



Quality Reinforced Soil Using Geosynthetics - Need of the Hour

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WHAT IS REINFORCED SOIL WALL?

A **COMPOSITE** structure comprising of

- Soil (Body Flesh)
- Facia (Skin)
- Reinforcement (Bones)

This composite mass is formed by the friction between the Soil and the reinforcement.

By means of friction, the soil transfers loads to the reinforcement & the forces built up in the earth mass.

The reinforcement thus develops tension.



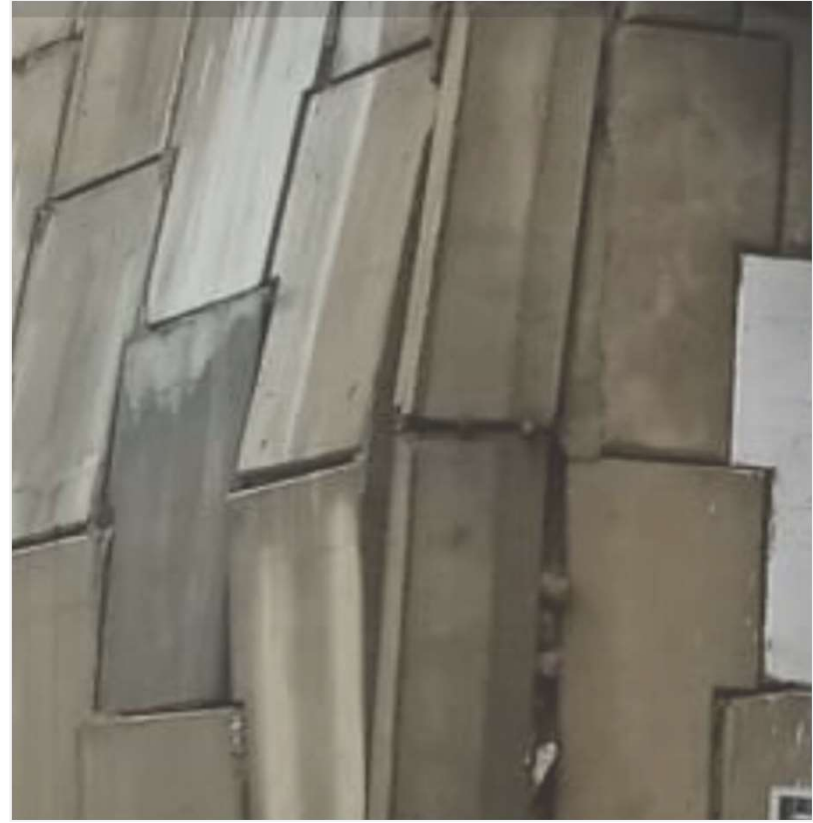
COMPONENTS OF RS WALL

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CURRENT ISSUES OF REINFORCED SOIL WALL

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Adoption of improper construction practice, leading to poor compaction at abutment and long-term volumetric changes

CURRENT ISSUES OF REINFORCED SOIL WALL

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Inadequate backfill material. These are non-repairable damages

CURRENT ISSUES OF REINFORCED SOIL WALL

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Project Name

Katni Umaria, MP

Probable Reasons

Formation of partial height of wall.
Improper drainage arrangement in slope protection works.



CURRENT ISSUES OF REINFORCED SOIL WALL

Project Name

Lucknow ring road.

Probable Reasons

Failure of drain placed at top of RS Wall.
Poor foundation



Source: <https://zeenews.india.com/hindi/india/up-uttarakhand/lucknow-30-meter-service-lane-of-outer-ring-road-damaged/555296>

