordinated in your Organisation

Step 4

Review the competencies of the organisation's personnel as part of a gap analysis against the requirements of ISO 3834 and ISO 14731

Step 5

Allocate the activities, tasks and responsibilities to personnel within the organisation chart (see Tables 2 and 3).

While allocating these consider:

- Your organisation's reporting process;
- Competencies of different personnel;
- Retraining of individuals to be competent for the tasks allocated.

Note: Deputies should be identified to act in the absence of welding coordinators.

Step 6

After allocation, if some of the activities are not filled, then

- Recruit more personnel or re-train existing personnel;
- Allocate to assisting personnel;
- Subcontract the activities to a suitably competent person external to the organisation.

Step 7

Decide who the Responsible Welding Coordinator (RWC) will be. The RWC shall

- Have overall responsibility for coordination of all welding and welding-related activities;
- Be authorised to sign on behalf of the organisation in contractual welding quality related matters or delegate such signing e.g. goods release for despatch, inspection sign-off.

Notes:

1. Further guidance is available from WTIA TGN-3834-07 "Self assessment of quality requirements – Checklist and action plan".
2. The title Authorised Welding Coordinator has changed to Responsible Welding Coordinator in the 2006 edition of ISO 14731.
3. In large organisations, with different products and sites, there may be more than one RWC.
4. Some countries believe that the RWC must be an International Welding Engineer (IWE) for an ISO 3834 Part 2 or Part 3 company.
5. In other circumstances, it is believed that the RWC can have other competency qualifications satisfactory to the employer and if inadequate the relevant tasks may be subcontracted.
6. It is possible for only part of a person's job position to be dedicated to welding coordination activities. For example, a Storeman in a mechanical engineering workshop

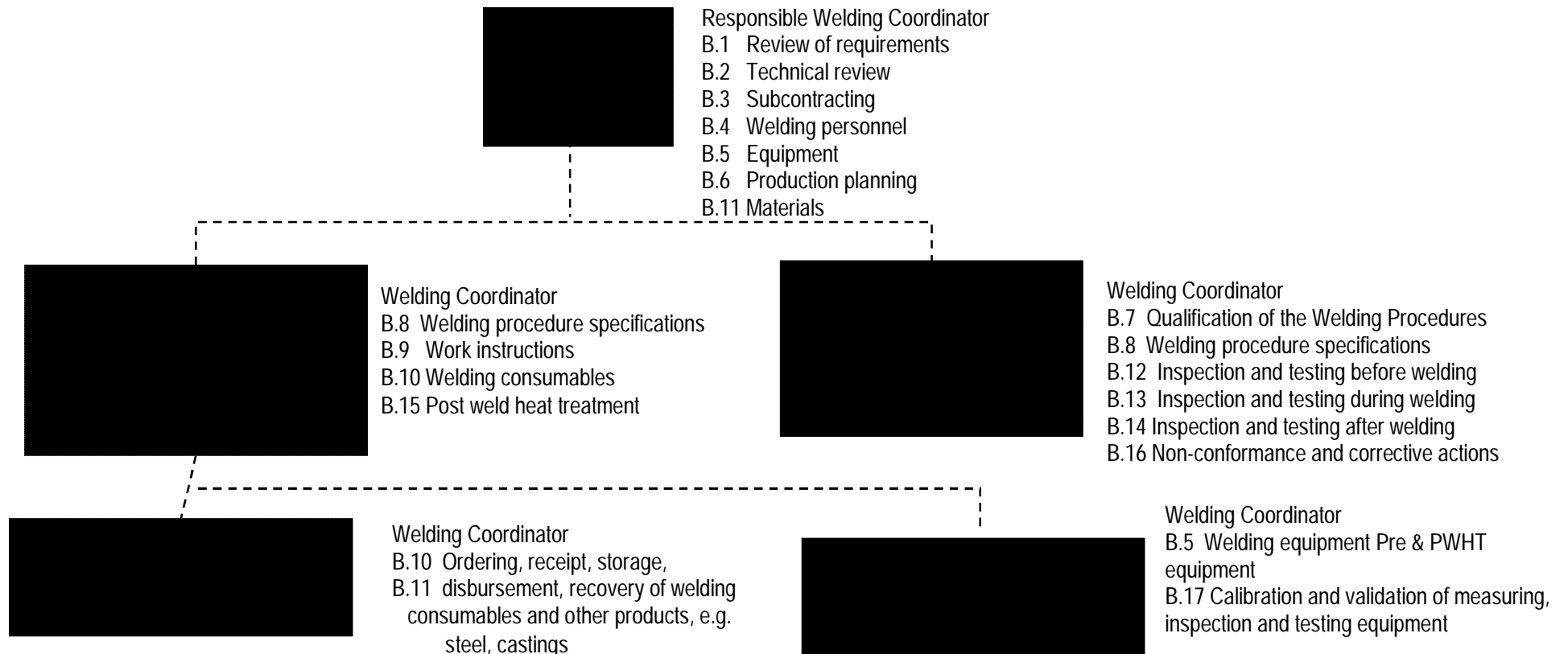
9. Some Welding Coordination Team Scenarios

