

SPECIFICATION PREFACE SHEET

DEPARTMENT: Engineering / Instrumentation	SHEET 1 OF 12	
AREA: Grundartangi Reduction Plant	SPEC No: 00/07/TS012	REV: C2

**STANDARD TECHNICAL
SPECIFICATION
FOR

DOCUMENTATION
AND
QUALITY ASSURANCE**

This Standard Technical Specification is subject to change without prior notice. The most current issue will at all times be located on the Nordural web site, www.nordural.is.

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NORÐURÁL – ENGINEERING

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TECHNICAL SPECIFICATION

1 INTRODUCTION.

In this Document the following words and expressions shall have the meaning hereby assigned to them except where the context otherwise requires:

Engineer:

The Owner or any person or organisation employed or engaged at any time by the Owner and authorised by the Owner, in writing, from time to time to act on behalf of the Owner in the execution of the items covered by this Document, in whole or in any part, for any or all purposes provided in this Technical Specification.

Owner:

Norðurál hf (Nordic Aluminum Corporation Ltd.), an independent legal entity owned by Century Aluminum.

This document forms a standard of minimum requirements in order to ensure clarity of understanding of all communication, designs and documentation. All text shall be in the Icelandic or English language.

2 RELATED STANDARDS

The Contractor is required to comply with all standards, which are relevant to the work, including amendments and addenda that are current at the time of order. Particular reference will be made to the following (or equivalent):

Icelandic Government Electrical Codes and Regulations no: 264/1971

Icelandic Government Health and Safety at Work Act no: 46/1980

ISA S5.1	Instrumentation Symbols and Identification (1984)
ISA S5.4	Instrument Loop Diagrams (1991)
ISA S5.5	Graphic Symbols for Process Displays (1985)
ISA	ISA Instrument Data Sheets
BS 2917	Pneumatic and Hydraulic Drawing Symbols (or IEC equivalent)
EC 60617	Symbols on Electrical drawings
DIN 2403	Identification of process pipes and systems
EN 60146	Semiconductor converters
BS 1042	Methods for the measurement of fluid flow in pipes
EN 837.1/2/3	Bourdon tube pressure and vacuum gauges.
EN 60751	Industrial platinum resistance thermometer elements
BS 3693	Recommendations for the design of scales and indexes
ISO 10816	Basis for specifying evaluation standards for rotating machines with operating speeds from 10 to 200 revolutions per second

SO 2954	Requirements for instruments for measuring vibration severity
ISO 9001	Quality Assurance
IEC 60079	Code of practice for the selection, installation and maintenance of electrical apparatus for use in potentially explosive atmospheres (other than mining applications or explosive processing and manufacture)
EN 60584	International Thermocouple Reference Tables
EN 61131.1/2/3	Programmable Logic Controllers
API 670	Vibration, Axial Position and Bearing Temperature Monitoring Systems

The Contractor may identify any other/different standards to which his equipment conforms and these must be submitted to the Engineer for approval prior to the commencement of work.

2.1 STANDARD DEFINITIONS

The following definition is for FDS, Functional Design Specification

'The Functional Design Specification shall be made at the end of the Analysis phase and must be approved by the Engineer. The Approved FDS can be further developed throughout the project to a point where it can form the basis for system implementation'

2.2 APPROVALS

In order that the described methodology can operate to maximum effectiveness the following approvals strategy should be defined as a minimum.

Quality Plan:	to be approved by the Contractor and the Engineer.
FDS (analysis stage):	to be approved by the Contractor and the Engineer.
Modified FDS (design stage):	to be approved by the Contractor and the Engineer.
Test Specifications:	to be approved by the Contractor and the Engineer.
Test Results:	to be approved by the Contractor and the Engineer.
Module/Code Tests:	to be approved by Contractor.
Final Documentation:	to be approved by the Contractor and the Engineer.

2.3 FINAL DOCUMENTATION

The final FDS should contain all analysis and design data related to both system operation and functionality. The FDS plus the following items of information should create a very comprehensive set of Operational and Maintenance Documentation.

- Equipment Data Sheets.
- Equipment and specified detailed Drawings.
- Cable Schedule and Connectivity Drawings.
- PLC Code Listings fully annotated.
- SCADA Configuration Files, fully annotated.

2.4 LANGUAGE

The standard language for all design documentation shall be Icelandic or English.

3 QUALITY MANAGEMENT

3.1 QUALITY STANDARD

All work on control systems shall be managed in accordance with the quality standard (BS EN) ISO 9001 or similar systems. The Quality Assurance System that is utilized should be supported by accreditation through an external certified authority, if requested by the Engineer. The accreditation and certification details will be supplied to the Engineer at the commencement of each contract.

