



شبكة المعلومات الجامعية

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ





شبكة المعلومات الجامعية



شبكة المعلومات الجامعية

التوثيق الالكتروني والميكرو فيلم

جامعة عين شمس

التوثيق الالكتروني والميكرو فيلم

قسم

نقسم بالله العظيم أن المادة التي تم توثيقها وتسجيلها
علي هذه الأفلام قد اعدت دون أية تغيرات



يجب أن

تحفظ هذه الأفلام بعيداً عن الغبار

في درجة حرارة من 15 – 20 مئوية ورطوبة نسبية من 20-40 %

To be kept away from dust in dry cool place of
15 – 25c and relative humidity 20-40 %



شبكة المعلومات الجامعية



بعض الوثائق الأصلية تالفة



شبكة المعلومات الجامعية



بالرسالة صفحات
لم ترد بالأصل

BEHAVIOR OF NON-PRISMATIC FOLDED PLATE STRUCTURES

By
MESIHA GEORGI MESIHA

A Thesis Submitted to the Faculty of Engineering at
Cairo University in the Partial Fulfillment of the
Requirements for the Degree of
Master of Science
in Civil Engineering (Structures)

Approved by the
Examining Committee

Associate Professor Dr. NABIL S. GHABRIAL, Thesis Main Advisor

Professor Dr. Sabri Samaan

(Cairo University)

Ssamaan

Professor Dr. Ahmed Abd-ellminam Korashy

(Ain shams University)

A. Korashy

B
AA 0-

**Faculty of Engineering , Cairo University
Giza , Egypt
January 1997**

1941

Dear Sir,

Thank you for your letter of 14th inst.

which I have just received.

Yours faithfully,

I am very glad to hear that you are well and hope that you will continue to be so. I am also glad to hear that you are still interested in the work of the Society and that you are still contributing to it. I am sure that your valuable assistance will be of great help to the Society in the future.

I am, Sir, very truly yours,

(language help)

ACKNOWLEDGMENT

First of all the author thanks God who gives him the life and the strength to complete this work. A special thanks to Prof. Dr. Sabri Samaan who supports him with the research tools of his office.

The author is greatly indebted to Dr. Nabil Gabrial, Associate professor, for his initiation of the research theme, his valuable guidance, and fruitful discussions. The author wishes to express his deep thankfulness to Dr. Samir Seif for his helpful guidance, continuous encouragement, and sincere help during the completion of this work.

Thanks for my parents, all friends, and colleagues specially Dr. Amir Bakhoun for his language help.

section

The following table shows the

(from)

and is the same as the one in the

previous section, but with the

of the previous study is omitted

between the longitudinal section

the vertical section, and the

with experiment (1935) (1935) (1935)

There is a large amount of

binding and the plane of the

reptil chord, the span, these

crosses the binding, and also

elements and sections of the

longitudinal part, and in the

ABSTRACT

The behavior of non-prismatic folded plate system is investigated here taking into account the effect of depth variation along the span, and the variation of the plate thickness. The study is based upon finite element technique. The used element has six degrees of freedom (including plate bending and plane stress action). Simply supported panel and continuous panels with infinite number of spans are considered. The effects of gravitational load and prestressing force in the longitudinal direction are studied.

A dimensionless parametric study is carried out. Many figures illustrate the relationships between deflections, longitudinal stresses, and transversal bending moments are plotted versus the variation of the mid span depth. A verification case has been solved to compare the results with experimental work by Trivedi (1983). This showed a good agreement.

Two important phenomena are observed, namely membrane forces and longitudinal bending moment out of the plane of the elements. Membrane forces are developed when the depth changes along the span. These membrane forces affect the distribution of longitudinal stresses that are calculated considering the bending action only. Also transversal bending moments and distortions of the cross section are created with significant values due the longitudinal prestressing in the inclined plates of the open cross section of the discussed cases.

