Base Load Power Hub (BLPH)

DIMENSIONAL CONTROL AND SURVEYING PROCEDURE

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1 INTRODUCTION

1.1 PROJECT OVERVIEW

Crosswind, a Shell and Eneco joint venture, was awarded the tender to develop the offshore Hollandse Kust Noord (HKN) wind farm, located 18.5km off the coast of Netherlands near the town of Egmond aan Zee. The consortium plans to have HKN operational in 2023 with an installed capacity of 759MW generating at least 3.3TWh per year. This is sufficient renewable power to supply more than 1 million Dutch households with green electricity.

Offshore wind farms produce intermittent electricity and balancing these dips and peaks and integrating this electricity into the national energy system requires new technologies. For this reason, the offshore wind farm will include several new technologies that could be implemented at full-scale in the future. The new technologies being explored include a floating solar park, a short-duration battery storage as well as long-term storage via green hydrogen produced by water electrolysis and subsequently consumed in a fuel cell. The combination of these individual measures, herein referred to as the Base Load Power Hub (BLPH) will ensure a continuous power supply regardless of the wind situation.

1.1.1 Project Location

The Hollandse Kust Noord (HKN) wind farm is located 18.5km off the coast of the Netherlands near the town of Egmond aan Zee.

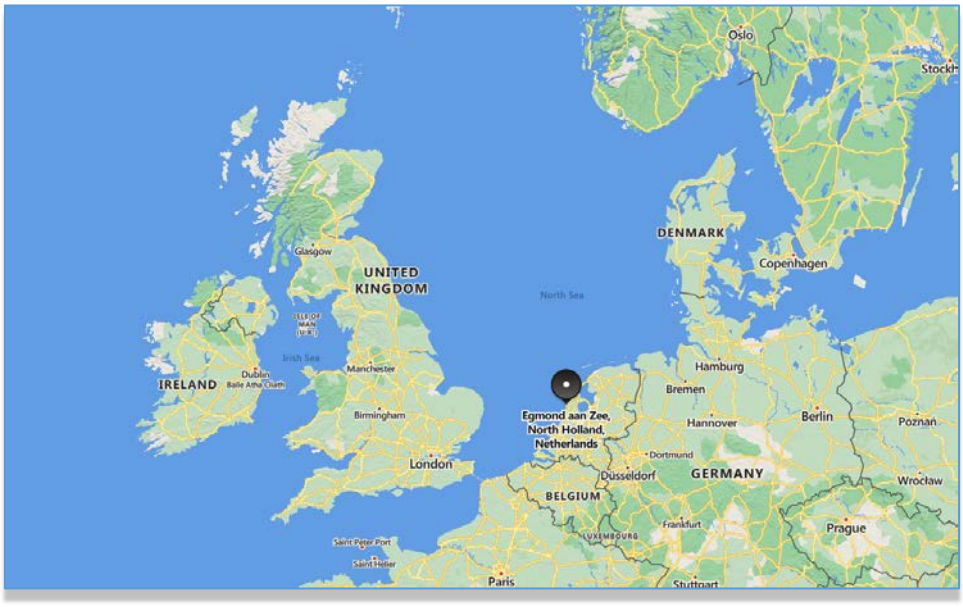


Figure 1 HOLLANDSE KUST NOORD WIND PARK Location Map

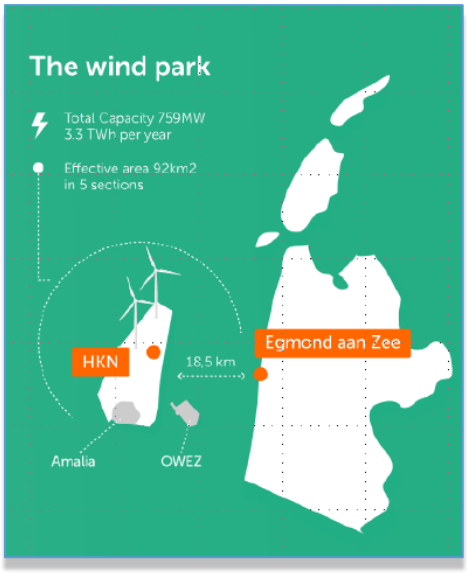


Figure 2 - Wind Park Details

The wind farm will consist of No. 69 x 11.5MW wind turbine generators each to be installed on a dedicated monopile structure. A 70th monopile located on coordinates E 590719.1, N 5841602.3 is reserved for installing the platform accommodating the BLPH. The monopile structure was designed and installed by Van Oord Offshore Wind (VooW) and therefore not part of the BLPH scope.