3.2 QUALITY ASSURANCE

Work procedures within the Quality Assurance System being utilized must be supportive and it must provide for:

- Document Control
- Change Control

3.3 QUALITY PLANNING

3.3.1 INTRODUCTION

The purpose of the Quality Plan (QP) is to declare, at the beginning of a project, the way that the project is to be undertaken, stating items that are to be delivered to the Norðurál and the time-scales for each of these deliverables. These items should align with the same items and dates in the Project Plan, it shall provide the mechanism for each item contained in the Plan to be inspected, at each milestone, and for each milestone to be signed off by the Contractor and, the Engineer, as appropriate.

The required minimum contents of such a Quality Plan are described below. Since change can occur during a project it must be recognized that a Quality Plan may require modification during the project but only with the agreement of the Engineer.

3.3.2 PLAN FORMAT

The Quality Plan must be a 'controlled' document. This requires that the Quality Assurance practice of the supplier include formal procedures for document control and version control. The first section of the plan will be the plan cover sheet and the distribution list.

The cover sheet should state the following:

- **Project Title:**
This is used if the service to be provided is a part of a bigger project. The project name will be issued by the Engineer.
- **Package Title:**
This is the title of the service that the Contractor is supposed to provide and will be issued by the Engineer.
- **Package Number:**
This is a unique number, awarded to the Contractor and must appear on every formal document produced during the project and this number will be issued by the Engineer.
- **Owners Identity and Reference code(s):**
In this case Norðurál, Grundartangi Reduction Plant.
- **Revision history table:**
This will include the state and number of revision and all related authorization.

The Distribution list shall be spreadsheet like and list all the stages of the Quality Plan against the recipients of the copies with the numbers of copies to each of them.

The body of the Quality Plan will contain the following items:

- General section, which briefly describes the scope of work.
- Staff and Responsibilities.
- Lines of Communications.
- Quality Plan Stages, with a continuous sequence of numbers starting at 1.
- Description of each stage in sufficient detail for clarity of meaning.
- Control Document, i.e. the document(s) that will be influential on the execution of the stage (stages) in question.
- Verification Document, i.e. the document(s) against which the completion of each stage will be verified.

- Inspection Intent, which includes a separate section for client and supplier and each section, will provide for the Inspection Reports, the date of inspection and the signature of the two inspectors.
- Remarks, a column, which allows a free record of salient points to be recorded as required.

All controlled documents, as the Control and Verification documents shall carry a data panel containing the following:

- Revision History including Status, Date of revision and approval authority for the revision. Space shall be provided for at least four revisions. The first location shall contain the Original entry and this shall be retained permanently whilst the following locations shall record the last (three) revisions or less if fewer than three revisions have occurred.
- The title and the number of the Quality Plan.
- The title and number of that document within the Quality Plan.
- The sheet identity, i.e. sheet 'a' of 'n', if the document contains more than one sheet. If the documents has more than one page, the revision history is only required on the first sheet.
- The revision status of the document.

The different stages of the Quality Plan will have an individual preface cover sheet for each stage

All pages of the Quality Plan shall contain in their footer the following data:

- The revision status of the document. If the particular sheet is a part of a Quality plan stage or other controlled document within the Quality Plan, the sheet will carry the revision number of the stage or the document.
- The page number in the format of page # of ##. If the particular sheet is a part of a Quality plan stage or other controlled document within the Quality Plan, the sheet will carry the page number within that stage or document.

All pages of the Quality Plan shall contain in their header the following data:

- The date of issue.
- Location name, in this case Norðurál.
- Project title, if this Package is a part of a bigger project.
- The Package title and number.
- The title QUALITY PLAN and number.
- The type of document and number of it within the Quality Plan.

3.3.3 QUALITY PLAN SHEETS EXAMPLES.

Cover sheet, example

NORÐURÁL hf

GRUNDARTANGI REDUCTION PLANT, 301 AKRANES,
ICELAND

PROJECT NAME: (EXPANSION)
(Will be obtained from the engineer if the work is part of a bigger project.)

QUALITY PLAN
For the
WORK OF (PACKAGE TITLE)
(Will be obtained from the engineer.)

WORK PACKAGE NUMBER (nnnnn)
(Will be obtained from the engineer.)

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Stage Cover sheet, example

<i>(Header)</i>	NORÐURÁL	QUALITY PLAN	<i>(PACKAGE TITLE)</i>
<i>(PROJECT TITLE)</i>	STAGE (n)	<i>(PACKAGE NUMBER)</i>	

STAGE n
(Number of stage of the quality plan)

STAGE TITLE:

THIS STAGE CONTAINS:
(Brief description of the stage contents)

REV	BY	DATE	CHK'D.	APPROVED	REVISION

<i>(Footer)</i>	DATE OF ISSUE	PAGE NUMBER nn of nn	REVISION:
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3.4 DOCUMENT CONTROL

The Document Control System shall be applicable to all documentation pertinent to the project, whether they be paper based, computer based or magnetic media based, whether they be Contractor generated, Engineer generated, other contractor generated, consultant generated or Norðurál generated.

