CONCORSO PUBBLICO, PER ESAMI, A N. 1 UNITÀ DI CATEGORIA D, POSIZIONE ECONOMICA D1, AREA TECNICA, TECNICO-SCIENTIFICA ED ELABORAZIONE DATI, PER LE ESIGENZE DEL DIPARTIMENTO DI STRUTTURE PER L'INGEGNERIA E L'ARCHITETTURA DELL'UNIVERSITÀ DEGLI STUDI DI NAPOLI FEDERICO II (cod. rif. 2407) INDETTO CON DECRETO DEL DIRETTORE GENERALE N. 301 DEL 14.03.2024 E PUBBLICATO SULLA G.U. IV SERIE SPECIALE – CONCORSI ED ESAMI N. 25 DEL 26.03.2024

GRUPPO DI QUESITI NON ESTRATTI ALLA PROVA ORALE DEL 06.06.2024

GRUPPO DI QUESITI N. 4

1) Le fasi comportamentali di una sezione in CA inflessa.

2) Le funzioni del Rettore.

3) In un foglio di lavoro del software Microsoft Excel, creare la tabella di seguito riportata, quindi creare un grafico a dispersione con linee rette, che rappresenti la massa del campione in funzione della sigla dello stesso:

Sigla campione	**Spessore del materassino [mm]**	**Massa del campione [kg]**
1	20,5	1,10
2	21,0	1,15
3	20,0	1,20
4	21,5	1,05
5	20,5	1,10

load is 0.25 kN on a 1/20-scale model). This reduction is even more dramatic when a low-modulus material such as plastic is used in the model.

The major limitations of using structural models in a design environment are those of time and expense. In comparing physical models with analytical models, one finds that the latter are normally less expensive and faster, and one cannot expect physical models to supplant or replace analytical modeling of structures when the latter procedure leads to acceptable definition of behavior of the prototype structure. Thus, physical models are almost always confined to situations where the mathematical analysis is not adequate or not feasible. Another limiting factor is that changes in the prototype design resulting from the results of a model study may require a second model to check the design. Practical considerations therefore often dictate that the model will be used to verify a "nearly finalized" design.

The time involved in modeling is often subjected to further pressures because the decision to go to a physical study is often made at the last minute, after more conventional approaches are proved inadequate. An engineer who is accustomed to getting all answers by analytical means is naturally hesitant to admit that the analysis is insufficient and that a physical model is needed. Suitable efforts must be made to predict earlier in the design process that a test is needed. This would enable earlier planning and a smoother, less hectic approach to the model study.

Design applications of structural models have been outlined earlier in this chapter. Structural models are also widely employed in research programs in such applications as the following:

1. Development of experimental data for verification of the adequacy of proposed analytical methods.
2. Study of basic behavior of complex structural forms such as shells.
3. Parametric studies on member behavior. Much of our basic research on reinforced concrete flexural members has been done on large-scale models.
4. Behavior of complete structural systems subjected to complex loading histories, such as coupled shear walls and connecting beams.
5. Development of new structural systems. The "dry stack" interlocking block masonry units described in Chapter 10 are an example.

Many of these areas of research modeling will be explored through examples in subsequent chapters. It is well recognized that research models play an invaluable role in improving knowledge of structural behavior and thereby pave the way for new and improved design methods. This role will always be important in structural engineering because it is a discipline founded strongly on physical behavior of real systems made of ordinary materials of construction.

1.9 ACCURACY OF STRUCTURAL MODELS

The reliability of the results from a given physical modeling study is perhaps the single most important factor to the user of the modeling approach. This topic is explored in depth in Chapter 9, and only a few general comments will be given here to stimulate the reader into thinking about this important topic. Adequate definitions of reliability and accuracy are difficult to formulate. One obvious measure is the degree to which a model can duplicate the response of a prototype structure. The problem met in such a comparison is the inherent variability in the prototype itself, particularly if it is a reinforced concrete structure. Two supposedly identical reinforced concrete elements or structures will normally show differences, sometimes as high as 20% or more, and when one must compare a model to a single prototype, the difficulty in making a firm conclusion on accuracy becomes rather apparent. Multiple prototypes and multiple models are needed to treat the results statistically, but the expense of even a single test structure is usually high, and the availability of sufficient data for application of statistical tests of significance is severely limited.