The international standard ISO 14731:2005 *Welding coordination - Tasks and responsibilities* identifies the quality-related responsibilities and tasks in the coordination of welding-related activities as shown in Table 1. It is not expected that the same person will be involved in every activity but the standard clearly requires that "the tasks and responsibilities of personnel involved in welding related activities should be clearly defined". This may be conveniently achieved by a series of job specifications and an organisational relationship diagram (Figure 1&Table 2, Table 3).

A few simplified scenarios are discussed to illustrate the variations in welding coordination including examples of the split of activities from Table 1. The structure and allocation of activities can vary according to the size, number and type of employees, departments etc. For example, people responsible for certain welding coordination activities may report to different managers e.g. Welding Supervisor to the Production Manager (PM), Welding Inspector to the Quality Officer (QO).

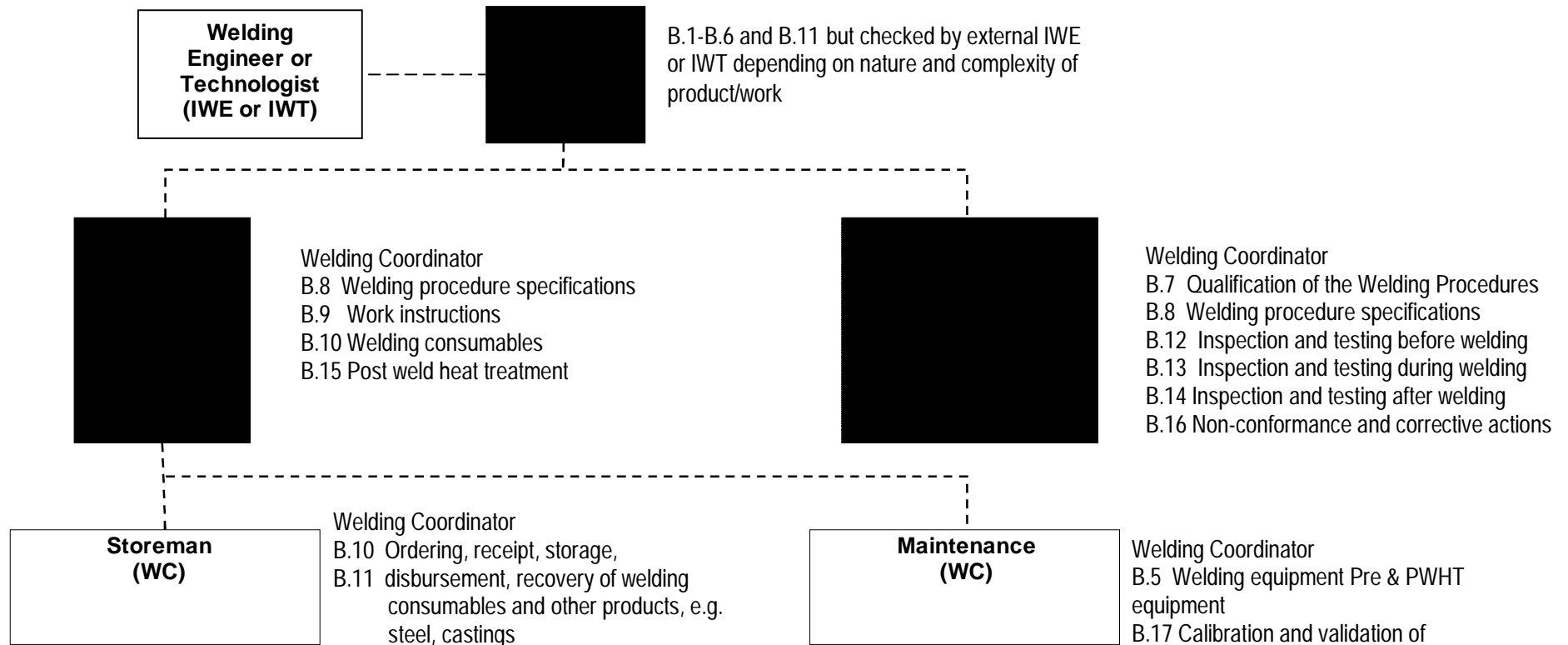
Scenario 1:

- Production is to ISO 3834:2005 Part 2 or Part 3
- The RWC has IWE qualifications
- The RWC takes overall responsibility for all the activities including some detailed activities (B.1-B.6 and B.11)



Scenario 2:

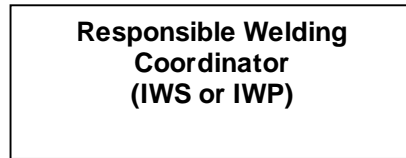
- Production is to ISO 3834:2005 Part 2 or Part 3
- The RWC has IWS qualifications
- The RWC does not feel competent to be directly responsible for activities B.1-B.6 and B.11
- Activities B.1-B.6 and B.11 are subcontracted to an external person who has IWE or IWT qualification
- The RWC still takes overall responsibility for all the activities related to welding



Note: Scenarios 1 & 2 could also apply to companies whose main line of business is not welding fabrication, construction, repair and maintenance but have workshops that perform such work to varying degrees e.g. smelters, mines, power stations, chemical plants

Scenario 3:

- Production is to ISO 3834:2005 Part 4
- Welding coordination is not a requirement
- It is still recommended however, that a RWC be appointed due to the many benefits of welding coordination (e.g. improved productivity, cost savings, efficiency etc)
- An IWS or IWP is recommended depending on the nature and complexity of the product/work

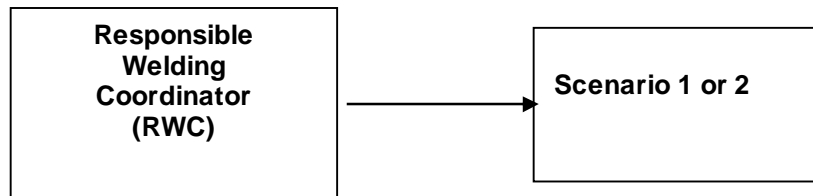


Scenario 4:

- The company does not perform any fabrication, construction or maintenance activity e.g. purchasers, specifiers, project managers etc
- They still need to coordinate certain welding activities however, e.g. review of requirements, technical review, materials, subcontract work etc
- A RWC shall be appointed to take overall responsibility for all the activities related to welding

Responsible Welding Coordinator

- B.1 Review of requirements
- B.2 Technical review
- B.3 Subcontracting
- B.4 Welding personnel
- B.5 Equipment
- B.6 Production planning
- B.11 Materials



