Part 1:

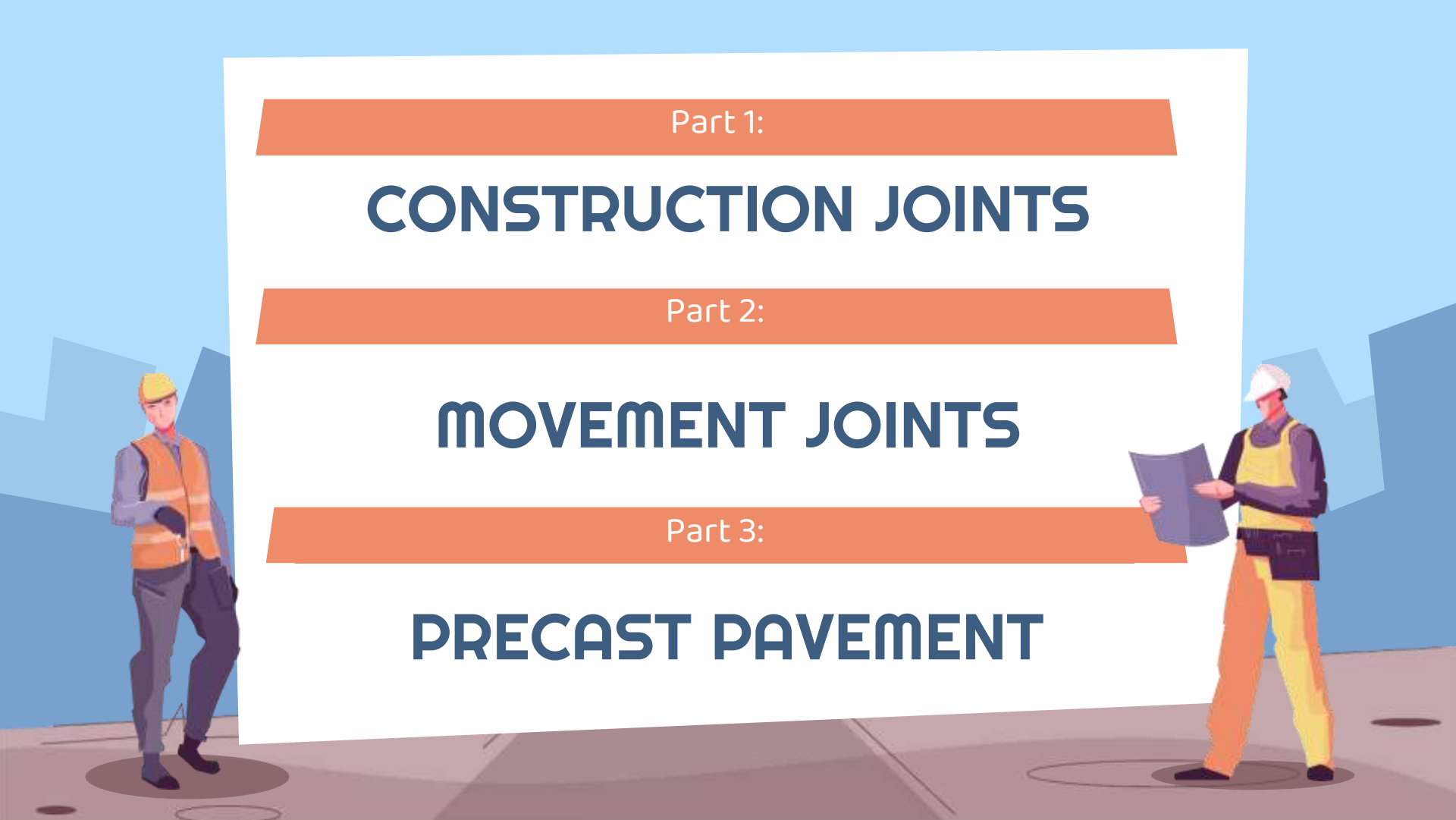
CONSTRUCTION JOINTS

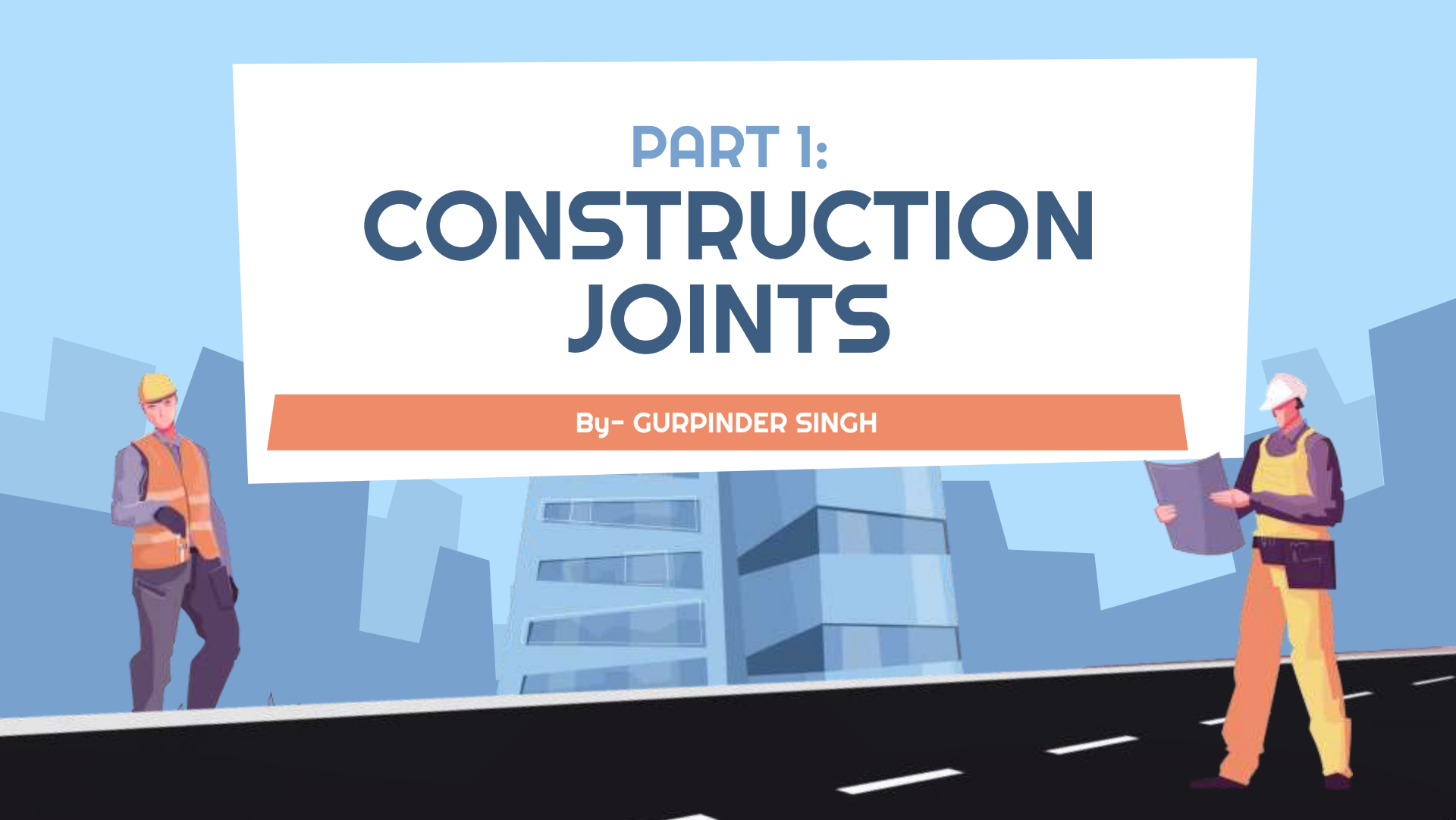
Part 2:

MOVEMENT JOINTS

Part 3:

PRECAST PAVEMENT





PART 1:
CONSTRUCTION JOINTS

By- GURPINDER SINGH

TABLE OF CONTENTS

Construction Joints

Construction joints are intentional interruptions in the concrete placement process that allow the pouring of concrete to be stopped and resumed later. They are typically created in vertical or horizontal surfaces where the new concrete will meet previously placed concrete.