1.1.2 Project Concept

All components included in the BLPH will be integrated onshore on a topsides and installed in an offshore location within the boundaries of the HKN wind farm. At its simplest, the BLPH will store energy during periods of high electricity generation from renewable sources (a wind turbine generator and the floating solar PV farm) and release it during periods of low generation. In practice. It is expected that the energy stored will supplement generation from renewable sources to ensure that at least 1.0MW of power is exported to the electrical grid regardless of wind/solar availability.

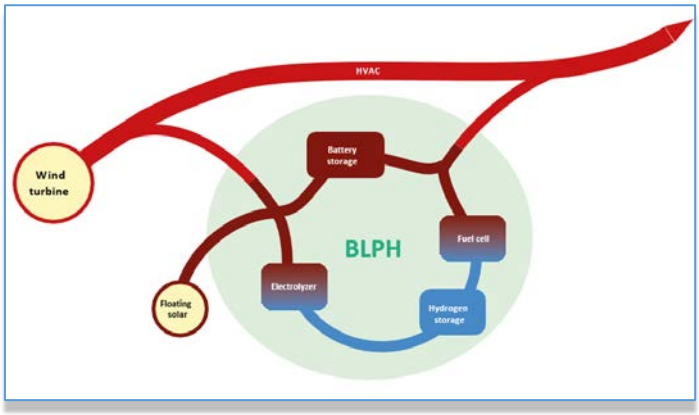


Figure 3 – BLPH Concept

Electricity in the BLPH will be stored in the form of electrons in a battery energy storage system (BESS) as well as converted into green hydrogen via water electrolysis. When the power output from the connecting wind turbine drops to below 1 MWe, the BLPH will return its stored energy to supplement the remaining power output. This will be by discharging the BESS, while stored hydrogen will be converted back into electricity using a fuel cell to extend the discharge duration.

The purpose of the BLPH s to function as a testbed for the integration of energy storage technologies with renewable generation. It is expected that equipment installed on the BLPH will operate as Normally Unmanned Installation for at least two (2) years with no or minimal maintenance and it will have its own independent control room with the ability to communicate with Crosswind's control room.

2 DOCUMENT SCOPE

The purpose of this specification is to define the guidelines, tasks and responsibilities for activities execution of the Dimensional Controls applicable to the construction of the STRUCTURES of the project 123A90.

This document shall be applied to structural fabrication of Nodes and Plate Girders

2.1 REFERENCES

Doc. No.	Description
EEMUA Publication 158 Third Edition	Construction Specification for fixed offshore structures
ISO 19902:2020	Petroleum and natural gas industries – Fixed steel offshore structures

Table 1 - Reference Documents

2.2 DEFINITIONS AND ABBREVIATIONS

COMPANY or Client (CPY):	Crosswind
CONTRACTOR (CTR):	ROSETTI MARINO S.p.A.
MANUFACTURER (MNF)	SCANDIUZZI STEEL CONSTRUCTIONS S.p.A.
PROJECT:	HOLLANDSE KUST NOORD WIND PARK Project
DC	Dimensional Control
QC	Quality Control Dept.
QCI	Quality Control Inspector
ITP	Inspection Test Plan
Production Report	Internal document with evidence of the deviations detected

Table 2 - Definitions and Abbreviations

3 FABRICATION TOLERANCE – DIMENSIONAL CONTROL

3.1 GENERAL

The instruments used shall be in accurate adjustment and shall have current valid calibration certificates.

Tolerances shall be checked at each stage in accordance with the fabrication procedures, and the final survey shall meet the defined tolerances.

Tolerances shall be based on theoretical setting-out points and centre lines of the structure referenced to permanent approved datum points (e.g. co-ordinated survey stations) and corrected to a temperature of +20°.