Depends on nature and Complexity of work

9. Example of SME Structure and Establishing Welding Coordination Team

9.1 Typical structure

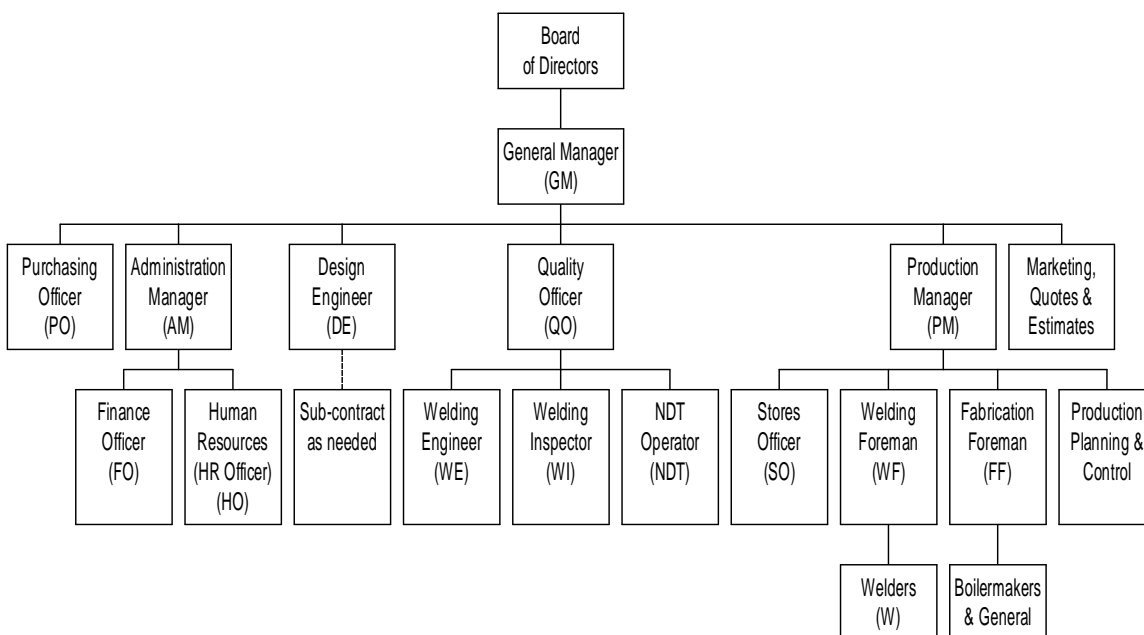


Figure 1: Typical organisation structure for a SME (Refer WTIA ETT: MS01-TWM-01)

Using Table 2 below, tick 'yes' or 'no', whether the welding activities requiring coordination are applicable to your company. If 'yes', allocate these activities to a job position shown in Table 3.

Table 2: WELDING COORDINATION ACTIVITIES AND RESPONSIBILITIES TO ISO 14731:2006 AND SELF-ASSESSMENT CHECKLIST

Activities & Responsibilities	Yes	No
B.1 Review of requirements		
The following elements shall be considered in a review of requirements:		
a) the product standard to be used, together with any supplementary requirements;		
b) the capability of the manufacturer to meet the prescribed requirements.		
B.2 Technical review		
The following elements shall be considered in a technical review:		
a) the parent material(s) specification and welded joint properties;		
b) the joint location with relation to the design requirements;		
c) quality and acceptance requirements for welds;		
d) the location, accessibility and sequence of welds, including accessibility for inspection and non-destructive testing;		
e) other welding requirements, e.g. batch testing of consumables, ferrite content of weld metal, ageing, hydrogen content, permanent backing, use of peening, surface finish, weld profile;		
f) the dimensions and details of joint preparation and completed weld.		
B.3 Sub-contracting		
With regard to sub-contracting, the suitability of any sub-contractor for welding fabrication shall be considered.		
B.4 Welding personnel		
With regard to welding personnel, the qualification of welders and welding operators, brazers and brazing operators shall be considered.		
B.5 Equipment		
The following elements shall be considered with regard to equipment:		
a) the suitability of welding and associated equipment;		
b) auxiliaries and equipment supply, identification and handling;		
c) personal protective equipment and other safety equipment, directly associated with the applicable manufacturing process;		
d) equipment maintenance;		
e) equipment verification and validation.		
B.6 Production planning		
The following elements shall be considered with regard to production planning:		
a) reference to the appropriate procedure specifications for welding and allied processes;		
b) the sequence in which the welds are to be made;		
c) environmental conditions (e.g. protection from wind, temperature and rain);		
d) the allocation of qualified personnel;		
e) equipment for preheating and post-heat treatment, including temperature indicators;		
f) the arrangement for any production test.		
B.7 Qualification of the welding procedures		
With regard to the qualification of the welding procedures, the method and range of qualification shall be considered.		
B.8 Welding procedure specifications		
With regard to welding procedure specifications, the range of qualification shall be considered.		
B.9 Work instructions		
With regard to work instructions, the issuing and use of work instructions shall be considered.		