Fig. 1

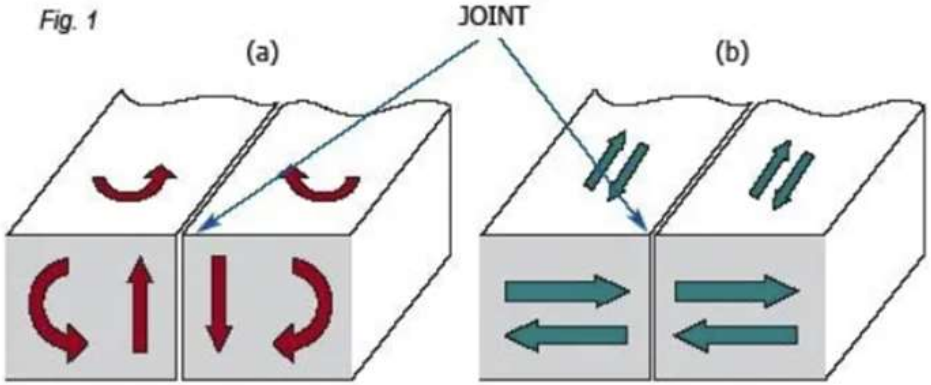


Figure 1 – Relative movements which must be (b) allowed and (a) not allowed by a con-struction joint for concrete slabs

Construction joints must allow horizontal displacement right-angled to the joint surface that is normally caused by thermal and shrinkage movement. At the same time, they must not allow vertical or rotational displacements. Fig.1 summarizes which displacement must be allowed or not allowed by a construction joint.

Purpose/Importance of Construction Joints

Control cracking

Construction joints are placed strategically to control where the cracks will occur, and to prevent them from forming in undesirable locations.

Allow for expansion and contraction

Concrete can expand and contract due to temperature changes, and without proper joints, this movement can cause damage to the structure.

Provide a smooth transition between concrete pours

Construction joints ensure that the transition between two different concrete pours is smooth and level, preventing trip hazards and other safety concerns.

Types of Construction Joints

Butt-type Construction Joint

Tongue-and-groove Construction Joint

Butt-type Construction Joint with Dowels:

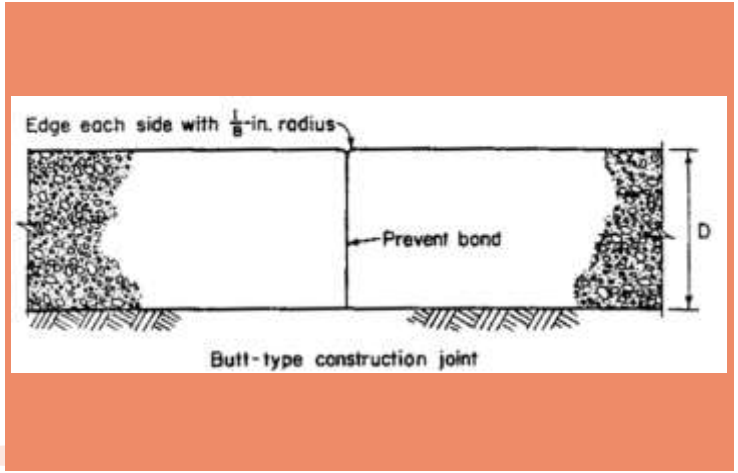
Butt-type Construction Joint with Tie Bars

01

Butt-type Construction Joint

01: Butt-type Construction Joint

A butt-type construction joint is the simplest type of construction joint, and it is created by placing fresh concrete against hardened concrete. The two concrete surfaces are then smoothed and finished to create a flat, level surface. Butt-type joints can be used in both horizontal and vertical concrete surfaces, but they do not provide any reinforcement or bonding between the two concrete surfaces. Butt-type joints are commonly used in large concrete structures such as walls, columns, and beams.

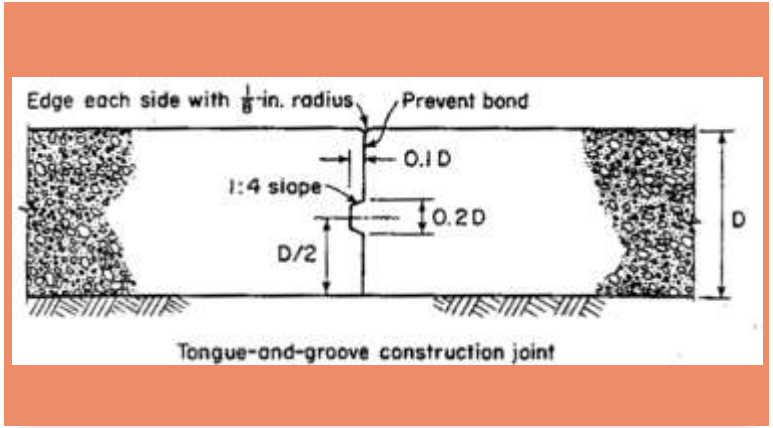


Butt-type construction joint

02

Tongue-and-groove Construction Joint

02: Tongue-and-groove Construction Joint



Tongue-and-groove construction joint

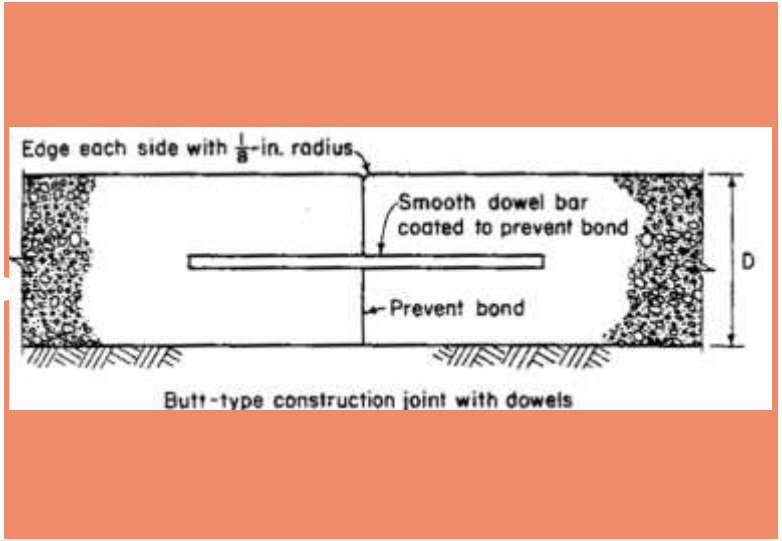
A tongue-and-groove construction joint is created by forming a tongue on the edge of the fresh concrete and a matching groove on the edge of the hardened concrete. The tongue and groove fit together, providing some reinforcement and preventing the formation of cracks in the joint. Tongue-and-groove joints are commonly used in concrete walls and floors, where they provide additional bonding between the two concrete surfaces.

03

Butt-type Construction Joint with Dowels

03: Butt-type Construction Joint with Dowels

A butt-type construction joint with dowels is created by placing steel dowels into the hardened concrete before pouring the fresh concrete. The dowels are then embedded into the fresh concrete, creating a mechanical connection between the two concrete surfaces. Butt-type joints with dowels provide additional reinforcement and stability, making them suitable for large concrete structures such as bridges and tunnels.

