

CONNECTIONS IN REINFORCED CONCRETE AND STRUCTURAL STEEL

by

Costandinou Demetris

Project Report

Submitted to

the Department of Civil Engineering

of the Higher Technical Institute

Nicosia - Cyprus

In partial fulfillment of the requirements

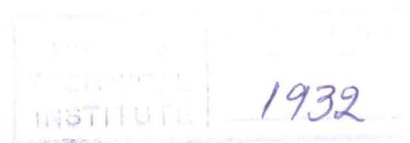
for the diploma of

TECHNICIAN ENGINEER

in

CIVIL ENGINEERING

June 1992



ACKNOWLEDGEMENTS

I gratefully acknowledge the assistance given by Mr. Demetris Andreou in reading and commenting my project.

June 1992

COSTANDINOU DEMETRIS

CONNECTIONS IN REINFORCED CONCRETE AND STRUCTURAL STEEL

SUMMARY

This project is concerned with the behaviour and design of connections in reinforced concrete and structural steel.

Chapter 1 provides a general introduction for the connections.

Chapter 2 deals with connections between members which are constructed in reinforced in situ concrete. Connections between beams and columns are considered first and in greater detail than connections between other types of member e.g., corbel (zero applied moments) connections, column-to-column connection, right-angled beam-to-beam connections, in-line beam-to-beam connections, slab-to-wall connections etc. Towards the end of the chapter a number of design examples are provided.

Chapter 3 deals with the behaviour and design of welded and bolted structural steel connections. Direct shear joints, single shear and double shear, are checked for failure by shear on the bolt shank, bearing on the member or bolt, tension in the member and shear at the end of the member. Eccentric connections subject to torsion and direct shear forces are considered towards. Then various types of pinned and rigid connections are discussed in greater detail e.g. beam-to-column connection, beam-to-beam connection, column-to-foundation connection etc. Structural hollow sections with their various types are considered later, a tube with another, a tube with a flat plate, a rectangular hollow section with another or with a flat plate. Towards the end of the chapter a number of design examples are provided based on the literature given in the chapter. Finally the conclusions are given.

CONTENTS

	Page
ACKNOWLEDGEMENTS	
SUMMARY	
1. GENERAL INTRODUCTION	
2. CONNECTIONS BETWEEN MEMBERS IN-IN SITU CONCRETE	
2.1 Introduction	1
2.2 Beam-to-column connections	1
2.2.1 Two member beam-to-column connections	3
2.2.2 Three member beam-to-column connections	8
2.2.3 Four member beam-to-column connections	12
2.3 Corbel (Zero applied moments) connections	14
2.3.1 Simple corbel connection	14
2.3.2 Beam half joint	18
2.4 Column-to-column connections	20
2.5 Right-angled beam-to-beam connections	23
2.6 In-line beam-to-beam connections	24
2.7 Slab-to-wall connections	24
2.8 Column-to-base connections	25
2.9 Slab-to-column connections	26
2.10 Anchorage lengths	27
2.11 Laps and joints	29
2.12 Bearing stress inside bends	30
2.13 Design examples	
Example 2.13.1 Beam-to-column connection	31
Example 2.13.2 Beam-to-column connection;	33
Example 2.13.3 Three-member beam-to-column	35
Example 2.13.4 Column-to-column connection	39
3. CONNECTIONS IN STRUCTURAL STEEL	
3.1 Introduction	41
3.2 Welding and types of weld	41
3.3 Permissible stresses in welds	43
3.4 Bolting and types of bolts	44
3.5 Spacing of bolts	46

3.6	Edge and end distance for bolt holes	47
3.7	Permissible stresses for bolts	47
3.8	Connections subject to simple shear forces ..	48
3.8.1	Bolted connection	49
3.8.2	Welded connection	53
3.9	Connections subject to eccentric shear forces	54
3.9.1	Bolted column bracket	54
3.9.2	Welded column bracket	57
3.10	Pinned Connections	59
3.10.1	Beam-to-column connections	59
3.10.2	Beam-to-beam connections	60
3.10.3	Column-to-foundation connections	62
3.11	Rigid Connections	64
3.11.1	End-bearing column bracket	64
3.11.2	Beam-to-beam connections	67
3.11.3	Beam splices	69
3.11.4	Column splices	71
3.11.5	Column-to-foundation connections	74
3.12	Connections for structural hollow sections ..	76
3.12.1	Types of connections	77
3.12.2	Design of welded joints	77
3.12.3	Length of intersection	80
3.13	Design examples	
	Example 3.13.1 Double covered butt joint ..	85
	Example 3.13.2 Welded tie bar	86
	Example 3.13.3 Bolted bracket connection subject to torsion and shear forces	87
	Example 3.13.4 Welded bracket connection subject to torsion and shear forces	89
	Example 3.13.5 Pinned beam-to-column connection	90
	Example 3.13.6 Pinned beam-to-beam connection	91
	Example 3.13.7 Pinned column-to-foundation connections	93
	Example 3.13.8 Rigid continuous beam-to-beam connection	96
	Example 3.13.9 Rigid beam-to-column connection	97
	Example 3.13.10 Rigid beam splice	99
	Example 3.13.11 Rigid column splice connec- ting two sections of the same serial size	101
	Example 3.13.12 Structural hollow section	104
4.	CONCLUSIONS	105