GRUPPO DI QUESITI N. 6

1) Metodi di analisi globale per la valutazione della risposta strutturale sismica.

2) Il Senato Accademico.

3) Aprire PowerPoint e crea una nuova presentazione scegliendo un modello disponibili
La prima diapositiva deve avere come titolo "Prova orale"
Crea rapidamente 1 diapositiva uguale alla prima utilizzando la funzione "duplica diapositiva"
Salva il file sul desktop con il nome "prova"

however, considerable skill and experience are prerequisites to achieve successful results. Thermosetting plastics are preferred to thermoplastics in the manufacture of shell models with varying thickness. Any complex curved surface with any desired thickness variation can be cast conveniently using thermosetting plastics. One must remember that the thickness of such shells is affected by the variations in thickness due to the forming process. This variation is governed by dissipation of the heat of polymerization, and therefore care must be exercised in using thermosetting plastics.

The advantage of using epoxy resins compared with thermoplastics is that the limited development of the heat of polymerization assures a more homogeneous hardening process, which results in a constant elastic modulus throughout the mass (Fumagalli, 1973). Also, the relatively lower shrinkage that occurs in epoxy resins after casting results in a significant decrease in the internal stresses. These are particularly useful in models of varying thickness where the internal stresses can even lead to fracture of the model. Properties of some plastics commonly used for structural models are described in Table 3.1. It must be noted that *only* typical values of the properties of plastics used by some investigators are listed. There are other available plastics that may be suitable for model work.

Epoxy resins also offer the possibility of modifying their physical properties by adjusting the quantity of hardener or by adding an inert material such as a filler dispersed homogeneously throughout the mass and/or reinforcements consisting of inorganic or organic fibers. Silica sand, powdered metal (aluminum or iron), cork, lead shot, polystyrene granules, and other ingredients have been successfully used as fillers. The addition of fillers alters the material density and modifies the modulus of elasticity within wide limits. It also decreases the temperature rise due to the generated heat of polymerization and reduces shrinkage and the associated internal stresses. Powdered cork, sand, and polystyrene help reduce the values of the Poisson's ratio, while the use of an aluminum powder increases the thermal conductivity, which helps disperse the heat generated from the electrical resistance strain gages later applied to the surface. Properties of some epoxy resin mixes with varying amounts of selected fillers are shown in Table 3.2.

3.3.2 Tension, Compression, and Flexural Characteristics of Plastics

The strength and stress–strain characteristics of plastics are dependent on a number of factors, such as the type of test (tension, compression, or flexure), the specimen size, the rate of loading, and the previous stress history in terms of creep and relaxation. The mechanical properties of plastics are also significantly influenced by temperature and relative humidity, which are discussed in more detail in Section 3.5. The measured properties vary not only from batch to batch but also from one sheet thicknesss to another within the same batch. Reasonable care must therefore be exercised to determine the properties in the laboratory under conditions of temperature and relative humidity similar to those in which the model will be both cast and tested. Also, it is important that if the model is subjected principally to direct stresses, the modulus of elasticity in direct tension or compression should be determined from tension or compression tests on suitable specimens. Similarly, if the model is subjected principally to bending, the modulus of elasticity in flexure should be determined using a cantilever beam test or a similar flexure test.

It is recommended that the tension and flexural specimens should be at least 8 in. (200 mm) long, randomly selected from the material for model construction. A brief description of the specimens recommended by the American Society for Testing and Materials (ASTM) Standards and of specimens used by some investigators is presented in Table 3.3.

Details of the tension specimen Type 1 recommended by ASTM Standard D638 *Standard Test Method for Tensile Properties of Plastics* are shown in Figure 3.1. The specimen has a uniform cross section (12.5 mm × sheet thickness) over a length of 57 mm and a gradual transition to the two enlarged ends to prevent failure at the grips. It is recommended that this specimen be used in model material evaluations.

PER ORDINE DEL PRESIDENTE
IL SEGRETARIO DELLA COMMISSIONE
F.to dott. Pasquale PIROLLI