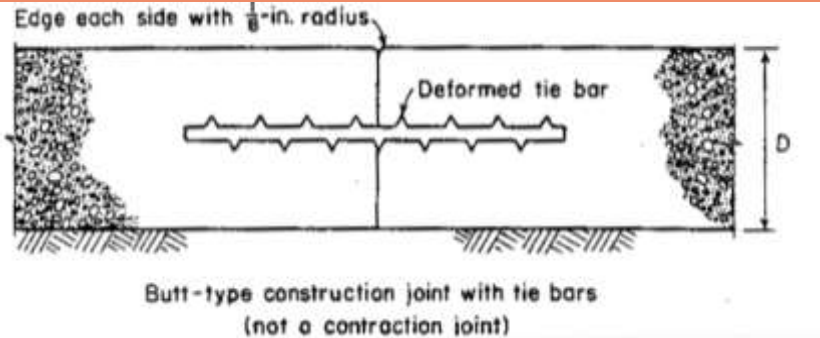


Butt-type construction joint with dowels

04

Butt-type Construction Joint with Tie Bars

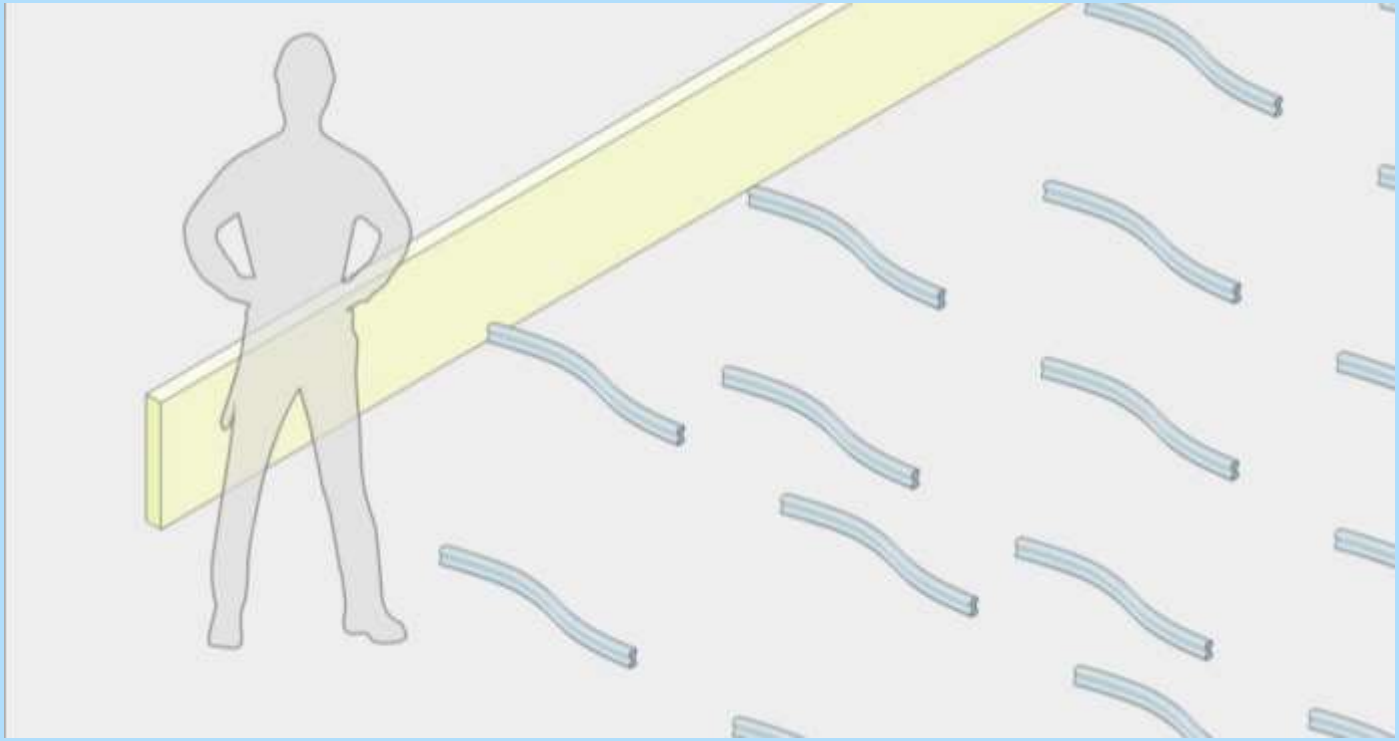
04: Butt-type Construction Joint with Tie Bars



Butt-type construction joint with tie bars
(not a contraction joint)

A butt-type construction joint with tie bars is similar to a butt-type joint with dowels, except that tie bars are used instead of dowels. The tie bars are placed through holes drilled in the hardened concrete, and they extend into the fresh concrete. The tie bars are then anchored in the hardened concrete, creating a mechanical connection between the two concrete surfaces. Butt-type joints with tie bars provide additional reinforcement and stability, making them suitable for large concrete structures such as bridge decks and parking garages.

Construction:



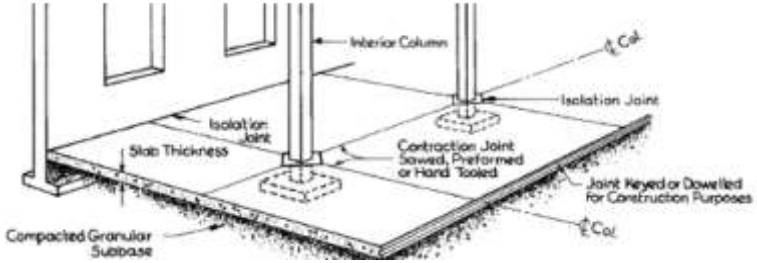
04

Design Consideration

Design considerations for construction joints are crucial to ensure that they effectively accommodate movements caused by temperature changes, shrinkage, and settling of building materials.

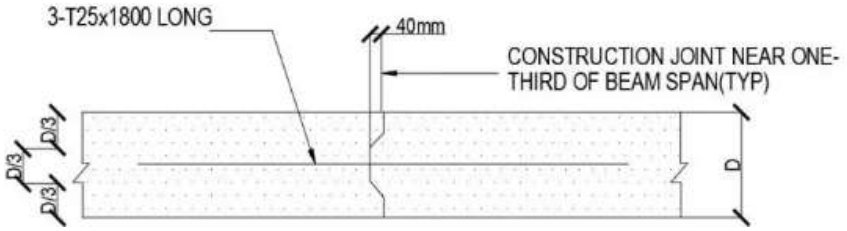
1: Location and spacing of joints:

Joints should be placed at regular intervals along the length of the building, with greater spacing in areas of low stress and closer spacing in areas of high stress. The location of joints should also consider the building's architectural design and the location of structural elements.



2: Width and depth of joints:

The width and depth of joints must be designed appropriately to prevent excessive stress on the joint filler materials. The width of joints should be based on the expected movement of the building, while the depth should be based on the thickness of the joint filler materials.

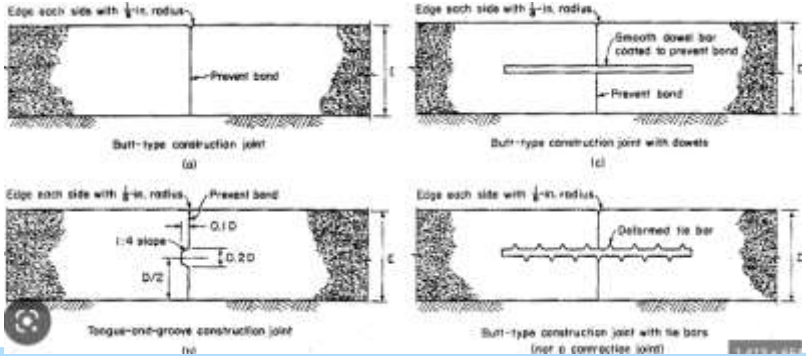


3: Joint sealant and filler materials

The selection of joint sealant and filler materials is critical to ensure long-term durability. The materials selected should be able to accommodate the expected movement of the building and provide a good seal against water and air infiltration. Common materials used for joint sealant include silicone, polyurethane, and polysulfide, while materials used for joint filler include foam backer rod, cork, and asphaltic impregnated fiberboard.

4: Joint reinforcement

Joint reinforcement, such as dowel bars or tie bars, may be necessary to provide additional support and prevent joint separation. The selection of reinforcement should be based on the expected movement of the building and the load capacity of the joint.



5: Compatibility with adjacent materials:

The joint design should consider the compatibility of the joint materials with adjacent materials. For example, if the joint is between two different types of concrete, the joint filler and sealant should be compatible with both types of concrete.
In this case, the joint design must consider the compatibility of the joint filler and sealant materials with both types of concrete. The joint filler and sealant materials selected must be compatible with both high-strength and standard-strength concrete to ensure a good seal and prevent water infiltration between the different types of concrete. The compatibility of the materials can be verified by consulting the manufacturers' specifications and testing the materials before installation.

Conclusion

- Construction joints are a critical part of building construction and must be carefully designed and constructed to ensure the building's stability, durability, and performance.
- By understanding the different types of construction joints and their design and construction considerations, building professionals can ensure that construction joints are properly implemented and contribute to a successful building project.