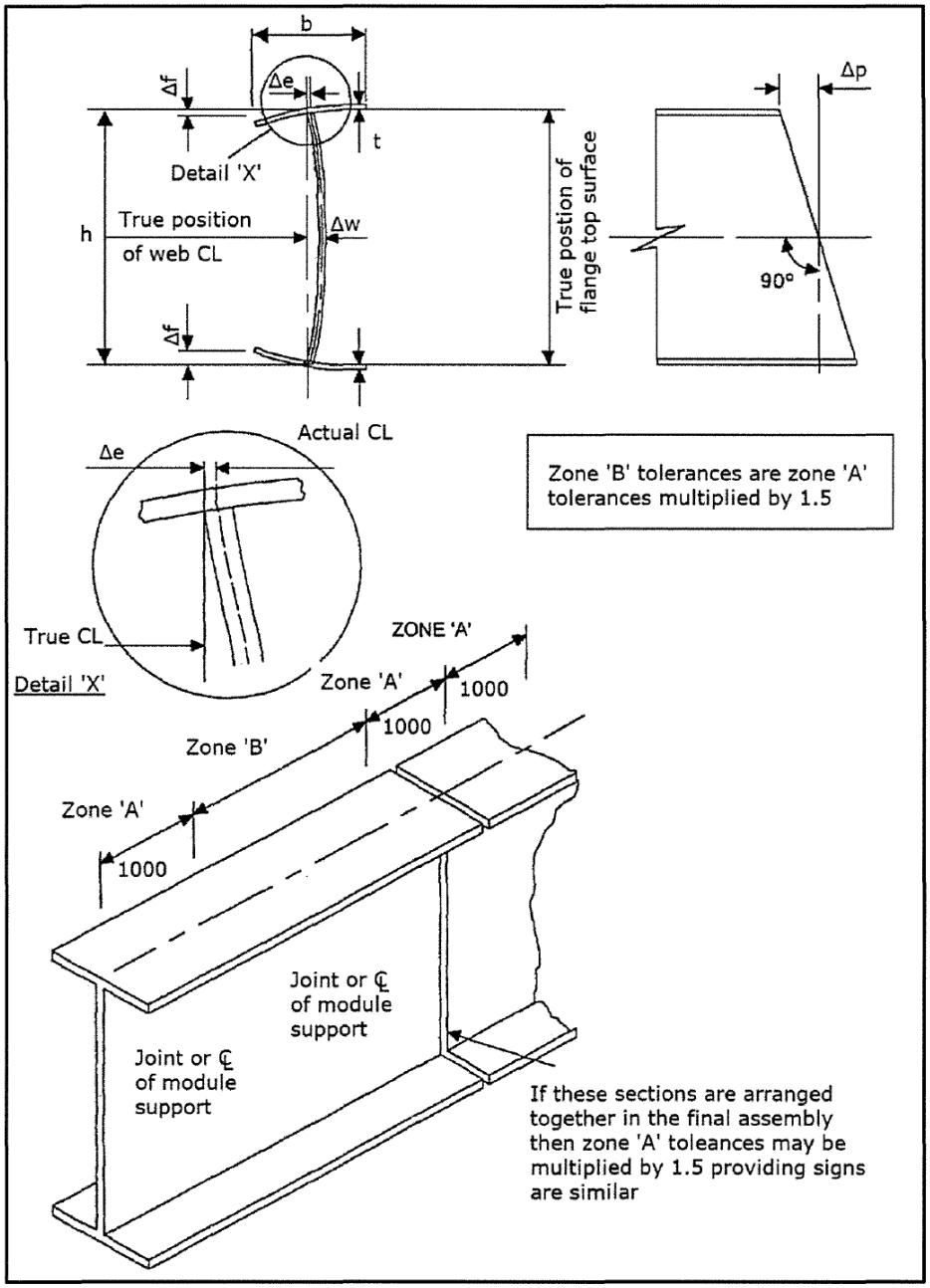
All setting out and fit-ups shall be subject to a tolerance measurement. Where local or global tolerances are not detailed in this Specification the item in question shall not deviate from the nominal design size, shape or position by more than ±15mm.

