EPS GEOFOAM APPLICATION TO SUPPORT SUSTAINABLE ROAD CONSTRUCTION

PT Adhi Karya (Persero) Tbk.

2023

Speaker Profile

EDUCATION

- S1 : TekniK Sipil UNDIP (1999)
- S2 : TekniK Sipil UNDIP (2018)
- Profesi Insinyur UNDIP (2021)
- IPM PII (2021)
- Student S3 DRM

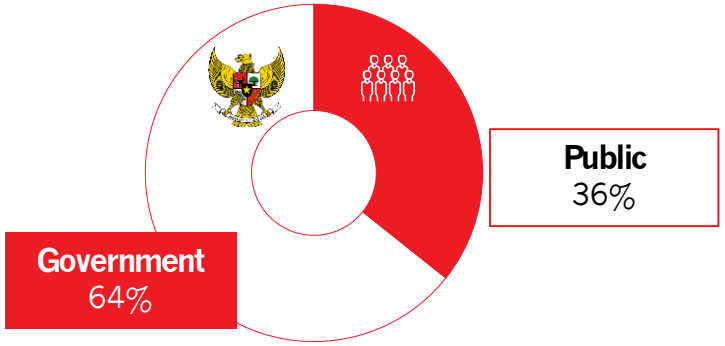
CAREER

- General Manager Infrastructure 1 Department – PT Adhi Karya (Persero) Tbk. – 2020 to present
- Division Construction III Manager– Infrastructure 1 Department PT Adhi Karya (Persero) Tbk. – 2016 to 2020
- Engineering Unit Manager – Infrastructure 1 Department PT Adhi Karya (Persero) Tbk. – 2016
- Division Construction III Production Manager for Sumsel, Bengkulu, Babel, Jambi and Lampung Area – 2015 to 2016
- Deputy Head of LRT Jakarta Division – 2015

ORGANIZATION

- Treasurer of the Adhi Sejahtera Union (KOJAS) – 2017 to present
- Politeknik Negeri Lampung Lecturer – 2020 to present

ADHI Profile



- PT Adhi Karya (Persero) Tbk. (ADHI) is one of the construction state-owned enterprise with very good credibility. ADHI was founded in 1960 and became a public company in 2004.
- ADHI contributes to the development of monumental projects and national infrastructure projects, such as the National Monument, GBK Stadium, Istiqlal Mosque, Jabodebek LRT, Solo-Yogyakarta-Kulon Progo Toll Road, Yogyakarta-Bawen Toll Road, Cisumdawu Toll Road, and Sigli-Banda Aceh Toll Road
- Now, ADHI is 64% owned by the Government and 36% owned by public shareholders, with an equity value of IDR 8.8 trillion and total assets of IDR 37.6 trillion. ADHI is supported by 2,700 skilled and talented employees.

Business Profile

ENGINEERING & CONSTRUCTION

- Infrastructure
- Building
- Power Plant, *Oil and Gas*
- Railway Infrastructure

- Infrastructure Dept.
- Building Dept.
- Energy & Industry Dept.
- Railway Dept.

adhi persada gedung

PROPERTY & HOSPITALITY

- TOD Property
- Hotel
- Other Property

adhi commuter properti adhi persada properti

MANUFACTURE

- Precast Concrete
- Ready Mix

adhi persada beton

INVESTMENT & CONSESSION

- Infrastructure (Toll Road)
- Preservation (Road)
- *Water Management*
- *Waste Management*