Documentation should include, but not be limited to, the following:

- Design Notes,
- Minutes of Meetings,
- Reports and Reviews,
- All Correspondence, both incoming and outgoing,
- Drawings,
- Specifications,
- Directories of Personal Work Files,
- Document/Equipment Transmittals,
- Document Release Requests,
- Technical Queries,
- Defect Reports,
- Quality Plans,
- Project Plans,
- Computer and PLC work files.

All incoming documentation that is received shall be acknowledged and, where a response or decision is required, the acknowledgement shall state the time period in which the response will be generated. Where documents are expected to be developed, revised or changed an unambiguous record of version and status will be maintained and shown on the document.

3.5 CHANGE CONTROL

The Change Control System shall be designed to deal with the real world situation where change will occur during the project. It is therefore required to manage change, not inhibit it. This system must integrate with the Document Control System and make full use of the version control mechanisms that are encompassed there in.

4 FDS STANDARDS

4.1 INTRODUCTION

The Functional Design Specifications (FDS) describes the scope and content of the system functionality, including hardware and software structures to be used on each ICA Contract. It shall be noted that with the agreement of the engineer: -

- Inapplicable sections may be explicitly excluded.
- Additional sections may be added if required.

4.2 CONTENTS

Any Functional Design Specification produced should consist of the following or similar sections:

- Title Page
- Document Revision History
- Document approval
- Abbreviations used
- Associated standards
- Related documents

SYSTEM OVERVIEW

- Description of System and Design Requirements
- System Hardware Configuration
- System Hardware and Software Descriptions

SYSTEM ANALYSIS

- Functional Description of System

SYSTEM DESIGN

- Detailed System Description
- Calculations Used in Design

COMMUNICATIONS

- Functional Description of Operator Interfaces
- Graphic and Report Layouts
- System Access and Security
- Alarm System Description
- Communications Protocols

TEST PLAN

- Test Recording Procedures
- Description of Levels of Testing
- List of Tests Necessary to prove system
- Negative Testing Provisions

4.3 SCOPE

The Functional Design Specification is a 'living' document, which exists and is refined throughout the entire project. There are however two major phases encompassed by the scope of the FDS.

ANALYSIS

Culminating in Client and End User approval this would contain the following sections

- SYSTEM OVERVIEW
- SYSTEM ANALYSIS
- COMMUNICATIONS
- TEST PLAN

DESIGN (and IMPLEMENTATION)

Culminating in system acceptance this would consist of a refinement to the sections above and would include the following additional sections

- SYSTEM DESIGN
- INPUT OUTPUT LISTS

The above information will constitute the detailed design specification. It is important that the analysis and design of the project detailed in the FDS be supported by a formal methodology. Design reviews will be held throughout the entire project and records of these reviews will form the basis for system acceptance. System analysis and design is a hierarchical process with each stage being reviewed against appropriate review documentation.

5 TEST SPECIFICATION STANDARDS

5.1 INTRODUCTION

This document describes the scope and content of test specifications to be produced for use on each Contract. It should be noted that: -

- Inapplicable sections may be explicitly excluded
- Additional sections may be added if required

5.2 GENERAL

Each test specification shall have a unique identifying reference number, that must be accepted by the Engineer. Each page of the test specification shall show this reference number plus a unique identifying number allocated by the Contractor, as well as the Revision Status, Page Number and Total Number of pages contained in the document.

5.3 APPROVAL SECTION

At the front of each test specification will be an approval section. This shall contain spaces for signatures indicating levels of approval. Associated with each signature shall be a paragraph indicating the level of responsibility to be undertaken by the signatory.

5.4 RELATED DOCUMENTS

The test specifications shall list any related documents either referred to within the document or which formed the basis for the content of the document.

5.5 SYSTEM TESTING

System testing falls into the following categories:

- Hardware Integration Tests (Panel testing).
- Code Reviews.
- Code Functionality Tests.
- Software System Integration Tests.
- Control System Hardware and Software Integration Tests.
- Plant Hardware and System Integration Tests.
- Site Installed Plant Integration Tests.
- End User Acceptance Tests.

6 ICA SYSTEM TAGGING STANDARD

Tag names shall describe the measured value in the best suitable way. Each tag name shall be structured with a facility code and a process code as described in the Norðurál Standard Technical Specification NA-00-07-TS009.