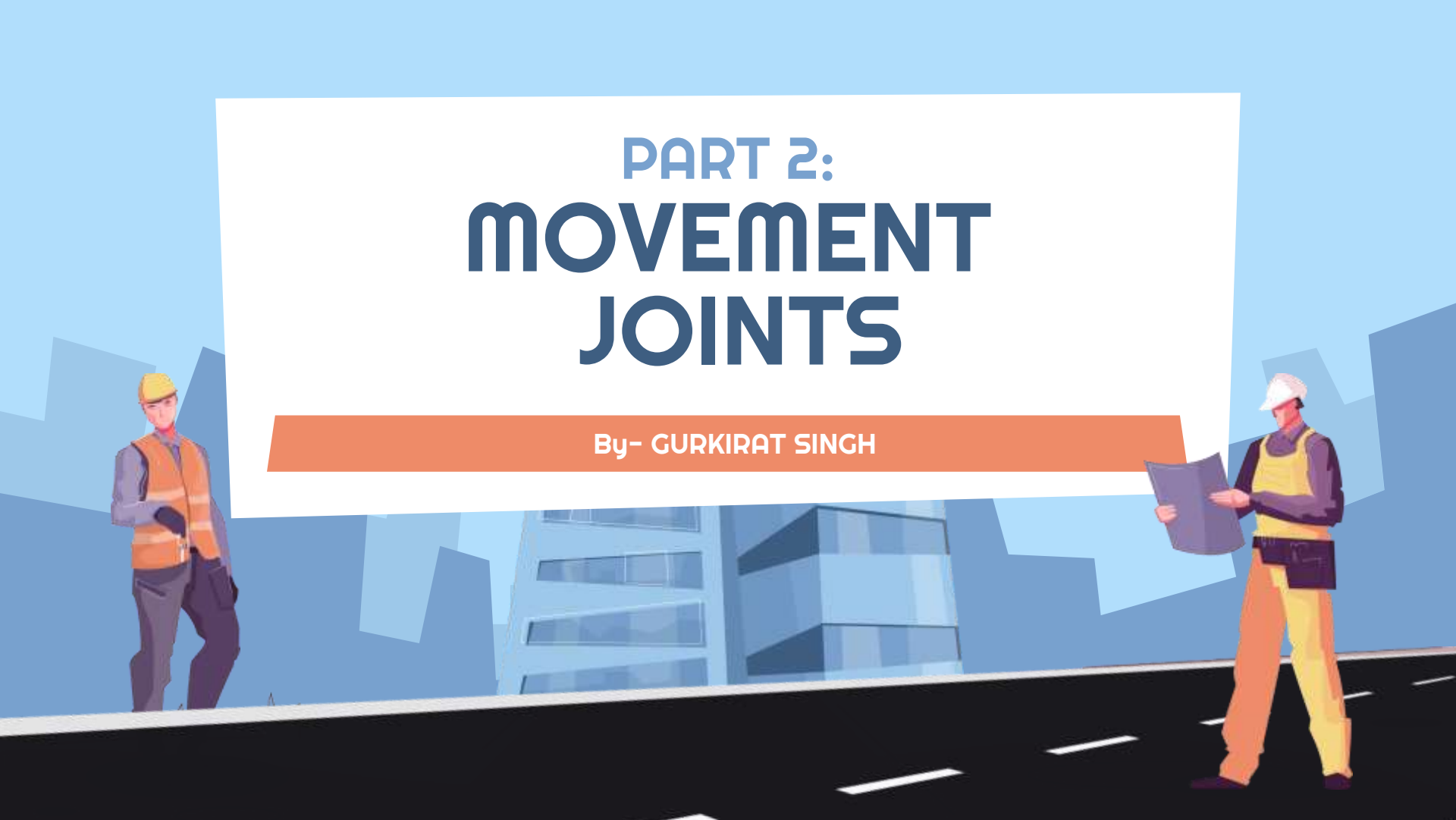

PART 2:
MOVEMENT JOINTS
By- GURKIRAT SINGH

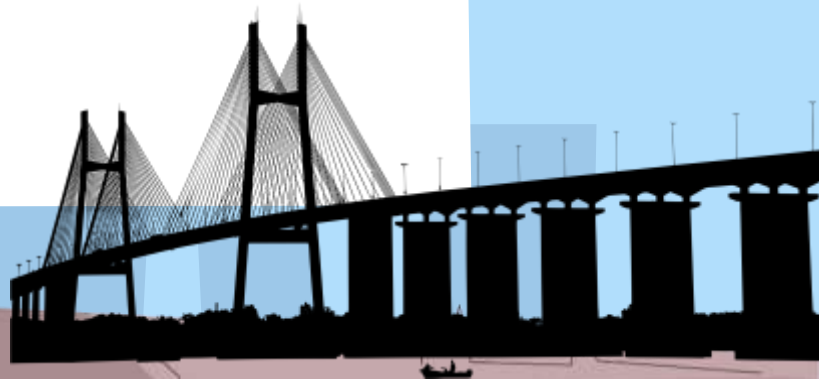
TABLE OF CONTENTS

Movement Joints

Expansion joints are commonly used in construction to provide a flexible connection between two structures or components that can accommodate the movement caused by thermal expansion and contraction, seismic activity, or other external factors.

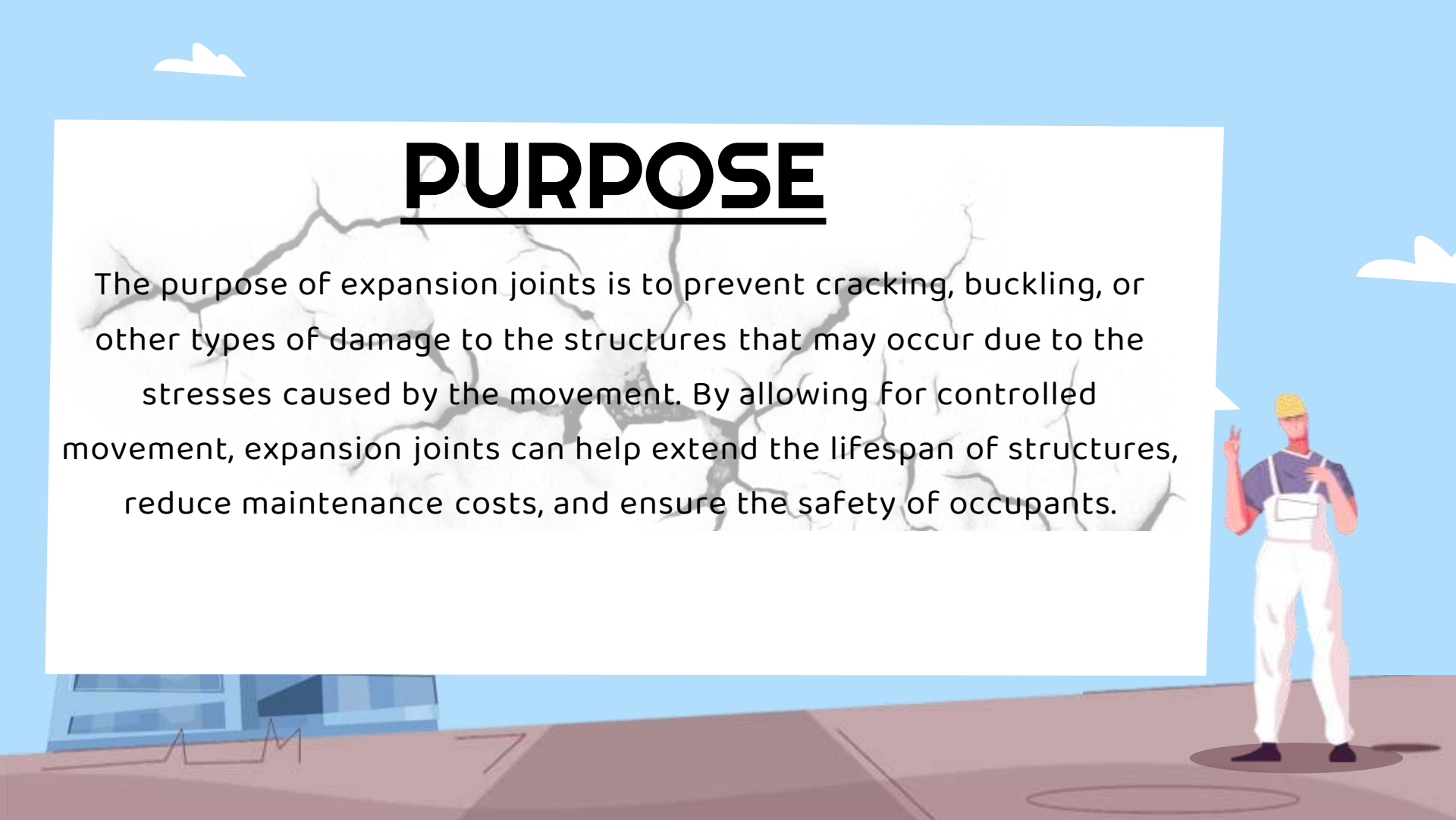
IMPORTANCE

- Concrete is not a elastic material -Can't bend &strech without failure
- concrete moves during expansion &shrinkage therefore elements slightly shifts
- to prevent harmful effects due to concrete movement like (earthquakes vibrations)



PURPOSE

The purpose of expansion joints is to prevent cracking, buckling, or other types of damage to the structures that may occur due to the stresses caused by the movement. By allowing for controlled movement, expansion joints can help extend the lifespan of structures, reduce maintenance costs, and ensure the safety of occupants.