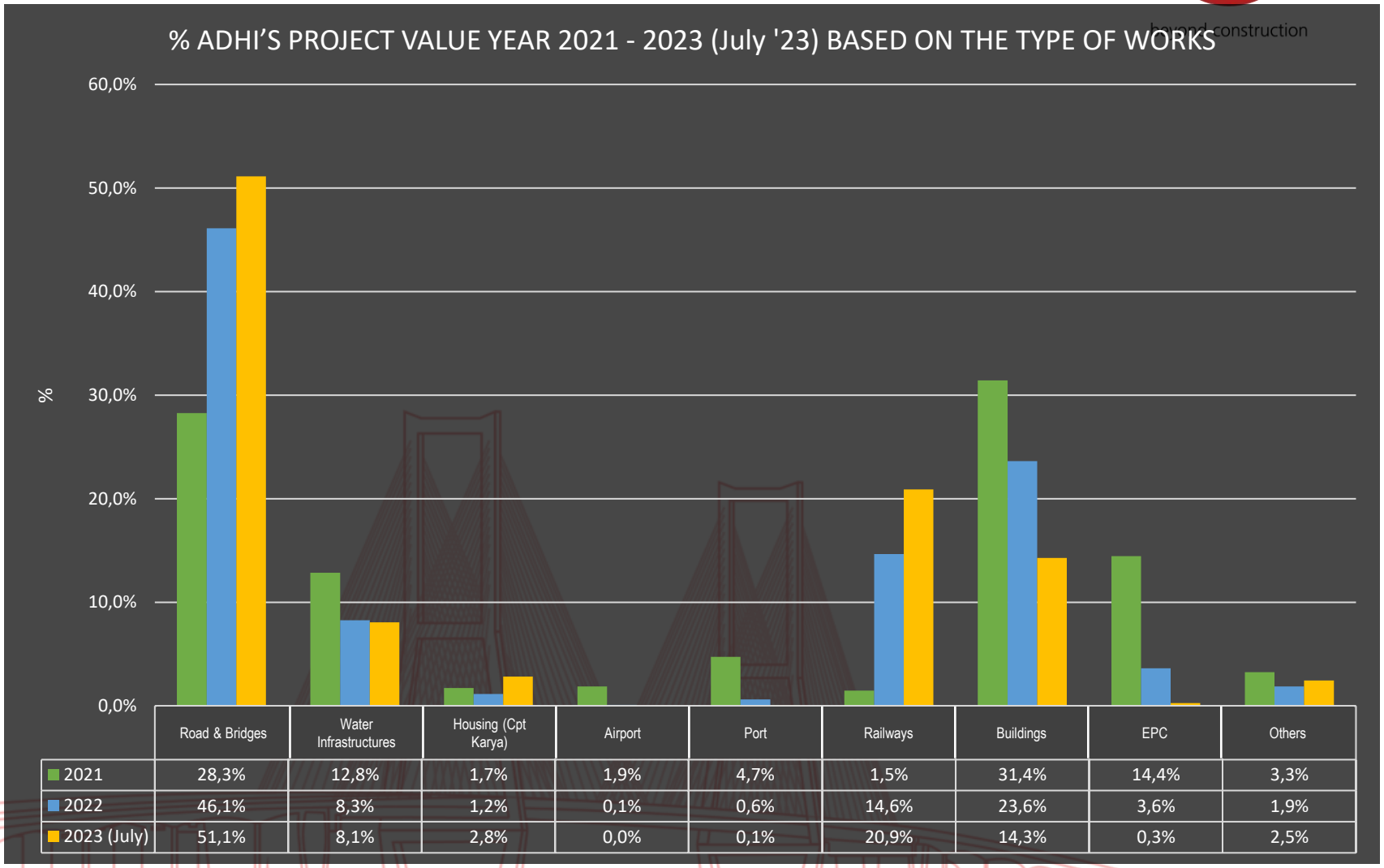
adhi JALINTIM RIAU · JASAMARGA JOGJA BAWEN · dumai tirta persada · JAA PT. JALINTIM ADHI ABIPRAYA · PT JOGJASOLO Marga Makmur · Karian Water Services · JASAMARGA BALI · JASAMARGA AKSES PATIMBAN · KLN KARYA LOGISTIK NUSANTARA

ADHI'S PROJECTS VALUES

Engineering & Construction

TYPE OF WORK	VALUE (Trillion)		
	2021	2022	2023
Road & Bridges	3,9	9,9	9,4
Water Infrastructures	1,8	1,8	1,5
Housing (Cipta Karya)	0,2	0,2	0,5
Airport	0,3	0,0	0,0
Port	0,7	0,1	0,0
Railways	0,2	3,1	3,8
Buildings	4,4	5,1	2,6
EPC	2,0	0,8	0,0
Others	0,5	0,4	0,4
TOTAL	**13,9**	**21,4**	**18,3**

- *In 2022 and 2023, the total contract value for Road & Bridge work is the largest in ADHI's Engineering & Construction business.*
- *For the past 3 years, the contract value of Road & Bridge work has increased significantly.*
- *It takes a lot of effort to achieve Sustainable Road Construction*