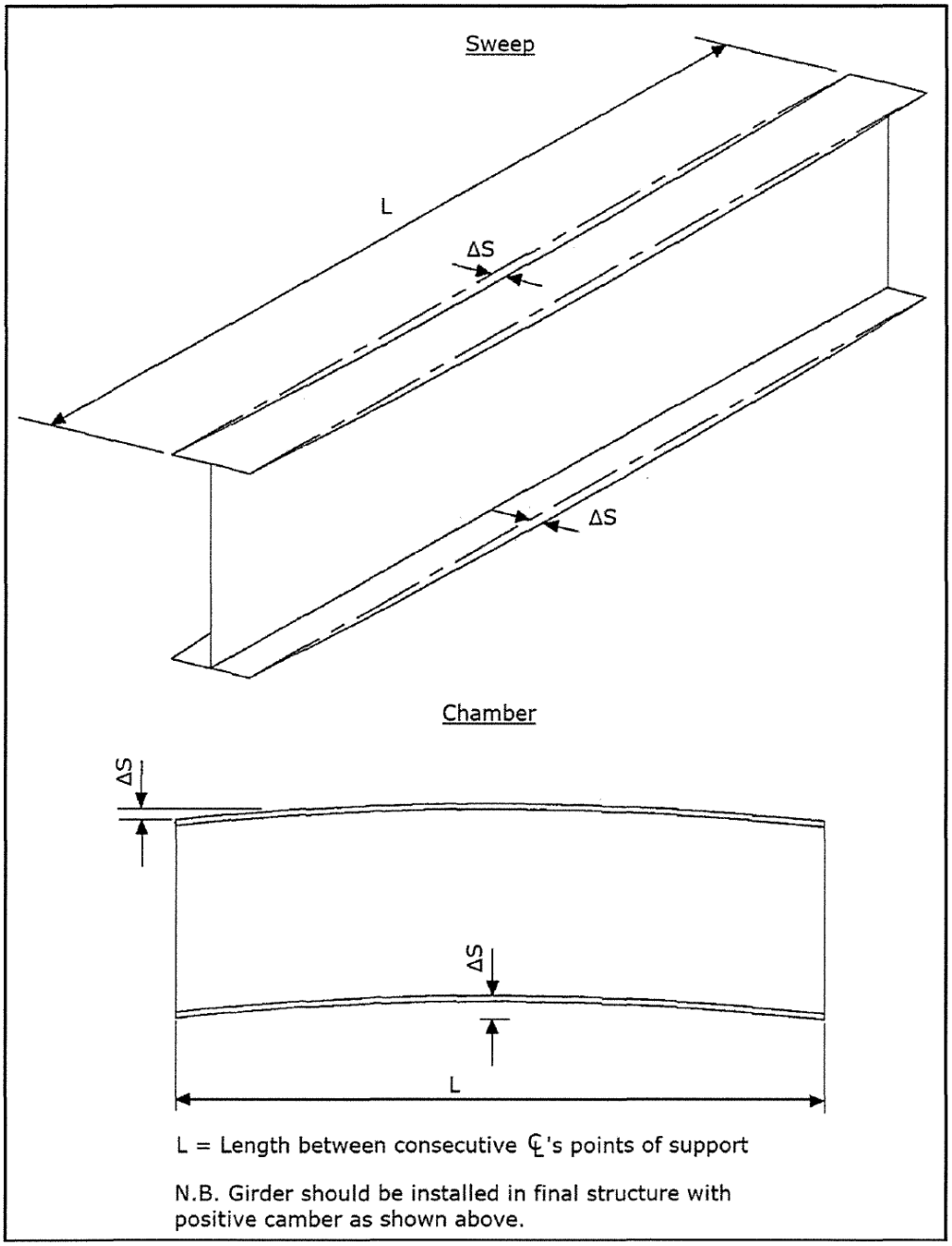
3.2 PLATE GIRDERS

Tolerances for plate girders shall comply with the following requirements:

Table 10 Tolerances for plate girders

	Tolerance	Limiting value (mm)
Web depth	±0·12t	±5
Inclination of web and bow of web (Δw)	±0·008h	±10
Flange width	-	±3
Rotation of flange and bow of flange (Δf) (excluding skid beams)	±0·0125b	±10
Eccentricity of flange on web (Δe)	±0·015b	±5
End perpendicularity (Δp)	-	±3
Out-of-straightness (Δs): normal to web (sweep) and normal to flange (camber)	+0·001L, -0	+15, -0


b
Δf
Δe
t
Detail 'X'
h
True position
of web CL
Δw
Δf
True postion of
flange top surface
Δp
90°
Actual CL
Δe
True CL
Detail 'X'
Zone 'B' tolerances are zone 'A' tolerances multiplied by 1.5
ZONE 'A'
Zone 'A'
1000
1000
Zone 'B'
Zone 'A'
1000
Joint or ℄
of module
support
Joint or ℄
of module
support
If these sections are arranged together in the final assembly then zone 'A' toleances may be multiplied by 1.5 providing signs are similar