CHARACTERSTICS OF MOVEMENT JOINTS

01

Permits thermal contraction ٤expansion without stress to the member

02

Absorbs expansion ٤ contraction, vibrations (earthquakes)

03

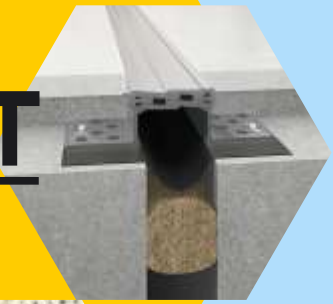
connection between segments of same material

TYPES

- EXPANSION JOINTS
- CONTRACTION JOINTS
- ISOLATION JOINTS

MOVEMENT JOINTS

TYPES



Expansion Joints: These joints allow for expansion due to temperature changes Expansion joints can be found in bridges, buildings, and other structures.

Contraction Joints: These joints allow for contraction due to temperature changes Contraction joints help prevent cracking and other damage caused by the contraction of the material.

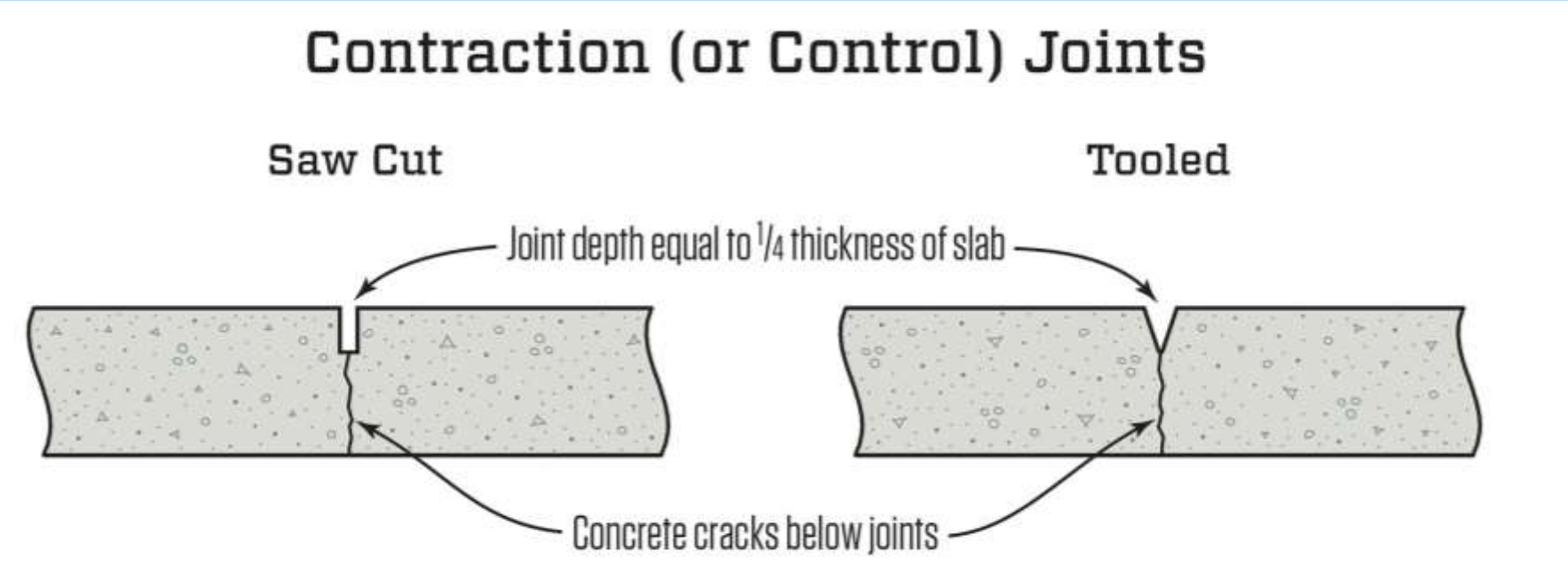
Isolation Joints: These joints are used to separate different parts of a structure to prevent damage from differential movement. Isolation joints are typically made from flexible materials such as neoprene.

PROVISIONS RELATED TO MOVEMENT JOINTS IN IS 3414:1995:

- **Expansion Joints**: Expansion joints should be provided at the junction of different building elements, such as at the intersection of walls and floors or between adjacent structural bays. The width of the expansion joint should be at least 10mm or 1% of the distance between the two adjacent building elements, whichever is greater.

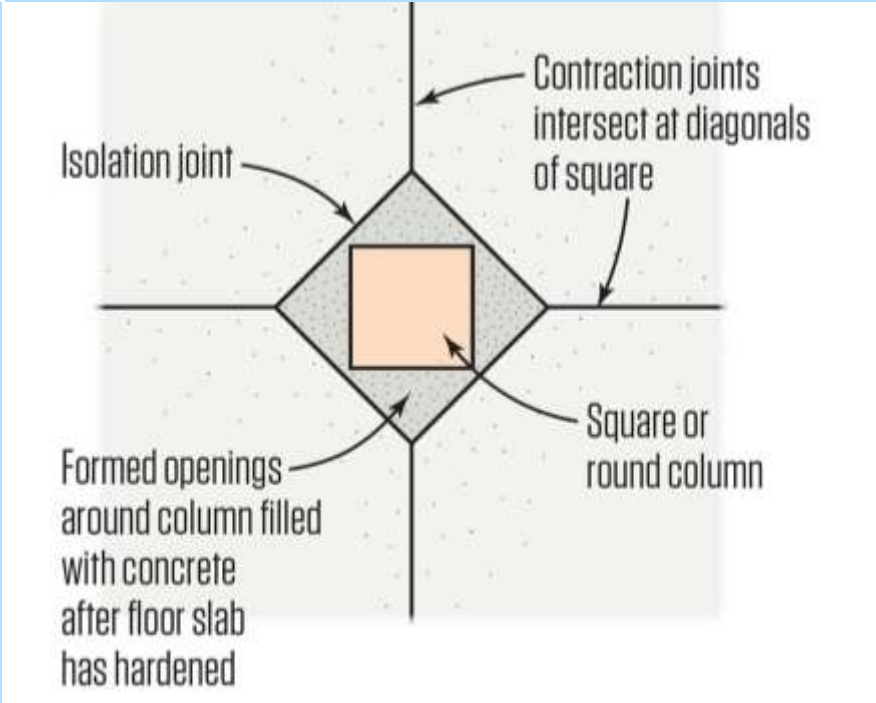
PROVISIONS RELATED TO MOVEMENT JOINTS IN IS 3414:1995:

- **Contraction Joints**: Contraction joints should be provided in concrete structures at intervals not exceeding 30 meters or a length to width ratio of 1.5, whichever is smaller. The width of the contraction joint should be at least 5mm



PROVISIONS RELATED TO MOVEMENT JOINTS IN IS 3414:1995:

- **Isolation Joints:** Isolation joints should be provided in structures to separate different parts of the building that may move differentially, such as the superstructure and substructure of a bridge. The isolation joint should be at least 25mm wide and filled with a compressible material.