Activities & Responsibilities	Yes	No
B.10 Welding consumables		
The following elements shall be considered with regard to welding consumables:		
a) compatibility;		
b) delivery conditions;		
c) any supplementary requirements in the welding consumable purchasing specifications, including the type of welding consumable inspection document;		
d) the storage and handling of welding consumables.		
B.11 Materials		
The following elements shall be considered with regard to materials:		
a) any supplementary requirements in the material purchasing specifications, including the type of inspection document for the material;		
b) the storage and handling of parent material;		
c) traceability.		
B.12 Inspection and testing before welding		
The following elements shall be considered with regard to inspection and testing before welding:		
a) the suitability and validity of welders' and welding operators' qualification certificates;		
b) the suitability of the welding procedure specification;		
c) the identity of the parent material;		
d) the identity of welding consumables;		
e) joint preparation (e.g. shape and dimensions);		
f) fit-up, jiggling and tacking;		
g) any special requirements in the welding procedure specification (e.g. prevention of distortion);		
h) the suitability of working conditions for welding, including the environment.		
B.13 Inspection and testing during welding		
The following elements shall be considered with regard to inspection and testing during welding:		
a) essential welding parameters (e.g. welding current, arc voltage and travel speed);		
b) the preheating/interpass temperature;		
c) the cleaning and shape of runs and layers of weld metal;		
d) back gouging;		
e) the welding sequence;		
f) the correct use and handling of welding consumables;		
g) control of distortion;		
h) any intermediate examination (e.g. checking dimensions).		
B.14 Inspection and testing after welding		
The following elements shall be considered with regard to inspection and testing after welding:		
a) the use of visual inspection (for completeness of welding, weld dimensions, shape);		
b) the use of non-destructive testing;		
c) the use of destructive testing;		
d) the form, shape, tolerance and dimensions of the construction;		
e) the results and records of post-operations (e.g. post-weld heat treatment, ageing).		
B.15 Post-weld heat treatment		
With regard to post-weld heat treatment, performance in accordance with the specification shall be considered.		
B.16 Non-conformance and corrective actions		
With regard to non-conformance and corrective actions, the necessary measures and actions (e.g. weld repairs, re-assessment of repaired welds, corrective actions) shall be considered.		
B.17 Calibration and validation of measuring, inspection and testing equipment		
With regard to the calibration and validation of measuring, inspection and testing equipment, the necessary methods and actions shall be considered.		

Activities & Responsibilities	Yes	No
B.18 Identification and traceability		
The following elements shall be considered with regard to identification and traceability:		
a) the identification of production plans;		
b) the identification of routing cards;		
c) the identification of weld locations in construction;		
d) the identification of non-destructive testing procedures and personnel;		
e) the identification of the welding consumable (e.g. designation, trade name, manufacturer of consumables and batch or cast numbers);		
f) the identification and/or traceability of parent material (e.g. type, cast number);		
g) the identification of the location of repairs;		
h) the identification of the location of temporary attachments;		
i) traceability for fully mechanized and automatic welding units to specific welds;		
j) traceability of welder and welding operators to specific welds;		
k) traceability of welding procedure specifications to specific welds.		
B.19 Quality records		
With regard to quality records, the preparation and maintenance of the necessary records (including subcontracted activities) shall be considered.		

Once complete, re-allocate the activities ticked 'yes' to a job position in Table 3.

Table 3: WELDING COORDINATION ACTIVITIES AND RESPONSIBILITIES TO ISO 14731:2006 TASK ALLOCATION CHECKLIST

Activities & Responsibilities	PM	WM	DE	QO	SO	WF	PO	WI	FF	NDT	W	B
B.1 Review of requirements												
a) the product standard to be used, together with any supplementary requirements;												
b) the capability of the manufacturer to meet the prescribed requirements.												
B.2 Technical review												
a) the parent material(s) specification and welded joint properties;												
b) the joint location with relation to the design requirements;												
c) quality and acceptance requirements for welds;												
d) the location, accessibility and sequence of welds, including accessibility for inspection and nondestructive testing;												
e) other welding requirements, e.g. batch testing of consumables, ferrite content of weld metal, ageing, hydrogen content, permanent backing, use of peening, surface finish, weld profile;												
f) the dimensions and details of joint preparation and completed weld.												
B.3 Sub-contracting												
With regard to sub-contracting, the suitability of any sub-contractor for welding fabrication shall be considered.												
B.4 Welding personnel												
With regard to welding personnel, the qualification of welders and welding operators, brazers and brazing operators shall be considered.												
B.5 Equipment												
a) the suitability of welding and associated equipment;												
b) auxiliaries and equipment supply, identification and handling;												
c) personal protective equipment and other safety equipment, directly associated with the applicable manufacturing process;												
d) equipment maintenance;												
e) equipment verification and validation.												
B.6 Production planning												
a) reference to the appropriate procedure specifications for welding and allied processes;												
b) the sequence in which the welds are to be made;												
c) environmental conditions (e.g. protection from wind, temperature and rain);												
d) the allocation of qualified personnel;												
e) equipment for preheating and post-heat treatment, including temperature indicators;												
f) the arrangement for any production test.												
B.7 Qualification of the welding procedures												
With regard to the qualification of the welding procedures, the method and range of qualification shall be considered.												
B.8 Welding procedure specifications												
With regard to welding procedure specifications, the range of qualification shall be considered.												

