

Chapter One

Introduction

1.1 Introduction:-

Slabs are surface structures which can derive their spatial configuration through continuous three dimensional surfaces, and the loads are resisted by the surfaces themselves. These structures carry tension, compression and in-plane shear within the surface as membrane forces. Bending and transverse shear are carried either normal to or within the surface, depending on the loading and the surface orientation.

Slabs provide some of the most efficient structural systems in terms of material usage, cost, time, formwork and this leads to inherent economies. Slabs form floors, roofs in buildings, deck of bridges...etc. normally they carry uniformly distributed loads. Slabs also tend to work as a diaphragm for lateral loads, it provides the overall structure stability by bracing columns.

Slabs are much more difficult to analyze because the surface geometry and the three dimensional material properties must be taken into account.

Slabs which are rectangular can be analyzed using the elastic analysis by idealization into strips or beams spanning one way or a grid with the strips spanning two ways, method of coefficients which is used for the two-way systems that are supported on non-yielding beams and the direct design method which can be used for column supported slabs.

1.2 Types of slabs:

Choose type of the suitable slab for particular case has major economic turnaround and provide time.

In reinforced concrete construction, slabs are used to provide flat useful surfaces. A reinforced concrete slab is a broad, flat plate, usually horizontal with top and bottom surfaces parallel or nearly so. It may be supported by reinforced concrete beams (and is usually cast monolithically with such beams), by masonry or reinforced concrete walls, by structural steel members, directly by columns or continuously by the ground.

Slabs generally can be classify according to distribution of loads as follow:

When slabs supported on two opposite sides only as shown in Fig 1.1a in which case the structural action of the slab is essentially *one-way*, the loads being carried by the slab in the direction perpendicular to the supporting beams. There may be beams on all four sides, as shown in Fig.1.1b, so that *two-way* slab action is obtained. Intermediate beams, as shown in Fig. 1.1c may be provided. If the ratio of length to width of one slab panel is larger than about 2, most of the load is carried in the short direction to the supporting beams and one-way action is obtained in effect, even though supports are provided on all sides.

Concrete slabs may in some cases be earned directly by columns, as shown in Fig.1.1d, without the use of beams or girders. Such slabs are described as *Flat plates* and are commonly used where spans are not large and loads not particularly heavy. *Flat slab* construction, shown in Fig.1.1e is also beamless but incorporates a thickened slab region in the vicinity of the column and often employs flared column tops. Both are devices to reduce stresses due to

shear and negative bending around the columns. They are referred to as *drop panels* and *column capitals* respectively.

Closely related to the hat plate slab is the two-way joist, also known as a *grid* or *waffle slab* shown in Fig 1.1f. To reduce the dead load of solid slab construction, voids are formed in a rectilinear pattern through use of metal or fiberglass form inserts, a two-way ribbed construction results. Usually inserts are omitted near the columns, so a solid slab is formed to resist moments and shears better in these areas.

In addition to the column-supported types of construction shown in Fig.1.1, many slabs are supported continuously on the ground, as for highways, airport run ways, and warehouse floors. In such cases, a well-compacted layer of crushed stone or gravel is usually provided to ensure uniform support and to allow for proper sub-grade drainage. Slabs may also be pre-stressed using high tensile strength strands.

According to shape of panel slab can be non-rectangular and classified as fallow:

- Circular slab,
- Triangular slab,
- Trapezoidal slab,
- Other shapes of slab.