TYPES

Masonry expansion joints

Bridge/road expansion joints

Railway expansion joints

Pipe expansion joints

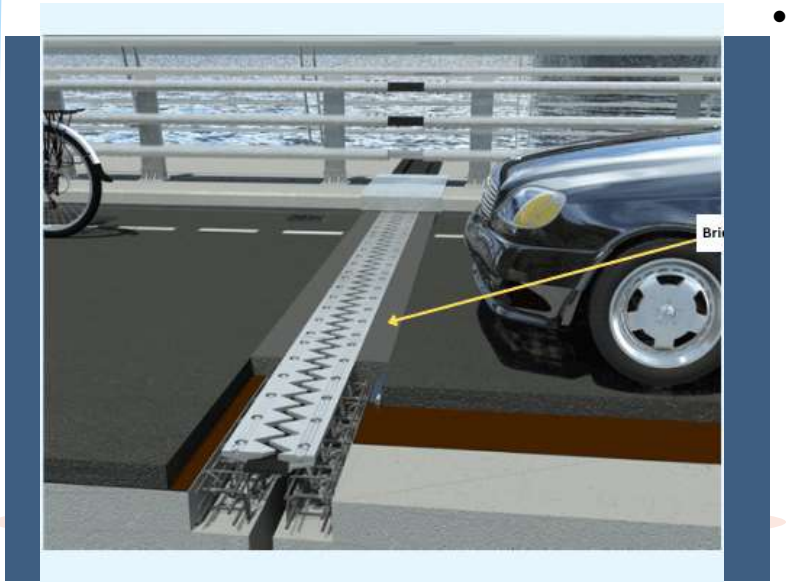
Expansion joints are provided -

- Slabs
- Pavements
- Buildings
- Bridges
- Sidewalks
- Railway tracks
- Piping system

MASONRY EXPANSION JOINT

- A masonry expansion joint is a type of joint used in brick, stone or concrete masonry construction to allow for movement caused by thermal expansion, moisture expansion, or seismic activity.
- The joint is usually a gap between the masonry units, which is filled with a flexible material such as foam or cork. The joint can be vertical or horizontal, depending on the location and design of the structure.

BRIDGE EXPANSION JOINT



- These are the joints provided in the bridges, roads or large slabs. These expansion joints are designed in such a way that heavy traffic can be allowed over them. These joints can carry continuous traffic over them during shrinkage, temperature change, vibrations on reinforced concrete, composite and steel structures, etc.

FILLERS

MOVEMENT JOINTS

Fillers are materials used to fill the gap between two adjacent surfaces in a joint to prevent the ingress of water, dust, or debris. They also act as a cushioning material and allow for movement of the adjacent surfaces without causing damage to the structure. The type of filler used in joints depends on the specific requirements of the structure, including the type of joint, the anticipated movement, and the environment in which the structure is located.

FILLERS

1

COMPRESSIBLE FOAM

Compressible foam is a lightweight, flexible material that is commonly used in expansion joints.

2

BITUMINOUS FILLER

Bituminous fillers, such as asphalt or tar, are commonly used in joints in asphalt concrete pavements. They have good waterproofing properties and can withstand the deformation caused by traffic.

FILLERS

1

RUBBER

Rubber fillers, such as neoprene or silicone, are commonly used in bridge joints and other heavy-duty applications. They have good flexibility and can accommodate large movements.

2

CORK

Cork is a natural material that has good compressive strength and flexibility. It is commonly used in expansion and contraction joints and is particularly suitable for use in hot and dry climates.

Expansion Joints according to IS 456 : 2000

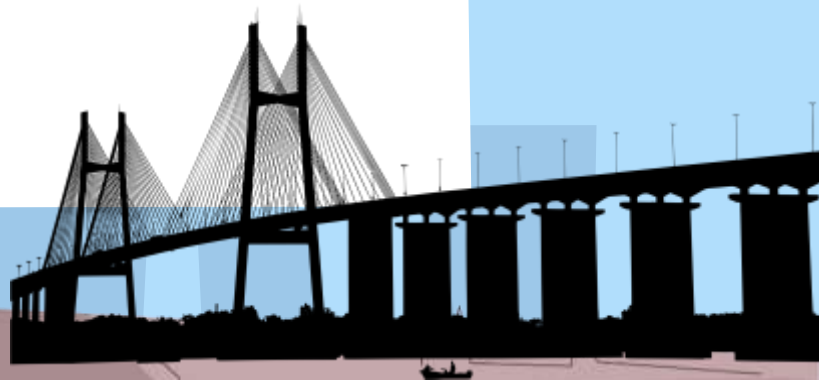
- Expansion joints shall be provided so that the movement occurs in the structure with the minimum resistance at the joint.
- Structures exceeding 45m in length are designed with expansion joints.
- The length of the structure where expansion joints have to be provided depends upon various considerations, such as weather exposure, temperature, season of laying, time of laying, quality and quantity of laying, etc.

Conclusion

Overall, movement joints are an important component of any construction project, and proper design and installation are critical to ensuring the long-term durability and safety of the structure.

Questions

- As per is code 456:2000 at what meter length expansion should be provided in a building?
- what are fillers ?

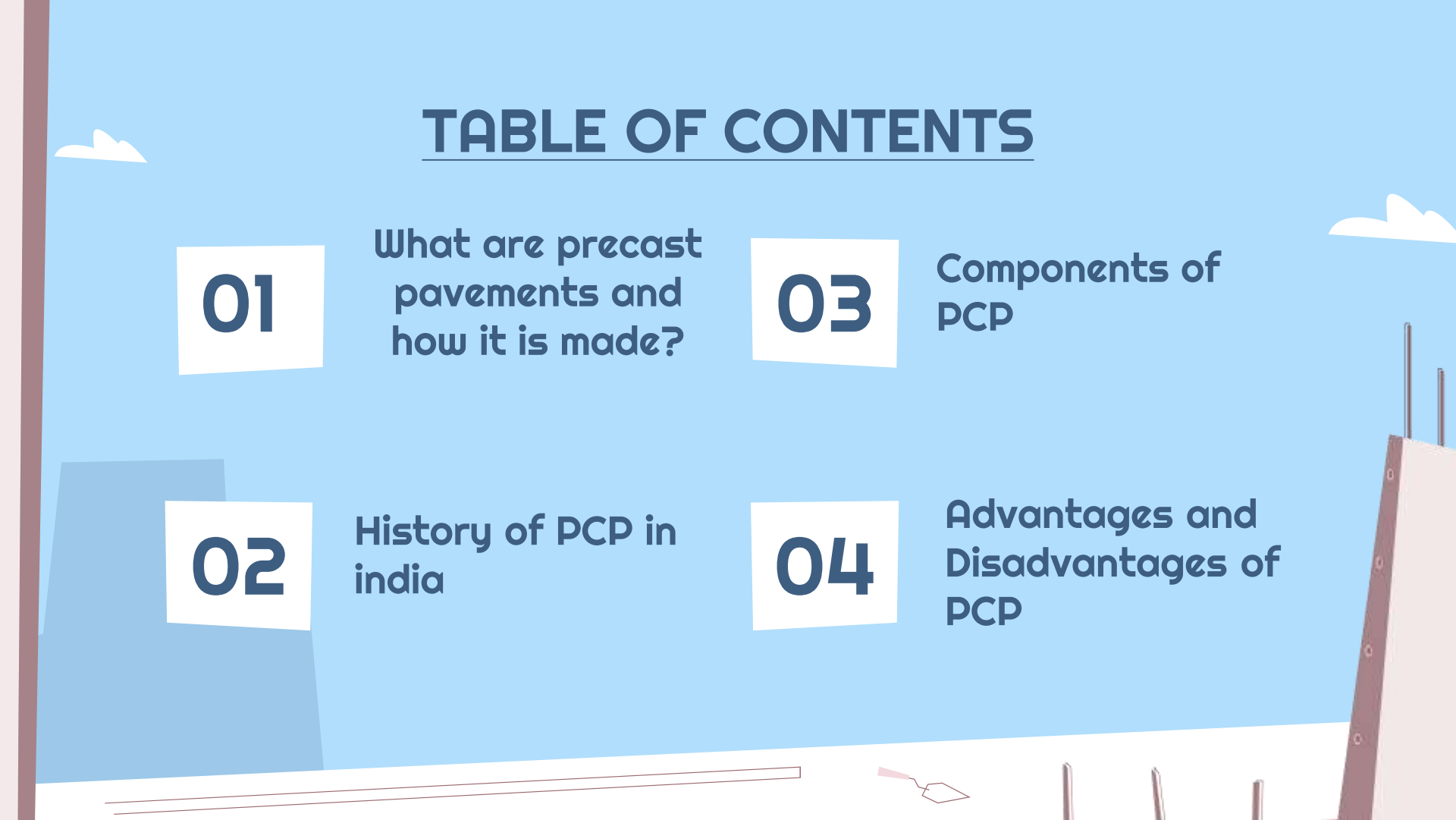


PART 3:

PRECASTCONCRETE PAVEMENTS

By- GURVEER KAUR AND HARDEEP SINGH

TABLE OF CONTENTS



01

WHAT ARE PRECAST CONCRETE PAVEMENTS AND HOW IT IS MADE?

