The Qingzang railway, Qinhuai–Xizang railway, or Qinhuai–Tibet railway (simplified Chinese: 青藏铁路; traditional Chinese: 青藏鐵路; pinyin: Qīngzāng Tiělù; Tibetan: mtsho bod lcags lam), is a high-altitude railway that connects Xining, Qinghai Province, to Lhasa, Tibet Autonomous Region, in China.

The total length of Qingzang railway is 1956 km. Construction of the 815 km section between Xining and Golmud was completed by 1984. The 1142 km section between Golmud and Lhasa was inaugurated on 1 July 2006 by president Hu Jintao: the first two passenger trains were "Qing 1" (Q1) from Golmud to Lhasa, and "Zang 2" (J2) from Lhasa.[1] This railway is the first to connect China proper with the Tibet Autonomous Region, which due to its altitude and terrain is the last province-level entity in the People's Republic of China to have a conventional railway. Testing of the line and equipment started on 1 May 2006.[2] Trains run from Beijing, Chengdu, Chongqing, Xining and Lanzhou.[3]

The line includes the Tanggula Pass, at 5,072 m (16,640 feet) above sea level the world's highest rail track. The 1,338 m Fenghuoshan tunnel is the highest rail tunnel in the world, at 4,905 m above sea level. The 3,345-m Yangbajing tunnel is the longest tunnel on the line. It is 4,264 m above sea level, 80 kilometres north-west of Lhasa.

More than 960 km, or over 80% of the Golmud-Lhasa section, is at an altitude of more than 4,000 m. There are 675 bridges, totalling 159.88 km, and about 550 km of the railway is laid on permafrost.

Contents

- Stations
- Trains and tickets
- Oxygen supply
- Construction
  - Future Extensions
- Engineering challenges
- Economic impact
- Environmental impact
- Criticism
- References
- External links

Stations

In the Golmud to Lhasa part of the line, 45 stations are open, 38 of which are unstaffed, monitored in the control center in Xining. Thirteen more stations are planned.[4]

Trains and tickets

The trains are specially built for high altitude environment. The diesel locomotives used on Golmud-Lhasa section were made by GE in Pennsylvania, and the passenger carriages are Chinese-made 25T carriages: on train T27/T28, between Beijing West and Lhasa, BSP carriages are from Bombardier. Carriages used on the Golmud-Lhasa section are either deep green/yellow or deep red/yellow. Signs in the carriages are in Tibetan, Simplified Chinese and English. The operational speed is 120 km/h, 100 km/h in sections laid on permafrost.

The 1,142-km Qinghai–Tibet railway from Golmud to Lhasa was completed on 12 October 2005. It opened to regular trial service on 1 July 2006.[5] During the one-year trial period, three passenger trains ran from Beijing, Chengdu/Chongqing, and Xining/Lanzhou, numbered T27/T28, T22/T23/T24/T21, T222/T223/T224/T221, N917/N918, K917/K918, respectively. Train T27 from Beijing to Lhasa takes 47 hours 28 minutes, covering 4,064 km (2,500 miles), departs at 21:30 from Beijing West, and arrives in Lhasa at 20:58 on the third day. A ticket costs CNY¥ 389 for hard seat, CNY¥ 813 for a lower hard sleeper (a lower bunk in a basic sleeping car), or CNY¥ 1,262 for a lower soft
There are no differences from other railway tickets used in China.

Apart from hard seat tickets, there is an extra charge for forward-facing seats/berths. Compared with standard pricing for the same class, the soft seat, hard sleeper and soft sleeper tickets have an added charge of 0.09, 0.10 or 0.16 yuan per kilometre per person respectively.

Trains from Shanghai and Guangzhou started on 1 October 2006. Train T264/5 from Guangzhou departs at 10:29 every other day and arrives in Lhasa at 19:50 on the third day (duration: 57 hours 21 minutes), while T266/3 (from 4 October 2006) departs Lhasa at 08:32 and arrive in Guangzhou at 19:37 on the third day (duration: 59 hours 5 minutes). Trains T164/5 from Shanghai to Lhasa depart at 16:11 from Shanghai, via Wuxi, Nanjing, Bengbu, Zhengzhou, Xi'an, Lanzhou, Xining, Golmud, Nagqu, arrive in Lhasa at 19:50 on the third day (duration: 51 hours 39 minutes). Trains T166/3 from Lhasa to Shanghai depart at 08:32 and arrive in Shanghai at 13:45 on the third day (duration: 53 hours 13 minutes). Therefore, the Beijing and Lhasa journey is the shortest in terms of time duration.

A Passenger Health Registration Card is required to take the train. The card can be obtained when purchasing the ticket. Passengers must read the health notice for high-altitude travel and sign the agreement on the card to take the train. On 28 August 2006 a 75-year-old Hong Kong man was reported to be the first passenger to die on the train, after he had suffered heart problems in Lhasa but insisted on travelling to Xining. [3] (http://www.theaustralian.news.com.au/story/0,20867,20286280-23109,00.html) On 19 November 2006 a woman died giving birth to a child on her own in a toilet.