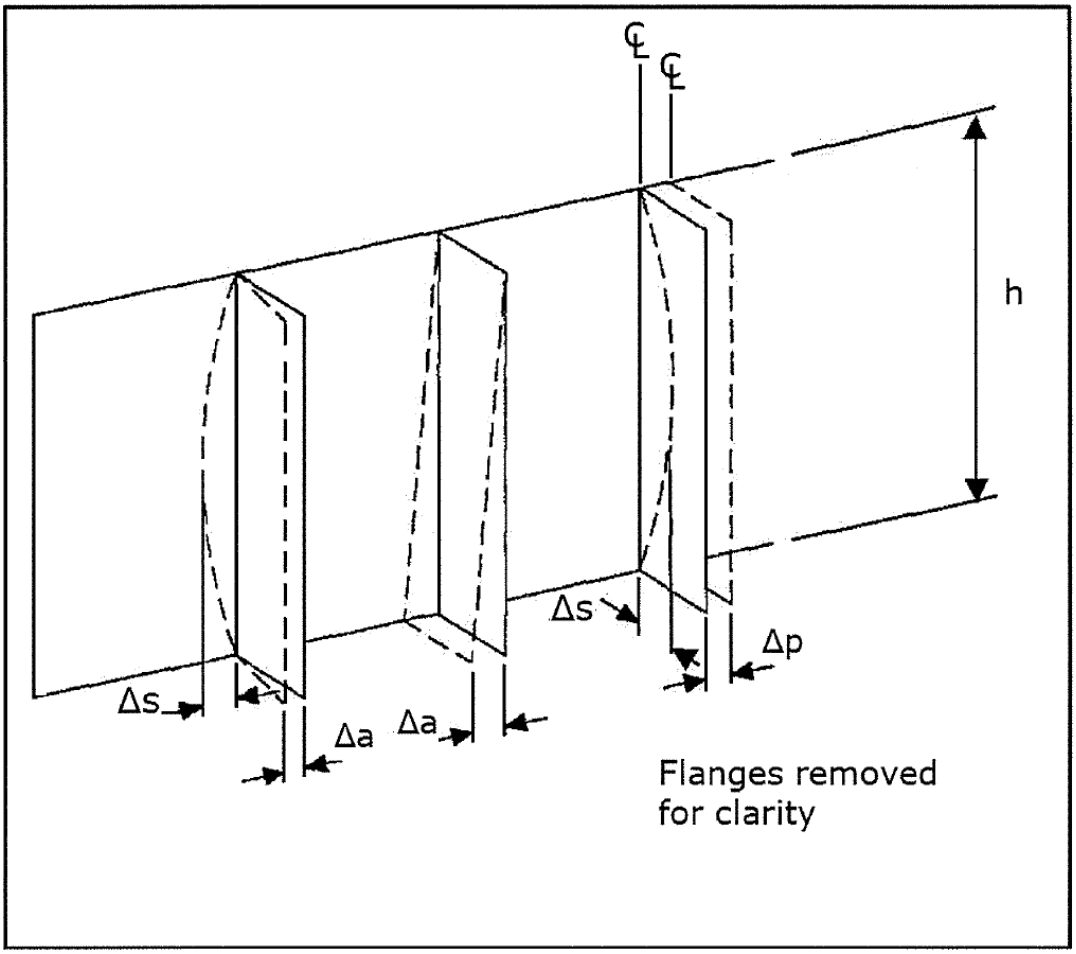


L = Length between consecutive ℄'s points of support

N.B. Girder should be installed in final structure with positive camber as shown above.