WHAT ARE PCP?

Precast pavements are prefabricated concrete slabs that are manufactured off-site and transported to the construction site for installation. They are used as a form of pavement for various applications, including roads, highways, airport runways, parking lots, and pedestrian walkways.

HOW PCP IS MADE?

Precast concrete pavement is made by casting concrete slabs in a controlled environment, usually in a factory or precast yard, and then transporting them to the construction site for installation.

Basic steps involved are:

1. Design and planning
2. Formwork
3. Concrete mix
4. Casting
5. Finishing
6. Transportation and installation

The basic steps involved in the process are:

Design and planning:

The design of the precast concrete pavement is developed based on the specific application and requirements of the project. The slab dimensions, thickness, and reinforcement details are finalized based on the expected traffic loads and other factors.

Formwork:

The formwork for the precast concrete pavement slabs constructed using steel or timber. The formwork provides the shape and size of the slab and also contains the reinforcement

Concrete mix:

The concrete mix is prepared according to the specifications of the design. The mix typically includes portland cement, aggregates, water, and admixtures to achieve the desired strength and durability.

Casting:

The prepared concrete mix is poured into the formwork and allowed to cure and harden. The slabs can be cast in different sizes and shapes to accommodate various pavement designs.

Finishing

Once the concrete has cured to the desired strength, the slab surface is finishing by sandblasting or shot blasting to provide the required texture and skid resistance.

Transportation and installation

After curing and finishing, the precast concrete pavement slabs are transported to the construction site and installed using appropriate equipment. The slabs are placed in the desired location and interlocked to provide a smooth and continuous pavement surface.

02 HISTORY OF PCP IN INDIA

HISTORY OF PCP IN INDIA

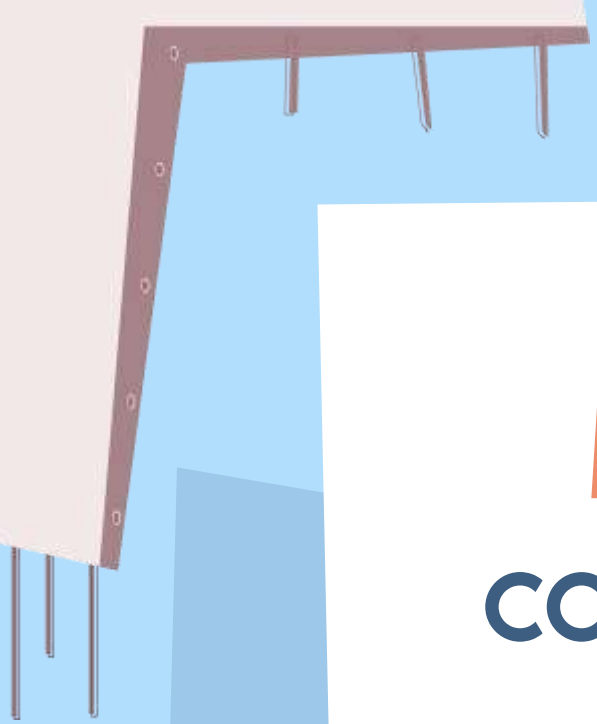
Precast concrete pavement has been used in India for several decades, primarily for industrial flooring and bridge construction. However, the use of precast concrete for pavement applications has only gained popularity in recent years.

One of the early examples of precast concrete pavement in India is the Mumbai-Pune Expressway, which was completed in 2002. The expressway featured precast concrete slabs for the median and shoulder, while the main carriageway was constructed using traditional concrete paving methods.

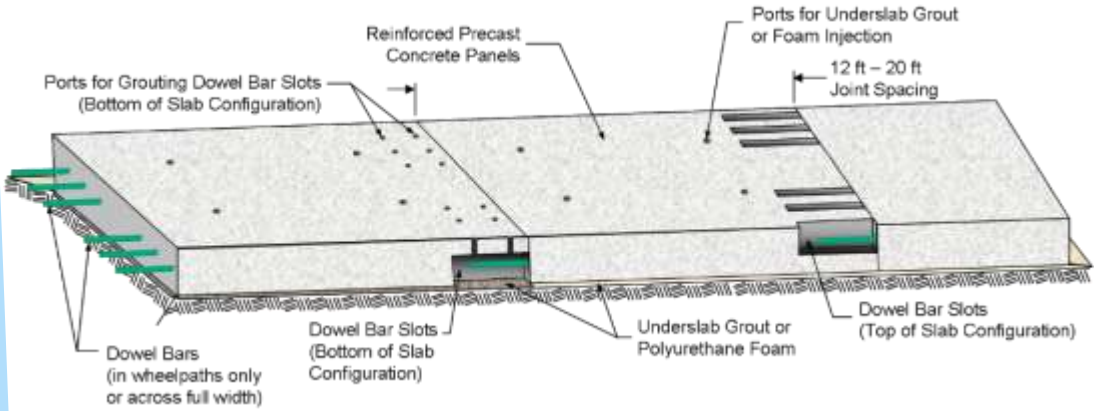
Since then, several other major projects have incorporated precast concrete pavement in India. In 2011, the Chennai Bypass project used precast concrete pavement for the first time in India, resulting in a significant reduction in construction time and cost