Activities & Responsibilities	PM	WM	DE	QO	SO	WF	PO	WI	FF	NDT	W	B
B.9 Work instructions												
With regard to work instructions, the issuing and use of work instructions shall be considered.												
B.10 Welding consumables												
a) compatibility;												
b) delivery conditions;												
c) any supplementary requirements in the welding consumable purchasing specifications, including the type of welding consumable inspection document;												
d) the storage and handling of welding consumables.												
B.11 Materials												
a) any supplementary requirements in the material purchasing specifications, including the type of inspection document for the material;												
b) the storage and handling of parent material;												
c) traceability.												
B.12 Inspection and testing before welding												
a) the suitability and validity of welders' and welding operators' qualification certificates;												
b) the suitability of the welding procedure specification;												
c) the identity of the parent material;												
d) the identity of welding consumables;												
e) joint preparation (e.g. shape and dimensions);												
f) fit-up, jiggging and tacking;												
g) any special requirements in the welding procedure specification (e.g. prevention of distortion);												
h) the suitability of working conditions for welding, including the environment.												
B.13 Inspection and testing during welding												
a) essential welding parameters (e.g. welding current, arc voltage and travel speed);												
b) the preheating/interpass temperature;												
c) the cleaning and shape of runs and layers of weld metal;												
d) back gouging;												
e) the welding sequence;												
f) the correct use and handling of welding consumables;												
g) control of distortion;												
h) any intermediate examination (e.g. checking dimensions).												
B.14 Inspection and testing after welding												
a) the use of visual inspection (for completeness of welding, weld dimensions, shape);												
b) the use of non-destructive testing;												
c) the use of destructive testing;												
d) the form, shape, tolerance and dimensions of the construction;												
e) the results and records of post-operations (e.g. post-weld heat treatment, ageing).												
B.15 Post-weld heat treatment												
With regard to post-weld heat treatment, performance in accordance with the specification shall be considered.												

Activities & Responsibilities	PM	WM	DE	QO	SO	WF	PO	WI	FF	NDT	W	B
B.16 Non-conformance and corrective actions												
With regard to non-conformance and corrective actions, the necessary measures and actions (e.g. weld repairs, re-assessment of repaired welds, corrective actions) shall be considered.												
B.17 Calibration and validation of measuring, inspection and testing equipment												
With regard to the calibration and validation of measuring, inspection and testing equipment, the necessary methods and actions shall be considered.												
B.18 Identification and traceability												
a) the identification of production plans;												
b) the identification of routing cards;												
c) the identification of weld locations in construction;												
d) the identification of non-destructive testing procedures and personnel;												
e) the identification of the welding consumable (e.g. designation, trade name, manufacturer of consumables and batch or cast numbers);												
f) the identification and/or traceability of parent material (e.g. type, cast number);												
g) the identification of the location of repairs;												
h) the identification of the location of temporary attachments;												
i) traceability for fully mechanized and automatic welding units to specific welds;												
j) traceability of welder and welding operators to specific welds;												
k) traceability of welding procedure specifications to specific welds.												
B.19 Quality records												
With regard to quality records, the preparation and maintenance of the necessary records (including subcontracted activities) shall be considered.												

KEY

DE – Design Engineer WF-Welding Foreman WI – Welding Inspector
WF – Welding Foreman PO – Purchasing Officer W – Welder B- Boilermaker
SO – Stores Officer QO – Quality Officer FF - Fabrication Foreman
NDT – Non Destructive Testing Operator P/WM – Production/Welding Manager (also AWC)

Once Table 3 is completed, draw up a diagram based on Section 8 and follow the steps shown in Section 7.

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