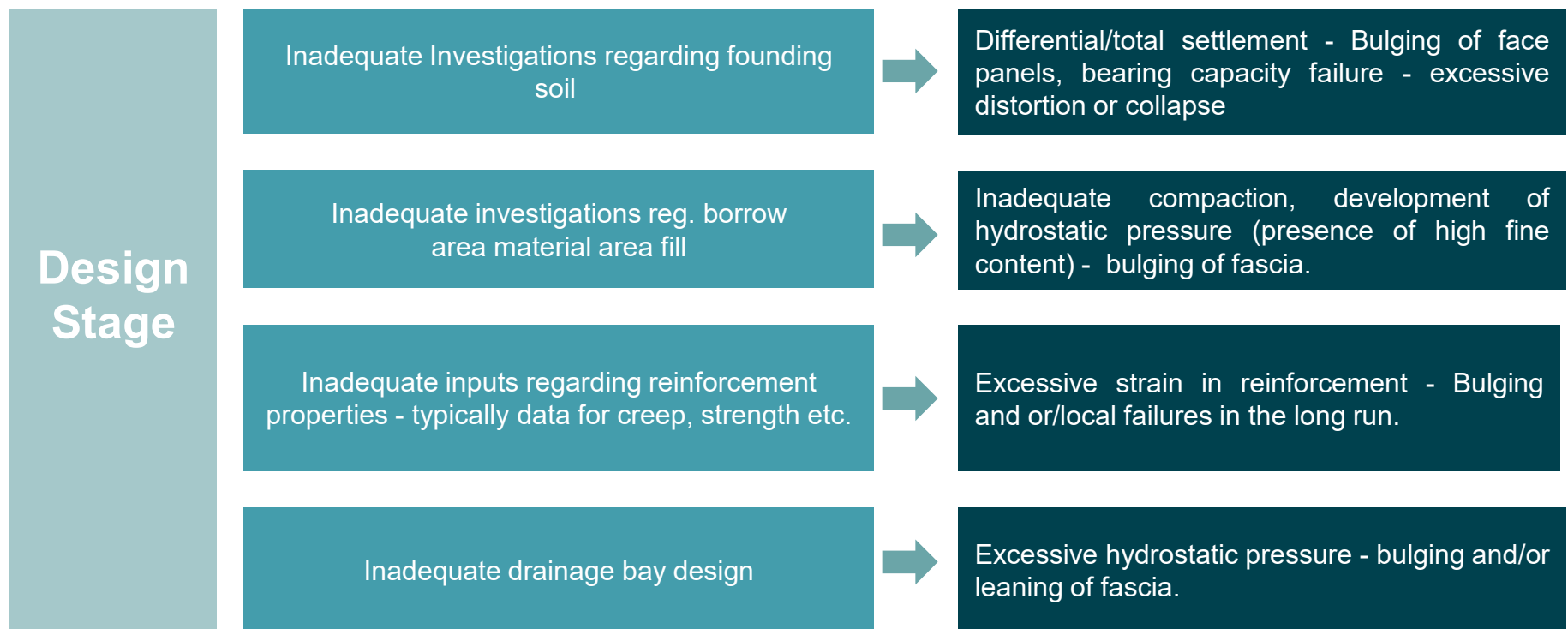
CURRENT ISSUES OF REINFORCED SOIL WALL

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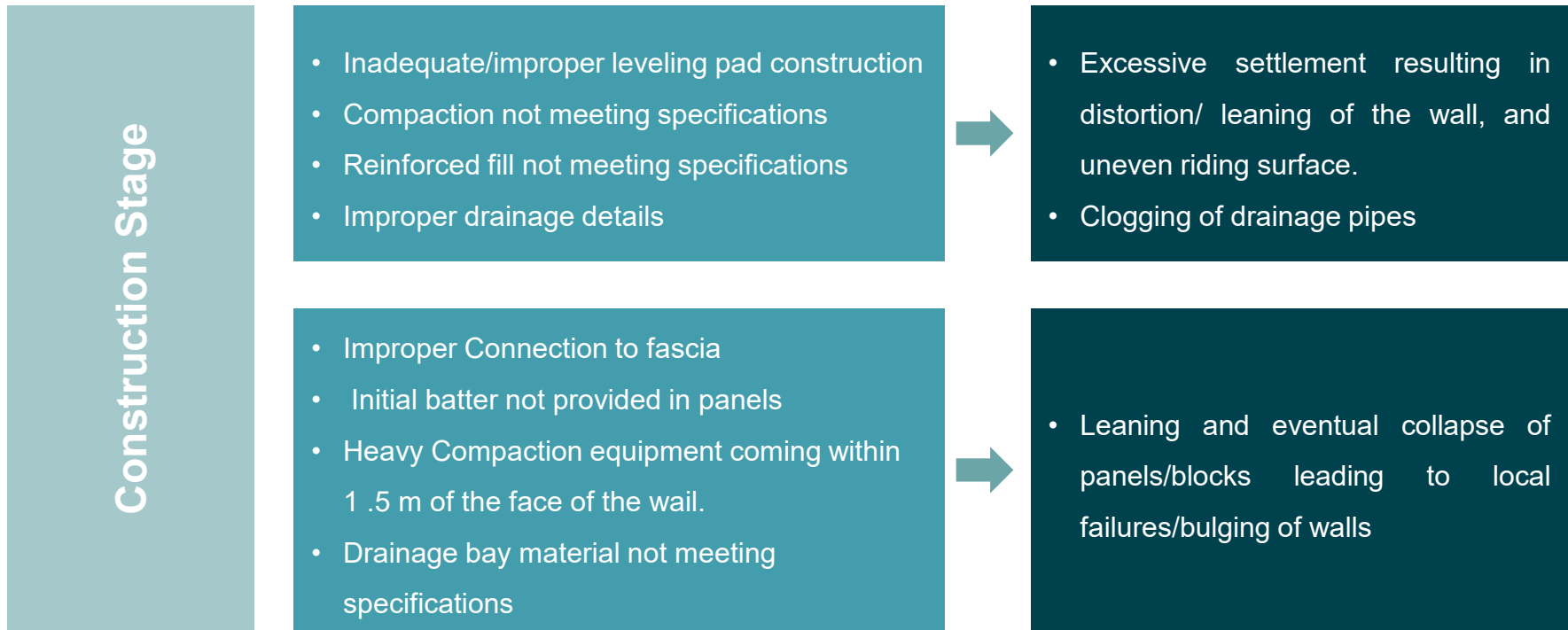


CAUSES OF FAILURES OF REINFORCED SOIL WALL

- Design and construction of Reinforced Soil Walls is an involved process requiring due diligence and quality control.



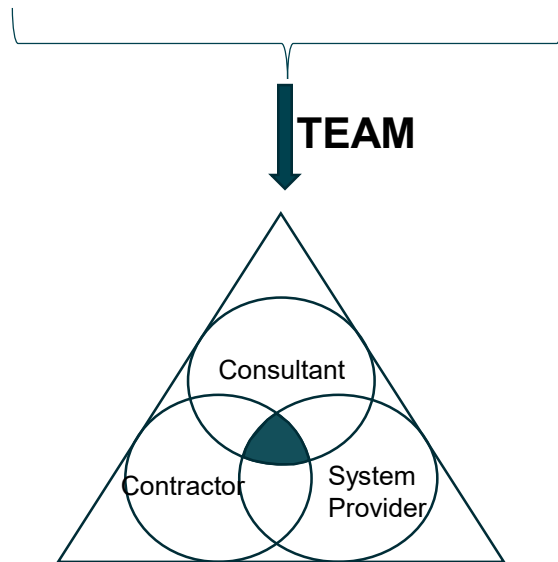
CAUSES OF FAILURES OF REINFORCED SOIL WALL



MAIN INFLUENCERS FOR GOOD QUALITY OF RS WALL

State-of-the-art reinforced technology means the **highest level of development** as of a **technique** achieved for **sustainable development** to make structures **cost effective** and **environmentally friendly**.

Project / Owner Consultant
 Contractor System Provider
 Applicator



Involvement	Description
Client / Owner	PQ Eligibility Criteria System provider – In-house manuf., design & Tech supervision staff Progress / quality reviews
Authority Engineer / Consultant	Selection of qualified system provider Implementation of PQ criteria Validation of certifications like BBA, etc Progress / quality reviews
Main Contractor	Selection of qualified system provider w.r.t approved PQ criteria Timely and adequate front availability Backfill soil and compaction, TPT Progress / quality reviews
System Provider	Design, Material and 24 hrs technical Supervision including backfill soil Quality audits, MTC, Progress / quality review
Applicator	Inventory of machine / moulds and trained staff. Progress / quality reviews

NO TO INFERIOR MATERIAL (REINFORCEMENT, CONNECTION & FILL MATERIAL)

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Proper Certification from Third Party like BBA.