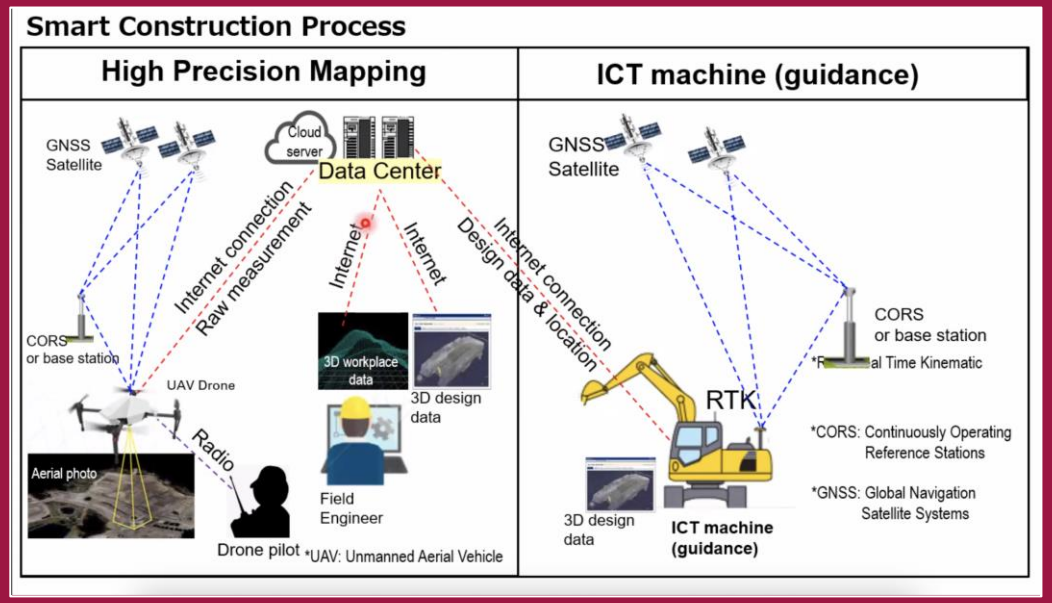


	Road & Bridges	Water Infrastructures	Housing (Cpt Karya)	Airport	Port	Railways	Buildings	EPC	Others
2021	28,3%	12,8%	1,7%	1,9%	4,7%	1,5%	31,4%	14,4%	3,3%
2022	46,1%	8,3%	1,2%	0,1%	0,6%	14,6%	23,6%	3,6%	1,9%
2023 (July)	51,1%	8,1%	2,8%	0,0%	0,1%	20,9%	14,3%	0,3%	2,5%

TECHNOLOGY 4.0 AND SUSTAINABILITY AT ADHI

- Commitment to using a minimum of 5D BIM (3D visualization of project value) for all ADHI Karya projects
- Drone Mapping Photogrammetry & Lidar: 3D point cloud, photo mapping and existing contours
- Implementation of internal and external BIM Common Data Environment (CDE), facilitating digital document coordination and collaboration
- Investment in Waste management project (FPLT Medan)
- MOBOX (modular box) – project office buildings/facilities made of lightweight, reusable materials that can be assembled and moved easily and quickly.
- Project innovation related to sustainability, for example:
  - ❖ EPS Geofoam Application for Embankment in the Cisumdawu 5A Toll Road Project
  - ❖ Utilization of Residues of Crushed Stone Products Made from Natural Sandstone at Basecamp Stone Crusher Sibanceh Toll Road

- BIM 8D (Safety Management) Integration Plan based on Artificial Intelligence
- Plan for using Smart Equipment (optimizing the level of accuracy of heavy equipment in the field by utilizing technology)



EPS GEOFOAM and SUSTAINABILITY

On this occasion I will explain the use of EPS Geofoam material as a substitute for soil embankment material, to address the design challenges and implementation of sustainable road construction in the Cisumdawu Toll Road Section 5A project.

I will explain the reasons behind the need for a design review, as well as the reasons for choosing EPS Geofoam as a design alternative.

PROJECT INFORMATION

Drone Iamges of Section 5A

The Cisumdawu Toll Road (Cileunyi – Sumedang – Dawuan) is a toll road with a total length of 62.6 km and is part of the Trans Java Toll Road in West Java. This toll road connects Bandung, Sumedang and Majalengka.