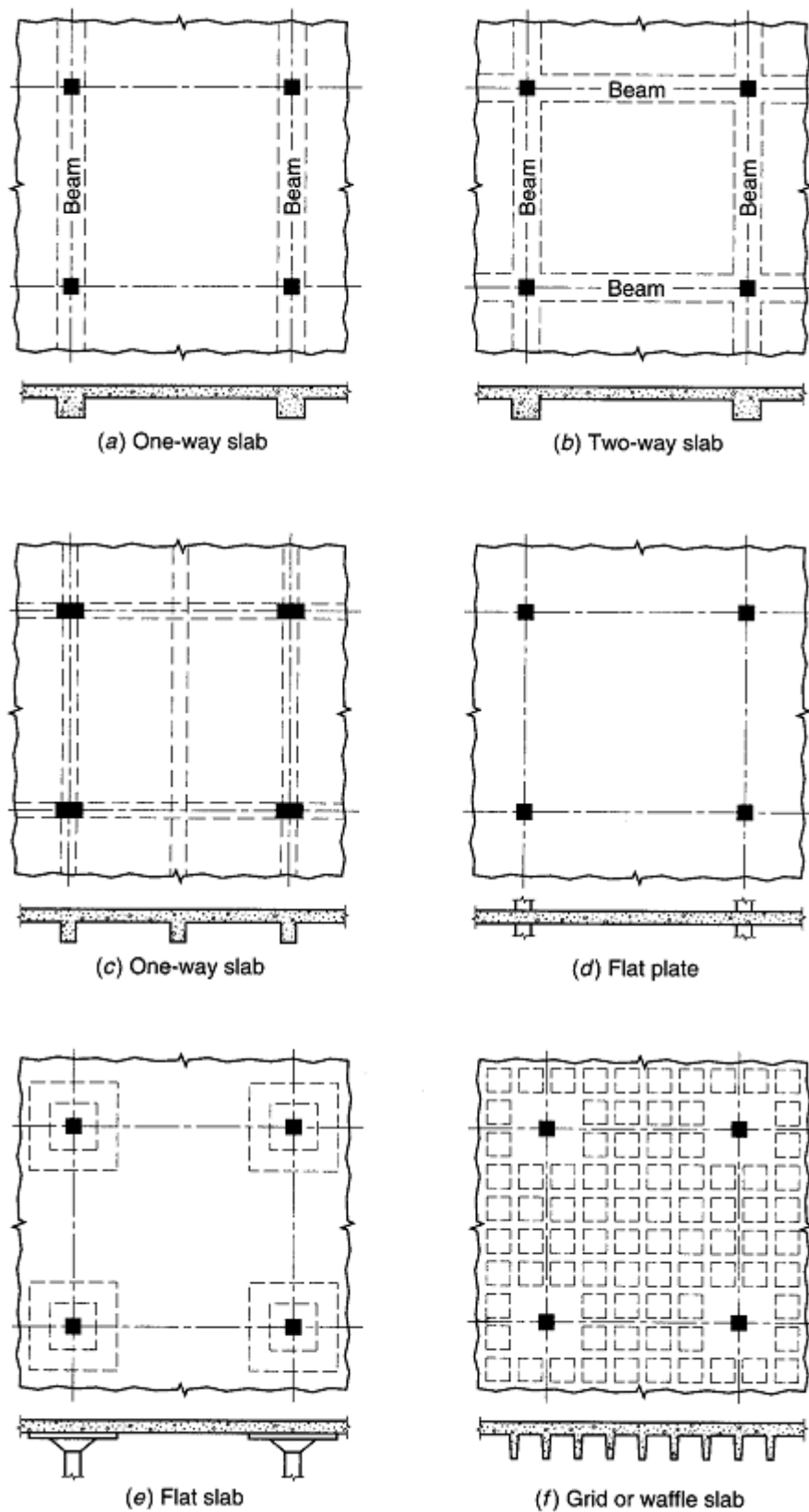


Figure1.1 Types of structure slabs.

1.3 Objective

The objective of this research is:

- 1- Investigate the kinds and shapes of slabs.
- 2- Investigate the structural behavior of slabs.
- 3- Analysis and design methods for slabs.
- 4- Comparison procedure between the structural systems of slabs.

1.4 Overview

To achieve these objectives the study was arranged as follows:

- Chapter one: Introduction.
- Chapter two: Edge supported slabs structural behavior, and design.
- Chapter three: columns supported slabs structural behavior, and design.
- Chapter four: Slabs design Applications and comparison.
- Chapter five: Conclusion and Recommendations.