As per IRC SP:102, Reduction factors for creep shall be declared for design temperatures of 20°C, 30°C & 40°C degrees.



Connections used by companies are just copy of Patented Cavity connectors



As per MORT&H and IRC SP 102 guidelines foundation soil investigation report and dedicated borrow areas for reinforced fill should be fixed.

QUALIFICATION THROUGH MINIMUM ELIGIBILITY CRITERIA



The reinforced soil wall technology provider shall have a proven adoption in Indian environment. **not less than 15 years.**



The specialized agency shall have successfully completed **at least 3 projects** of reinforced soil structures of **height not less than 15.0 m** and a total **minimum 100,000 sq.m** wall area of reinforced soil structures under single project in India for bridges/ flyovers/ underpasses/ ROB etc.



The reinforced soil wall system shall have independent third-party certification by accredited certification body like **BBA** for walls & abutment.



The specialized agency shall have **in-house design and manufacturing** of soil reinforcing element & same shall be ISO 9001:2015 certified by an internationally accredited organization.

QUALIFICATION THROUGH MINIMUM ELIGIBILITY CRITERIA

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The specialised agency shall have **inhouse computer controlled tensile testing machine** for ensuring quality of soil reinforcement.



The agency shall provide the results of tests carried out on the connection to establish the connection strength between the facia and reinforcing elements from independent accredited body as per the requirement of **IRC SP 102**.



Reinforced soil structure being a specialized technology, shall furnish **design, drawings, method statement, QA plan etc.,**

PARAWEB® : LTDS - LONG TERM DESIGN STRENGTH

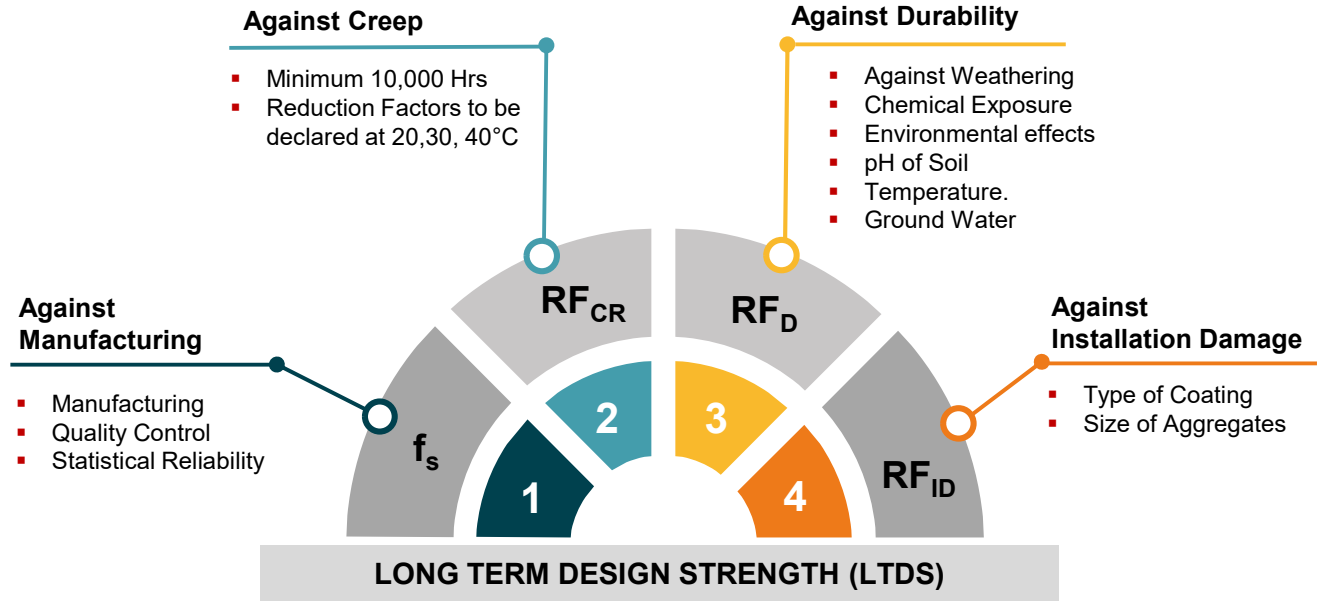
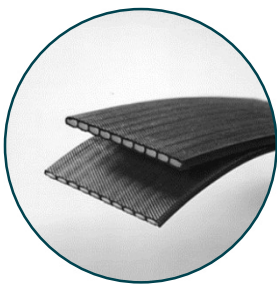
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Governing Equation

$$LTDS = T_{char} / RF$$

$$RF = f_s \times RF_{CR} \times RF_{ID} \times RF_D$$

RF	Reduction Factor
f_s	Manufacturing
RF_{CR}	Creep
RF_{ID}	Installation Damage
RF_D	Durability