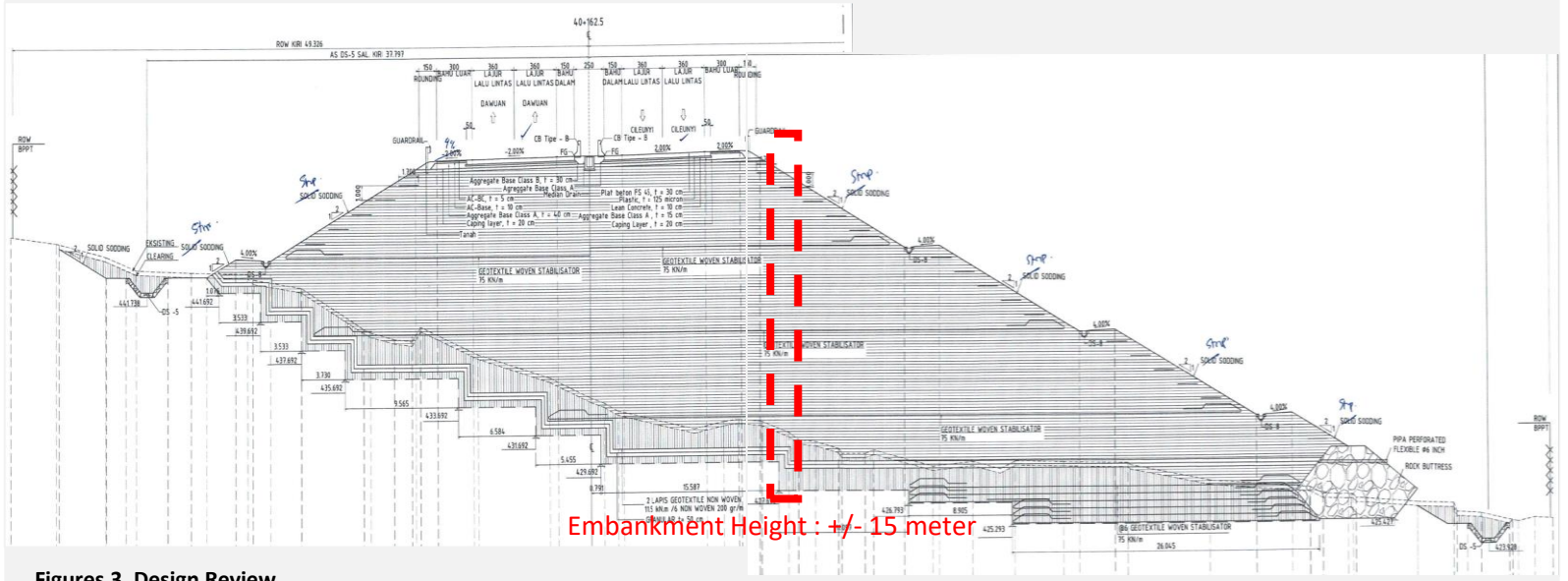
The construction of the Cisumdawu Toll Road is divided into 2 stages of work, the first stage is carried out by the government for 28.5 km and the second stage is carried out by the private sector (PT Citra Karya Jabar Tol) for 33.2 km.

PT. Adhi Karya (Persero) Tbk. appointed as the contractor to carry out the construction of Section 5A along 6.81 km, with PT CKJT as the project owner, PT MPB as the supervision consultant, and PT MRI as the independent quality inspector. The contract value of Section 5A based on Addendum 4 is Rp. 1,121,854,989,320 with an execution time of 485 calendar days, and a maintenance period of 730 calendar days.

DESIGN CHALLENGE

- In the embankment work at sta 40+050 - 40+324 (274 meters) there is a slope area as shown in Figure 2, the embankment design reaches +/- 15 meters (Figure 3).

