

Structural Design of Industrial Facilities

Purpose and Background

Efficient structural design of industrial facilities requires engineers to possess integrated knowledge of theories and practices and it is essential to understand the issues that can impact stability, safety, and serviceability. This course presents structural design of industrial facilities in a systematic manner starting with different types of structural systems and essential subsystems including crane runways, mill buildings, combined columns, and industrial floors.

The instructor will review the analysis of elevated floors subjected to moving loads (traffic) and establishes structural design procedures by illustrating them with numerical examples similar to those typically encountered in design offices. The course concludes with the exchange of ideas on economic considerations for the design of industrial facilities.

Seminar Instructor

Kasi V. Bendapudi, P.E., S.E., B.S., M.S., M.ASCE, is a registered professional engineer in 23 states. Mr. Bendapudi is a structural engineering consultant based in Dallas, Texas. He has over 30 years of design experience in structural engineering. Mr. Bendapudi specializes in the design of heavy industrial, manufacturing, and hi-tech facilities and is responsible for the structural design of numerous industrial and manufacturing facilities in the United States and overseas. His experience includes evaluation of structural deficiencies and damage assessment; failure analysis of equipment foundations and superstructure; evaluation of construction defects; structure stability and safety; and reconstruction of construction accidents and failures.

Mr. Bendapudi is a certified Structures Specialist – FEMA, National Urban Search and Rescue (US &R) Response Operations. He is a recipient of the Educational Achievement Award from the College of Engineering, University of Wisconsin at Madison (extension) and has published several articles in the area of structural design of industrial facilities.

- To register your group, call John Wyrick at 703.295.6184

Summary Outline

INTRODUCTION

- What are Industrial facilities, general and specialty manufacturing facilities
- How are they different from other types of structures such as warehouses, commercial, institutional, and municipal structures
- Most commonly used structural systems. Gable frames, joists and joist girders, laced columns and trusses, stepped columns, conventional framing, and pre-engineered structural systems.

STRUCTURAL SYSTEMS AND COMPONENTS

- Systems with cranes-Heavy Industrial facilities
- Systems without cranes-Light Industrial/Manufacturing facilities
- Pre-engineered metal buildings do and don't
- Hybrid systems
- Essential Sub-systems
- WALLS
- Metal walls: Design of girts, sag rods, and wind posts
- M.F.L. walls

STRUCTURAL FAILURES

ELEVATED FLOORS

- Types of floors used in industrial facilities
- Design concepts, crack control, joints, form deck, permanent forms, openings, and composite vs. non-composite
- Design of elevated floors for forklift truck traffic

INDUSTRIAL FLOORS ON GRADE

- Classification of floors on grade based on usage and design
- Quality of floors
- Use of vapor barrier and reinforcing steel
- Superflat technology and tolerances
- Planning and selection of flatwork contractor
- Outline specifications
- Details of slabs on grade

CRANE RUNWAYS

- Types of crane runway systems, under hung, overhead (EOT), yard cranes, and floor mounted jibs.
- Service classifications (CMAA) and usage
- Forces imparted by cranes and operational aspects of cranes
- Crane load specifications – AISC vs. AISE
- Load combinations involving cranes
- Design of EOT crane runways and details

DESIGN OF MILL BUILDINGS AND COMBINED COLUMNS

- Design considerations
- K – factors and end restraints
- Column Design – recommended procedure
- Bracing requirements
- Base fixity, rotational restraints, and support settlement
- Lateral drift and stiffness considerations
- Design of fixed column bases

FOUNDATIONS

- Mat Foundations
- Mass concrete
- Foundations for stacks, tall vessels, and towers
- Piles
- Drilled piers

CONNECTIONS AND ANCHORAGES

- High strength bolts – ASTM A325 and ASTM A490
- Bearing
- Fully tensioned
- Slip critical
- Standard connections
- Moment connections
- Column to truss connections, and general considerations for long span trusses
- Connections at column bases and design of base plates
- Design of anchor bolts
- Design of shear lugs
- Connections of pre-cast walls

STRUCTURE STABILITY

- Concepts of strength and stability
- Local buckling and member failure
- Bracing design
- Magical 2% rule
- Diaphragm shears and connection design
- Design of roof structure to prevent ponding failures
- General rules for safe design

SERVICEABILITY

- Deflections and camber
- Side sway
- Drift index
- Differential settlements
- Expansion and contraction
- Vibrations and noise
- Base rotations and connection slip
- Corrosion

MISCELLANEOUS ECONOMIC CONSIDERATIONS - GROUP DISCUSSION FOLLOWED BY PRESENTATION

Seminar Benefits

Attendees will gain from a unique course that covers problems, and solutions involved with the design of industrial facilities while benefitting from a broad range of topics covered, with design procedures and real-life practical examples.

This course is intended to introduce theoretical concepts and practical methods to design industrial facilities. Attendees will learn design of crane runways, mill buildings, slabs on grade, elevated floors, and foundations for industrial facilities as well as become familiarized to the concepts of stability and serviceability.

Who Should Attend

- Structural designers
- Structural engineers
- Consultants
- Architectural engineers
- Plant engineers
- Facility owners
- Building manufactures
- Contractors
- Municipal engineers and other regulatory agency engineers who influence the design, location, and the use of industrial facilities

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