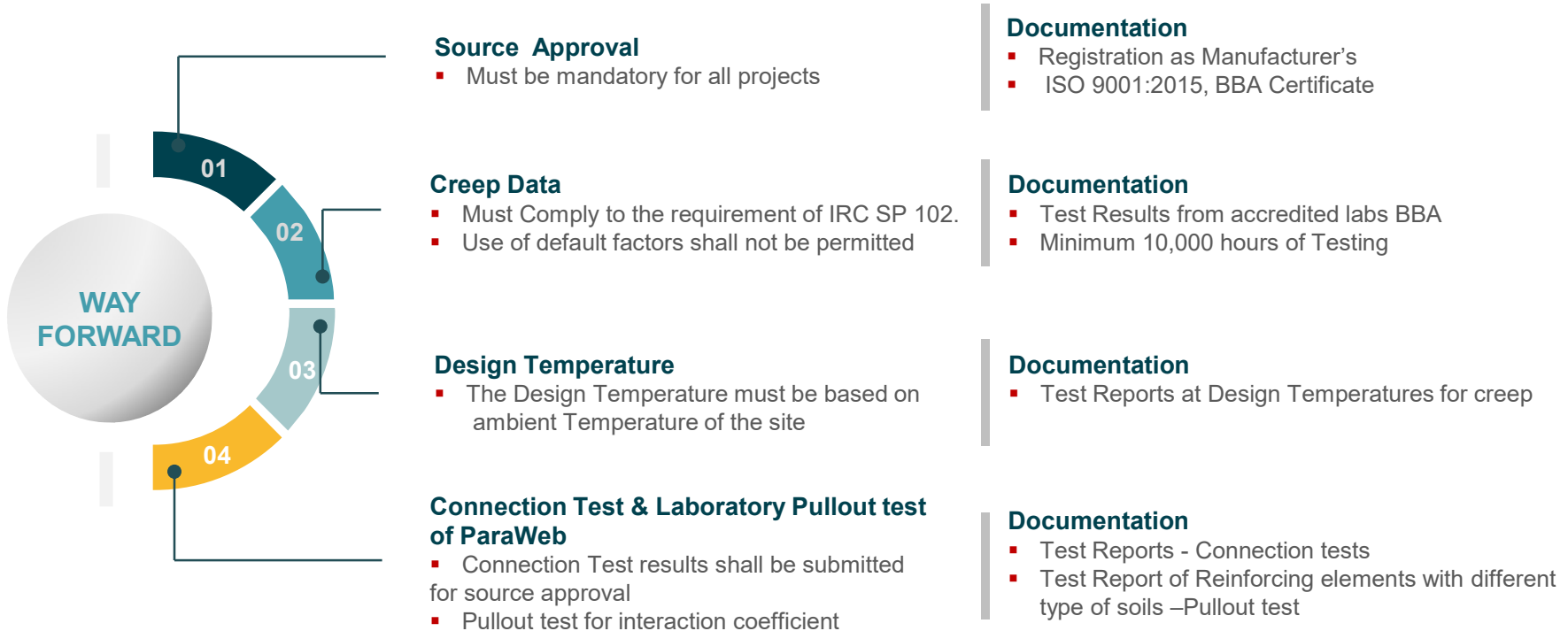


Note : Min. 10,000 hrs. test results are required

Paraweb® creep upto 41,945 hrs. (tested for more hours than 41,000)

As per IRC SP :102 , Certification for reduction factors of geosynthetic reinforcing elements shall be taken from accredited agencies like **BBA, NTPEP etc.** Test report can be considered acceptable if it is from reputable international bodies..

WAY FORWARD: HENCE-FORTH



Thank You.

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