Figure 2. Existing Condition After Clearing



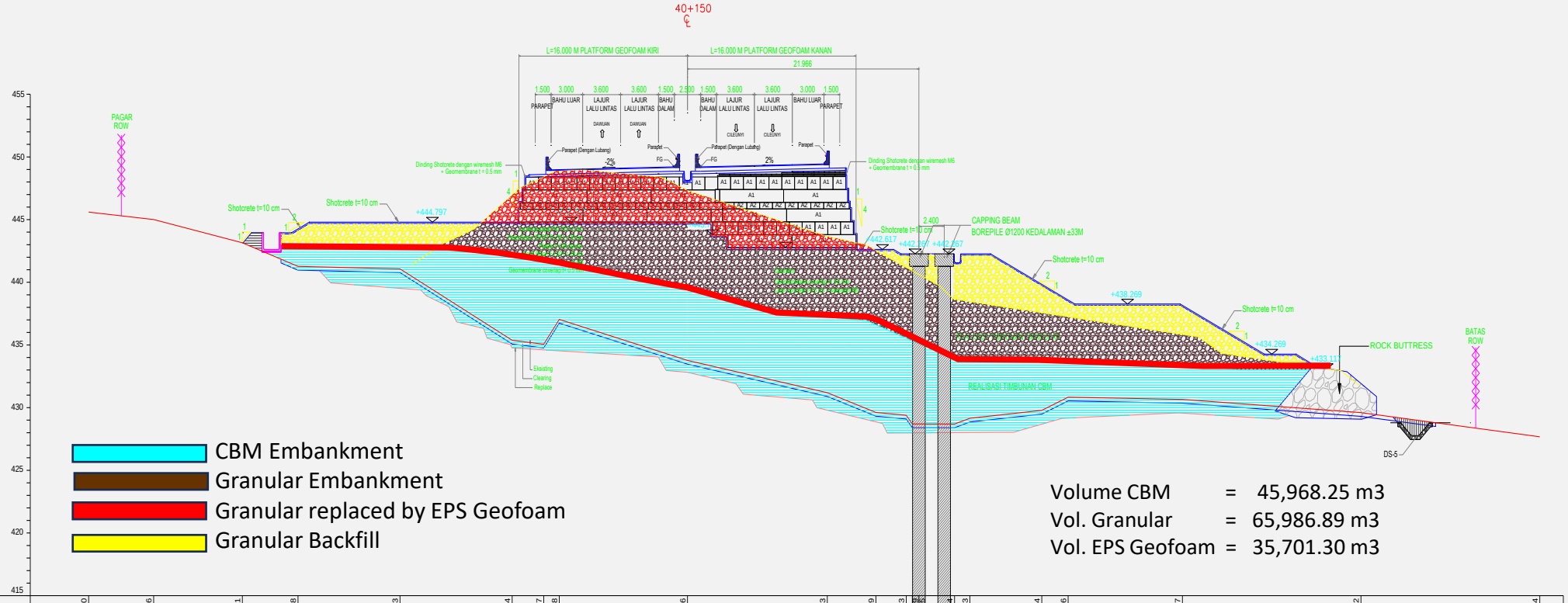
Figures 3. Design Review

- Based on soil investigation data, the subgrade soil at location 40+200 is clayshale soil, whose characteristics are easily damaged, and the shear strength can drop drastically.
- The bearing capacity of clayshale soil is relatively low, so it cannot support heavy soil loads.
- The use of granular materials as embankment in rainy conditions can cause rainwater to be trapped in the cavities of the material, thereby increasing the mass of the pile and prone to subsidence or shifting.
- Time is urgent, so a solution is needed to speed up the embankment work.
- It is hoped that the design solutions will support the construction of sustainable road infrastructure.

SOLUTION

- Reducing embankment elevation
- Create a temporary drainage system
- Replace some part of the granular embankment with **EPS Geofoam** material
- Build a soldier pile to increase the strength of the slope
- Adding a waterproof layer to the surface of the granular embankment
- Plan surface runoff management in the 40+200 area