1970

1971

1972

1973

1974

1975

1976

1977

1978

1979

1980

1981

1982

1983

1984

1985

1986

1987

1988

1989

1990

1991

1992

1993

1. Introduction	20
2. Behavior	20
3. Results	20
4. Discussion	20

Table of Content

Chapter	Page
1 INTRODUCTION	
1.1 General	1
1.2 Scope of Study.....	4
1.3 Prestressed Folded Plates	4
1.4 Organization of The Thesis.....	5
2 LITERATURE REVIEW	
2.1 Introduction	6
2.2 Historical Review	6
2.3 Analytical Methods	9
2.3.1 General.....	9
2.3.2 Elementary analysis (Winter & Pie, 1947).....	9
2.3.3 Refined analysis (Method of Consistency of Angular Deformations)	13
2.4 Experimental Work	16
2.4.1 Prismatic Systems.....	16
2.4.2 Continuous Prismatic Systems	20
2.4.3 Non Prismatic Systems	22
2.4.4 Prestressed folded plates systems.....	25
2.4.5 Comment	27
3 MATHEMATICAL MODELING OF NON-PRISMATIC FOLDED PLATES	
3.1 Introduction	28
3.2 Behavior of The System	29
3.2.1 Geometrical Configurations	29
3.2.2 Material l Properties	29
3.3 Finite Element Technique Applied to Non-Prismatic Folded Plates	30

Chapter	Page
3.3.1 Elements and nodes	30
3.3.2 Degrees of freedom	30
3.3.3 Internal forces	32
3.3.4 Boundary Conditions.....	34
3.4 Prestressing Force	40
3.4.1 General	40
3.4.2 Cable profile	40
3.4.3 Introducing prestressing force.....	43
3.4.4 Derivation the equivalent distributed prestressing loads for parabolic cable profile.....	45
3.5 Test Problem.....	48
4 PARAMETRIC STUDY	
4.1 Introduction.....	50
4.2 Case Study.....	50
4.2.1 General geometrical features of folded plates system taken into consideration.....	50
4.2.2 Parameters	52
4.3 Results and Discussions.....	61
4.3.1 Simply Supported Panel with Parabolic Depth Variation	61
a-Normal Stresses	61
a-1 General distribution of normal stresses	61
a-2 Variation of normal stresses at critical points versus depth.....	61
b- Transversal Bending Moment.....	64
b-1 General Distribution of transversal bending moments	64
b-2 Variation of transversal bending moment at critical points versus depth....	64
c- Vertical deflection.....	67

Chapter	Page
4.3.2 Continuous Panels with Parabolic Depth Variation	68
a- Normal Stresses	68
a-1 General distribution of normal stresses	68
a-2 Membrane phenomenon	68
a-3 Variation of normal stresses at lower valley versus the depth	73
a-4 Variation of normal stresses at upper ridge versus the depth	75
b- Transversal Bending Moment.....	77
b-1 General Distribution of transversal bending moments	77
b-2 Variation of transversal bending moment at lower valley versus the depth	77
b-3 Variation of transversal bending moment at upper ridge versus the depth	77
b-4 Variation of transversal moment at mid point of upper plate versus the depth	77
c- Bending moment in the longitudinal direction.....	80
d- Vertical deflection.....	81
4.3.3 Simply Supported Prestressed Panel with Parabolic Depth Variation.....	82
a- Normal Stresses	82
a-1 General distribution of normal stresses	82
a-2 Variation of longitudinal stress at lower valley versus the depth.....	82
a-3 Variation of longitudinal stress at upper ridge versus the depth.....	85
b- Transversal Bending Moment.....	85
b-1 General Distribution of transversal bending moments	85
b-2 Variation of transversal bending versus the depth.....	87
c- Vertical deflection.....	89
4.3.4 Continuous Prestressed Panels with Parabolic Depth Variation.....	90
a- General.....	90
b- Normal Stresses	90

Chapter	Page
b-1 General distribution of normal stresses	90
b-2 Variation of longitudinal stress at lower valley versus the depth.....	94
b-3 Variation of longitudinal stress at upper ridge versus the depth.....	96
c- Transversal Bending Moment.....	96
d- Deflections	101
4.3.5 Simply Supported Panel with Variable Plates Thickness.....	104
a- Normal stresses.....	104
b- Transversal bending moments	104
4.3.6 Simply Supported Panel with Linear Depth Variation	107
a- Normal stresses.....	107
b- Transversal bending moments	107
5 CONCLUSIONS AND FUTURE WORKS	
5.1 Conclusions.....	109
5.2 Proposed and future works.....	111
REFERENCES.....	112