Suseo High Speed Rail
(Yulhyeon Tunnel)
Republic of Korea

Presented by: Korea Rail Network Authority
1 General Information

61.1 km in total length, 52.3 kilometers

Deep underground tunnel
Suseo High Speed Rail (Yulhyeon Tunnel)
1. **General Information**

Client: **Korea Rail Network Authority**

Engineering firms: **Dong Myeong Engr. Consultants** and 9 others

Contractors: **Samsung C&T** and 9 others

Other stakeholders: **Korea Railroad T&C** and 14 others
### General Information

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<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>1</strong></td>
<td>Tunnel length</td>
<td>52.3 km (incl. 3-arch enlargement tunnel, NATM 48.4 km)</td>
</tr>
<tr>
<td><strong>2</strong></td>
<td>Cross sectional area</td>
<td>89.5 m²</td>
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<tr>
<td><strong>3</strong></td>
<td>Excavation volume</td>
<td>4,680,850 m³</td>
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<tr>
<td><strong>4</strong></td>
<td>Overall cost</td>
<td>€2,099 million</td>
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<tr>
<td><strong>5</strong></td>
<td>Civil works cost</td>
<td>€967 million</td>
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</table>

Yulhyeon Tunnel

Miami, USA 18th November 2019
2 Project Details

- Safe construction on geological anomalies (Singal Fault Zone, L = 12.8 km)
- 1st level of earthquake resistance (6.5 on Richter scale)
Project Details

- High quality construction of enlargement tunnel

3-arch, 2-arch tunnels (L = 535 m)

Wall thickness (600 mm → 900 to 1,600 mm), safety level increased up to 2.0
Project Details

Completed view of 3-arch tunnel

Yulhyeon Tunnel
Project Details

BIM used throughout the project (planning, design and construction)
2 Project Details

Safe construction with 0% settlement under existing HSR in service
Analysis of stability and real-time management of displacement

<table>
<thead>
<tr>
<th>Step</th>
<th>Maximum deflection (mm)</th>
<th>Angular displacement</th>
<th>Horizontal strain</th>
<th>Maximum horizontal displacement (mm)</th>
<th>Steel (Mpa)</th>
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</thead>
<tbody>
<tr>
<td>Step 1</td>
<td>1.089</td>
<td>6.548E-05</td>
<td>1.399E-05</td>
<td>3.375E-04</td>
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<tr>
<td>Step 2</td>
<td>1.089</td>
<td>6.548E-05</td>
<td>1.399E-05</td>
<td>3.375E-04</td>
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<tr>
<td>Step 3</td>
<td>1.089</td>
<td>6.548E-05</td>
<td>1.399E-05</td>
<td>3.375E-04</td>
<td>69.43</td>
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<td>Step 4</td>
<td>1.315</td>
<td>9.934E-05</td>
<td>1.132E-05</td>
<td>3.133E-04</td>
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<td>Step 5</td>
<td>1.797 (0.482)</td>
<td>1.023E-04</td>
<td>1.099E-05</td>
<td>3.825E-04</td>
<td>120.70</td>
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<td>Step 6</td>
<td>3.694 (2.376)</td>
<td>1.023E-04</td>
<td>1.122E-05</td>
<td>3.810E-04</td>
<td>162.40</td>
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<td>Tolerance range</td>
<td>25(3)</td>
<td>1/800 (1.25E-03)</td>
<td>1/2000 (5.0E-04)</td>
<td>3</td>
<td>190.00</td>
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<td>Evaluation</td>
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</table>
Project Details

Underpinning method

Completed view

Yulhyeon Tunnel
3 Underground Station

Dongtan Station size

\[ L = 607 \text{ m}, \quad W = 118 \text{ m}, \quad D = 43 \text{ m} \]
3 Underground Station

Earthwork (2,050,000 m³), anchor (17,011)
Emergency Evacuation

- 22 evacuation routes (average distance 2.2 km: shortest 1.1km, longest 4.7km)
Sustainability Criteria

1. Reduce access time to **15 to 16 mins.** compared to existing HSR stations (Seoul, Yongsan and Gwangmyeong Stns.).

2. Reduce travel time (Approximately **€16 million**).

3. Reduce trip time (**7 to 8 minutes**).

4. Increase railway capacity from **29 to 51 times**.
5 Sustainability Criteria

5. Effect on production inducement: €7,242 million

6. Job creation effect: 766 thousand

7. Effect on station area economy of: €374 million

8. Population influx: 12,896 people, industrial Impact of: €0.3 million

Yulhyeon Tunnel
Thank you!