FINAL DRAWING OF DESIGN CHANGES



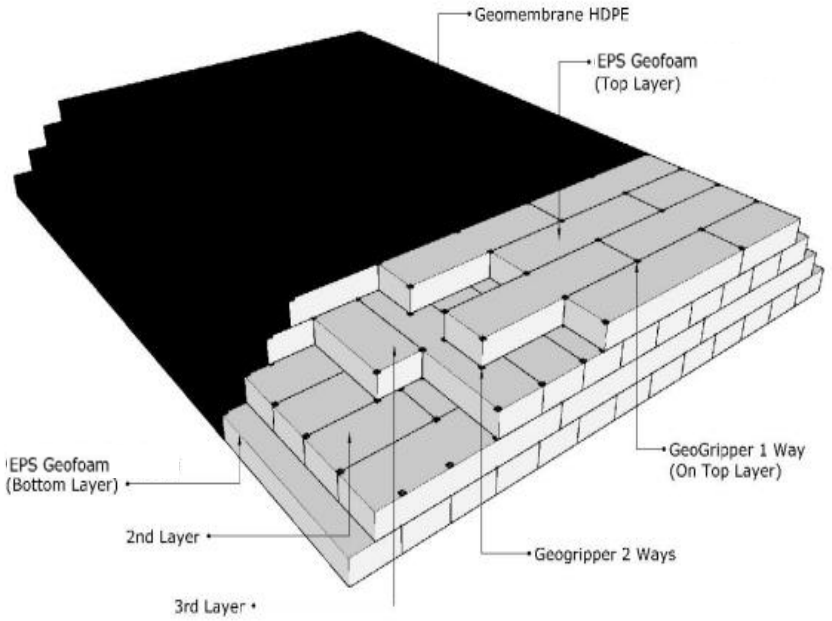
EPS GEOFOAM

WHAT?

Materials made from polymers that are developed with expanders (Expanded polystyrene)

WHERE?

- Road construction with low bearing capacity soil
- Bridge/rail abutments and underfills
- Lining of culverts and buried pipe structures, etc



WHY?

- The weight of EPS Geofoam is around 1%-3% (10kg/m3 to 60kg/m3) of the weight of the soil (1600kg/m3 to 2000/m3)
- Reducing the load that is supported by the subgrade
- Replacing problem backfill with more competent material
- Transfer the load to a more competent layer
- Workable in rainy weather
- Relatively fast work time
- Material is consistent and can be produced quickly
- Durable
- EPS Geofoam is **Green Materials**
- Not sensitive to weather

HOW?

- The EPS Geofoam material is poured into the block mold, to be heated and then evaporated
- EPS Geofoam is printed with dimensions of 4000 mm x 1000 mm x 500 mm and 6000 mm x 1000 mm x 1200 mm
- Dimensions can be customized according to field requirements

EPS GEOFOAM dan SUSTAINABLITY

EPS (Expanded Polystyrene) Geofoam is high density polystyrene formed as large lightweight blocks used in the construction sector. The weight of EPS Geofoam is around 1%-3% (10kg/m3 to 60kg/m3) of the soil weight (1600kg/m3 to 2000/m3).

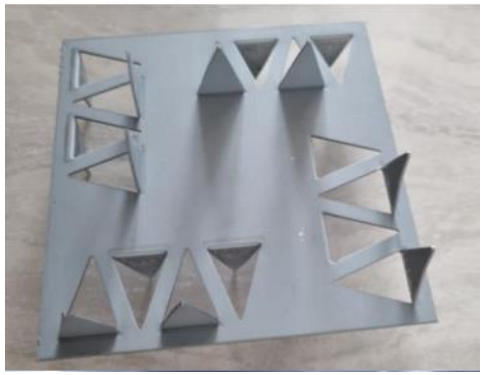
EPS Geofoam is ***Green Materials***

EPS Geofoam is recycleable and not easily decomposed by microorganisms, making it effective for long-term use. (not a single use material in a short time)

Residual material from EPS Geofoam can be reused into:

- New EPS Geofoam, with a maximum composition of 30% residual EPS Geofoam and 70% new raw material.
- Derivative products into polystyrene pellets and ingots, which are commonly used in the plastics industry (such as cellphone cases, hangers, buckets, trash cans, etc.)
- Water proofing material by mixing it with chemicals such as thinner.
- Planting media mixes, doll and bean bag fillers and other crafts.

SUPPLEMENTARY MATERIAL



Geo-Gripper

The hook between layers of EPS Geofoam blocks, which are installed with a certain distance

Geomembrane

Geosynthetics material which is waterproof, protects EPS Geofoam from direct exposure to liquids or other hazardous objects