03

COMPONENTS OF PCP



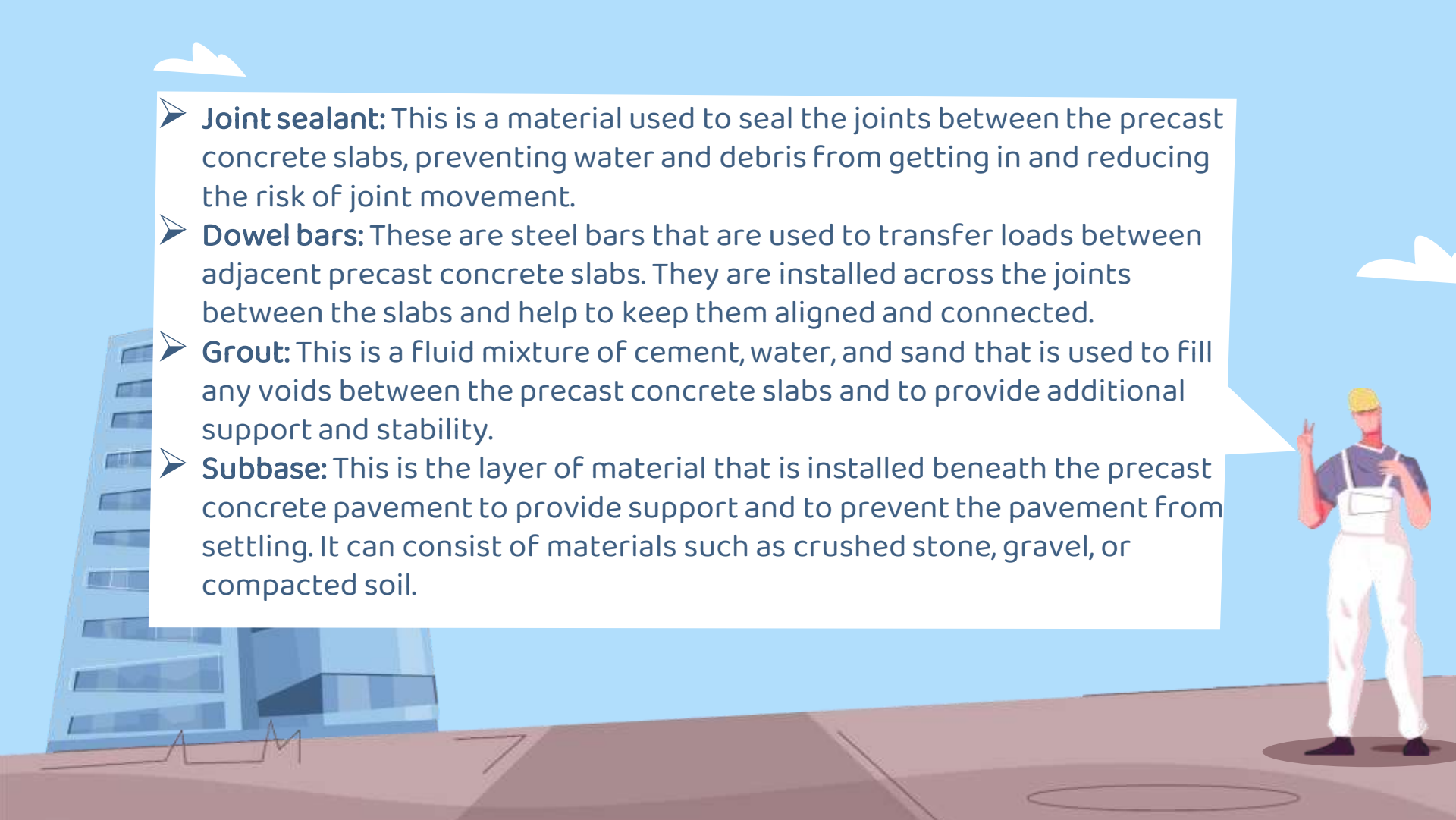
COMPONENTS OF PCP



The components of precast concrete pavement typically include:

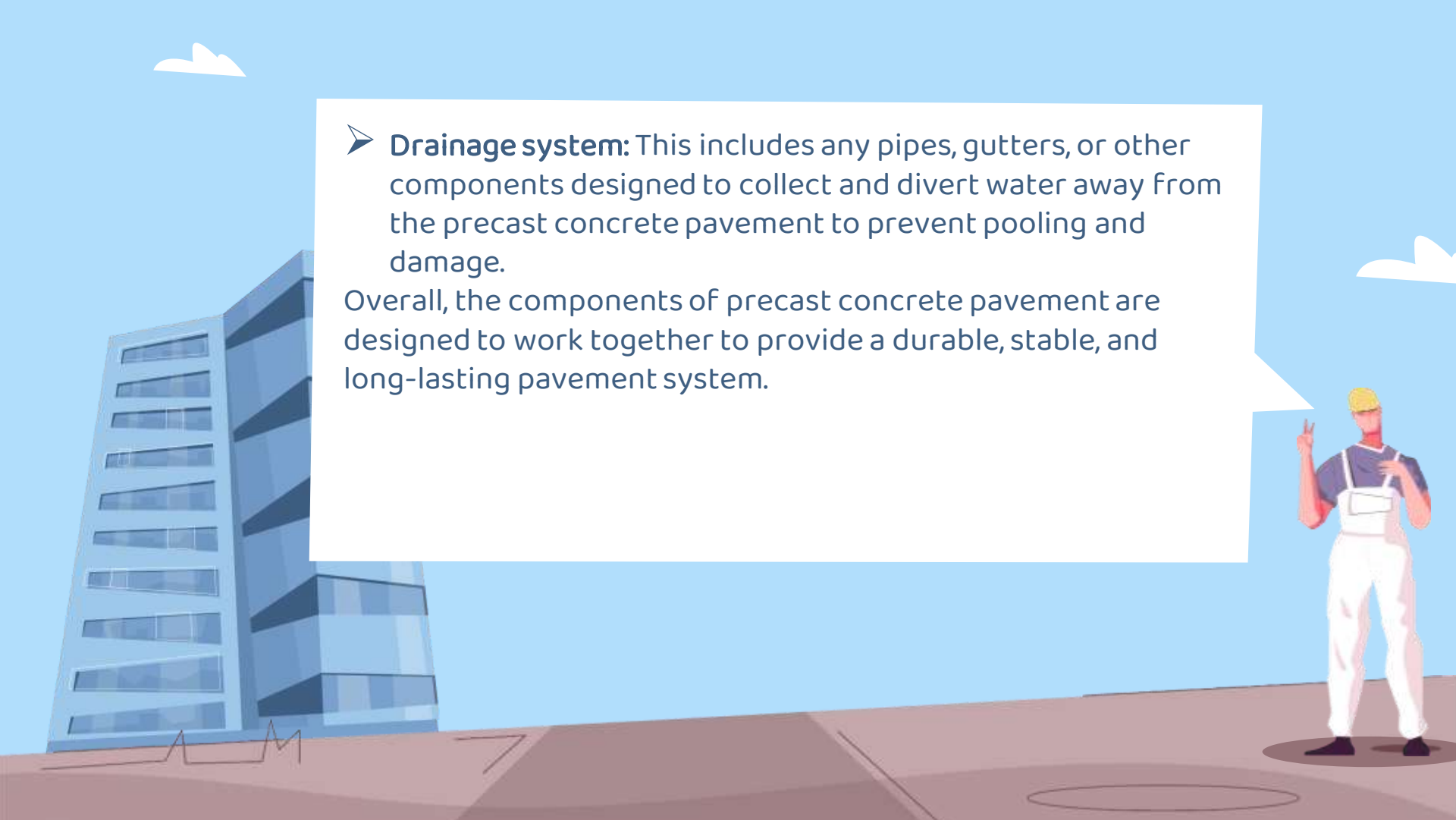
- **Precast concrete slabs:** These are precast concreteelements that are manufactured offsite in a controlled environment and transported to the construction site for installation. They come in various shapes and sizes, and are designed to interlock with each other to form a continuous pavement.

- **Joint sealant:** This is a material used to seal the joints between the precast concrete slabs, preventing water and debris from getting in and reducing the risk of joint movement.
- **Dowel bars:** These are steel bars that are used to transfer loads between adjacent precast concrete slabs. They are installed across the joints between the slabs and help to keep them aligned and connected.
- **Grout:** This is a fluid mixture of cement, water, and sand that is used to fill any voids between the precast concrete slabs and to provide additional support and stability.
- **Subbase:** This is the layer of material that is installed beneath the precast concrete pavement to provide support and to prevent the pavement from settling. It can consist of materials such as crushed stone, gravel, or compacted soil.



- **Drainage system:** This includes any pipes, gutters, or other components designed to collect and divert water away from the precast concrete pavement to prevent pooling and damage.

Overall, the components of precast concrete pavement are designed to work together to provide a durable, stable, and long-lasting pavement system.



04

Advantages and Disadvantages of PCP

Advantages of PCP

01

Speed of installation: Precast concrete pavement can be installed much more quickly than cast-in-place concrete, since the precast slabs are manufactured offsite and can be quickly installed on site with minimal disruption to traffic.

02

Quality control: Precast concrete pavement is manufactured under controlled conditions in a factory, ensuring consistent quality and reducing the risk of defects.

03

Durability: Precast concrete pavement is highly durable and can withstand heavy traffic loads, extreme temperatures, and harsh weather conditions. This makes it ideal for use in high-traffic areas, such as highways, airports, and industrial facilities.

04

Educed maintenance: Because precast concrete pavement is highly durable and resistant to wear and tear, it requires less maintenance than traditional cast-in-place concrete pavement.

05

Sustainability: Precast concrete pavement is an environmentally friendly option, as it can be made with recycled materials and is 100% recyclable at the end of its useful life.

06

Cost-effective: Although the initial cost of precast concrete pavement may be higher than traditional cast_x0002_in-place concrete, the speed of installation, durability, and reduced maintenance requirements can lead to long_x0002_term cost savings

Disadvantages of PCP

01

Difficulty with repair and replacement:
Precast concrete pavement can be difficult to repair or replace since the slabs are connected to each other, which can make it challenging to remove and replace individual slabs.

02

Limited design flexibility:
Precast concrete pavement is manufactured offsite, which means that design changes cannot be easily made once the slabs are cast. This can limit design flexibility

03

Transportation challenges:
Precast concrete pavement is heavy and requires special equipment to transport, which can be costly and may cause disruption to traffic.

04

Higher initial cost:
The initial cost of precast concrete pavement may be higher than traditional cast-in-place concrete pavement due to the cost of manufacturing and transportation.

05

Limited availability:
Precast concrete pavement is not widely available in all regions, which can limit its use in certain areas.

06

Potential for cracking:
Precast concrete pavement can be susceptible to cracking due to factors such as moisture temperature changes, and heavy loads.

THANKS