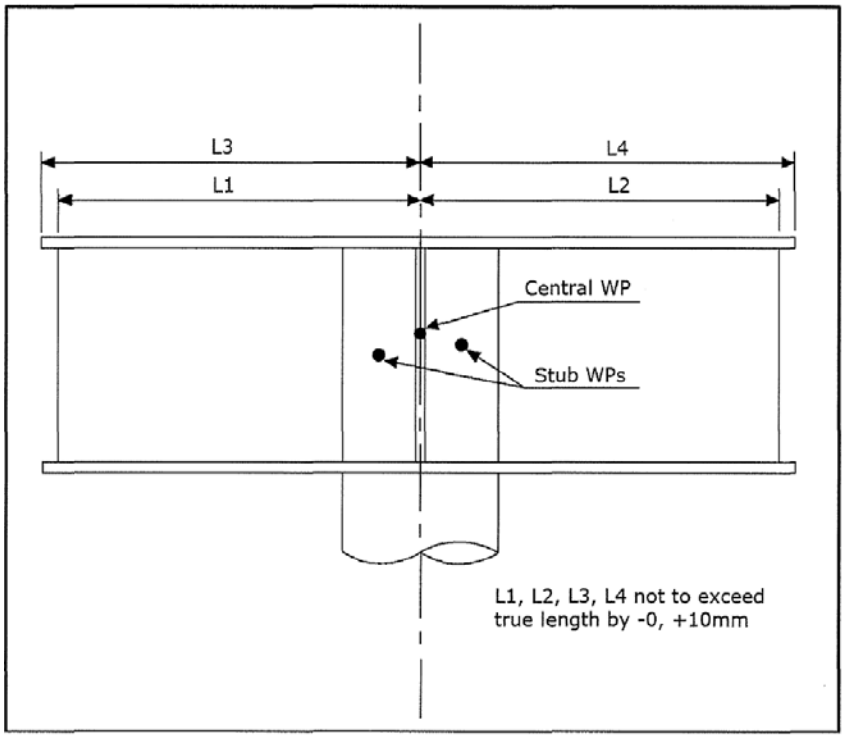
Table 11 Tolerances for plate girder stiffeners

	Tolerance	Limiting value (mm)
Positional deviation (Δp)	-	±5
Angular deviation and inclination (Δa)	±0·005h	±5
Out of straightness normal to girder web plane and normal to stiffener plane (Δs)	-	±5



3.3 GIRDER NODES

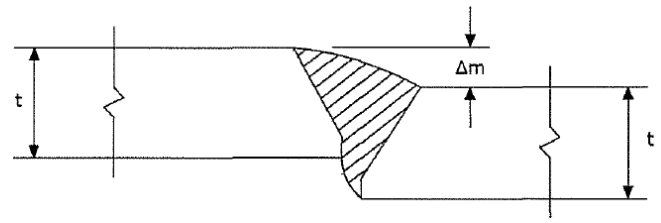
The length of a girder node measured from the central work point to either end shall be within 0 to +10mm of the length as specified in the purchaser approved drawings.



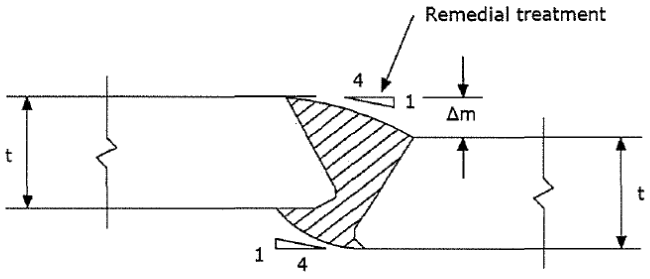
3.4 JOINT MISALIGNMENT

Joint misalignment in fabricated tubulars and rectangular beams shall be in accordance with fit-up dimensions applicable to the qualified welding procedures.

All misalignments greater than 2mm or 10% of the wall thickness, whichever is larger, in double-sided butt welds shall be built up with weld deposit to give a cross joint taper of 1:4.



A. Single sided butt



B. Double sided butt

Types of section	Δm
Circular and longitudunal seams	Double sided welds: 10% t (but not > 6mm) Single sided welds: 10% t (but not > 3mm)
Rectangular (except skid beams) all thicknesses	12% t (but not > 5mm)

4 REPORTS

Dimensional certificates (see attached template) will be issued for the approval of finished plate girders and nodes.To these dimensional certificates will be attached the drawing of the checked items with the major dimensions measured values.

SCANDIUZZI	DIMENSIONAL CHECK REPORT	Certificate Num.	Pages	Issue Date
			1 of x	

Customer	Project Name	Item	Purchase Order	Rev.

Material Description	
Examination Place	

Reference Standard		Acceptance Criteria	

Type of Control	Internal	Internal with Customer	Supplier Site	Customer Site

ITP Number	Phase Description

Test Type	
	VISUAL TEST
	DIMENSIONAL TEST
	IN PROCESS TEST
	SUPERFICIAL TREATMENTS

Test Result	
	ACCEPTED
	REJECTED

Remarks	

Issue Date	Scandiuzzi Steel Constructions			TPI
	Amoroso Moreno			

For Items and quantities see next page(s)

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