PHOTOS

Soil Preparation Work

EPS Geofoam Platform Work

PHOTOS

EPS Geofoam + GeoGripper Installation Work

Concrete Floor Work

BUMN UNTUK INDONESIA

adhi
beyond construction

Shotcrete Work

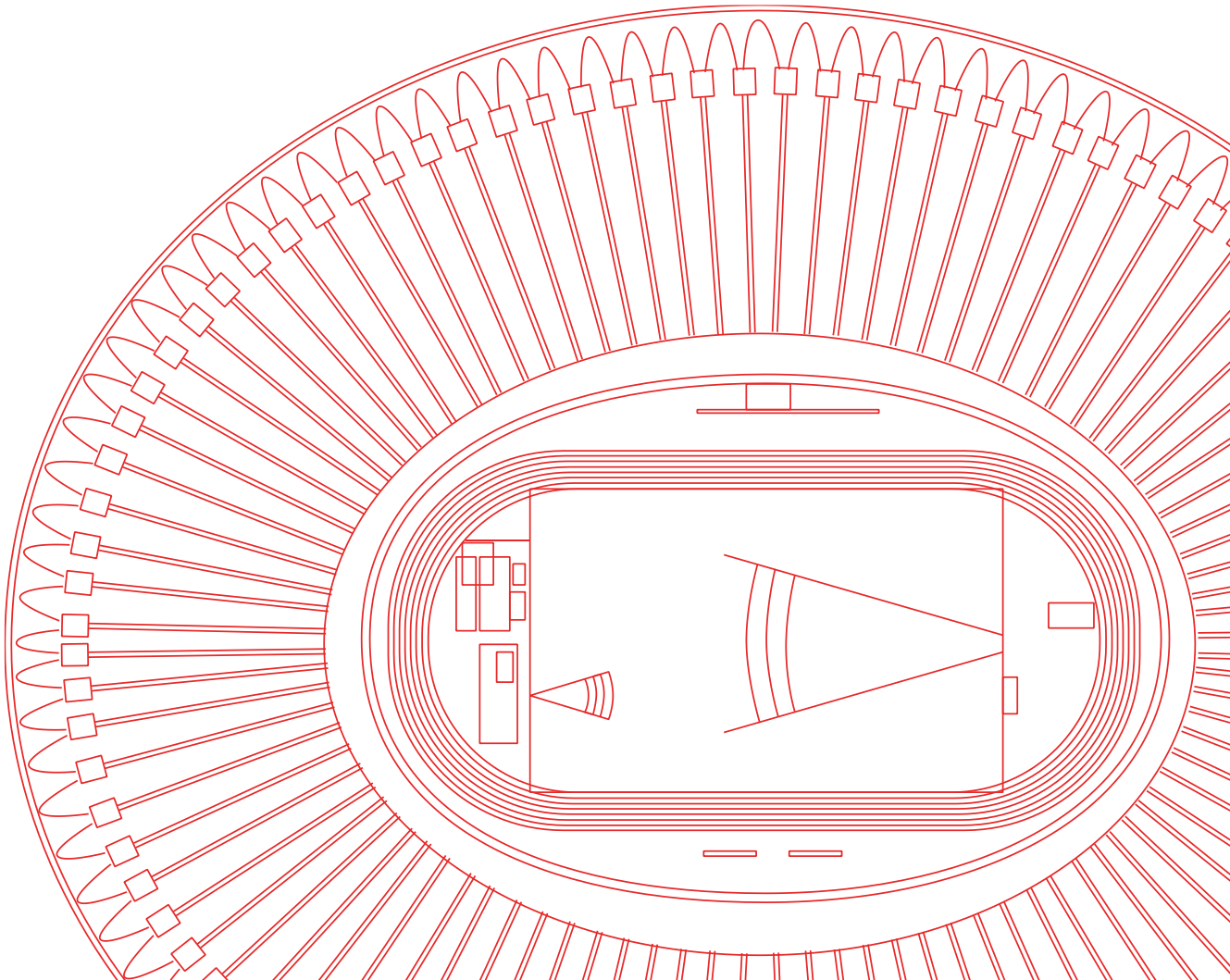
Final Condition

beyond construction

BUMN UNTUK INDONESIA

adhi
beyond construction

Thank You



Disclaimer

Important Notice

- This document was prepared only for the party with the purpose of discussion. This document and its contents may only be reproduced, disclosed or used with the express written consent of PT Adhi Karya (Persero) Tbk.
- This document may contain statements that projected hopes and expectations in the future, which represents the Company's current circumstances with possible events in the future and financial planning. The projections are based on assumptions and available data at the time this data is created, containing risks and are subject to change at any time.
- PT Adhi Karya (Persero) Tbk. or connected parties will not be liable in any way for any consequences (including but not limited to any direct, indirect, or consequential losses)arising from or relating to any reliance on or use of the content of this document.

www.adhi.co.id

For further information please contact:

+62 21 797 5312 +62 21 797 5311 corpcomm@adhi.co.id

BUMN UNTUK INDONESIA

adhi
beyond construction