Ticket prices for five-carriage trains in the testing period were as follows: (Unit: Chinese Yuan)

<table>
<thead>
<tr>
<th>Train</th>
<th>From/To</th>
<th>Kilometres</th>
<th>Hard Seat</th>
<th>Hard Sleeper (lower berth)</th>
<th>Soft Sleeper (lower berth)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T27/28</td>
<td>Beijing west - Lhasa</td>
<td>4064</td>
<td>389</td>
<td>813</td>
<td>1262</td>
</tr>
<tr>
<td>T22/23/24/21</td>
<td>Chengdu - Lhasa</td>
<td>3360</td>
<td>331</td>
<td>712</td>
<td>1104</td>
</tr>
<tr>
<td>T222/223/224/221</td>
<td>Chongqing - Lhasa</td>
<td>3654</td>
<td>355</td>
<td>754</td>
<td>1168</td>
</tr>
<tr>
<td>T164/5</td>
<td>Shanghai - Lhasa</td>
<td>4373</td>
<td>406</td>
<td>845</td>
<td>1314</td>
</tr>
<tr>
<td>T166/3</td>
<td>Lhasa - Shanghai</td>
<td>4373</td>
<td>406</td>
<td>845</td>
<td>1314</td>
</tr>
<tr>
<td>T262</td>
<td>Guangzhou - Lhasa</td>
<td>4980</td>
<td>451</td>
<td>923</td>
<td>1434</td>
</tr>
<tr>
<td>T264</td>
<td>Lhasa - Guangzhou</td>
<td>4980</td>
<td>451</td>
<td>923</td>
<td>1434</td>
</tr>
<tr>
<td>K917/K918</td>
<td>Lanzhou - Lhasa</td>
<td>2188</td>
<td>242</td>
<td>552</td>
<td>854</td>
</tr>
<tr>
<td>N917/N918</td>
<td>Xining - Lhasa</td>
<td>1972</td>
<td>226</td>
<td>523</td>
<td>810</td>
</tr>
</tbody>
</table>

**Oxygen supply**

From October 2006 five pairs of passenger trains run between Golmud and Lhasa, and one more pair between Xining and Golmud. The line has a capacity of eight pairs of passenger trains, and the carriages are specially built and have an oxygen supply for each passenger.

**Construction**

Since the formation of the Tibetan Autonomous Region in early 1950s, the Chinese government has dreamed of building a railway connecting Tibet to China proper. Engineers were sent to investigate the possibility, but shortage of technology and money prevented the project from starting.

The 815 km section from Xining, Qinghai to Golmud, Qinghai opened to traffic in 1984. Construction of the remaining 1,142 km section from Golmud to Lhasa could not be started until the recent economic growth of China. This section was formally started on 29 June 2001. This section was finished on 12 October 2005, and signalling work and track testing took another eight months. It was completed in five years at a cost of $3.68 billion.
Track-laying in Tibet was launched from both directions, towards Tanggula Mountain and Lhasa, from Anduo Railway Station on 22 June 2004. On 24 August 2005, track was laid at the railway's highest point, the Tanggula Pass, 5,072 m (16,640 feet) above sea level.[6]

Forty-four railway stations are to be built, among them Tanggula Mountain railway station, at 5,068 m the world's highest (Côndor station, at 4,786 m, on the Rio Mulatos-Potosí line, Bolivia, and La Galera station at 4,781 m, in Peru, being the next highest). The Qingzang Railway project involved more than 20,000 workers and over 6,000 pieces of industrial equipment, and is considered one of China's major accomplishments of the 21st century.

Bombardier Transportation provided 361 high-altitude passenger carriages with special enriched-oxygen and UV-protection systems, delivered between December 2005 and May 2006. Fifty-three are luxury sleeper carriages for tourist services.[7]

The construction of the railway was part of the China Western Development strategy, an attempt to develop the western provinces of China, which are much less developed than eastern China. The railway will be extended to Zhangmu via Shigatse (日喀则) to the west, and Dali via Nyingchi (林芝) to the east. A further extension is planned to link Shigatse with Yadong near the China-India border [8] (Map [9]). The railway is considered one of the greatest feats achieved in modern Chinese history by the government, and as a result is often mentioned on regular TV programs. Chinese-Tibetan folk singer Han Hong has a song called Tianlu (Road to Heaven; 天路) praising and glorifying the Qingzang Railway.

Future Extensions

In a meeting between Chinese and Nepalese officials on 25 April 2008, the Chinese delegation announced that country's intention to extend the Qingzang railway from Lhasa to Khasha on the Nepalese border. Nepal had requested that the railway be extended to enable trade and tourism between the two nations. Construction of the extension is planned to be completed by 2013.[10] On 2008-08-17, a railway spokesman confirmed plans to add six more rail lines to the Qinghai-Tibet railway. The six new tracks include one from Lhasa to Nyingchi and one from Lhasa to Xigaze, both in the Tibet Autonomous Region. Three tracks will originate from Golmud in Qinghai province and run to Chengdu in Sichuan province, Dunhuang in Gansu province, and Kuerle of the Xinjiang Uygur Autonomous Region. The sixth will link Xining, capital of Qinghai, with Zhangye in Gansu. The six lines are expected to be completed and put into operation before 2020.[11]

Possible stations include:
- Khasa
- Yatung
- Nathu La - a mountain pass near Indian state of Sikkim.
- Nyingchi - an important trading town north Arunachal Pradesh, at the tri-junction with Myanmar (1000mm gauge).
- Birganj - nearest railhead in Nepal of 1676mm gauge Indian Railways
- Raxaul in Bihar state - 1667mm gauge and/or 1000mm ?

Engineering challenges

There were and are many technical difficulties for such a railway. About half of the second section was built on barely permanent permafrost. In the summer, the uppermost layer thaws, and the ground becomes muddy. Chinese engineers dealt with this problem by building elevated tracks with foundations sunk deep into the ground, building hollow concrete pipes beneath the tracks to keep the rail bed frozen, and using metal sun shades.[12] Similar to the Trans-Alaska Pipeline System portions of the track are also passively cooled with ammonia based heat exchangers.

The air in Tibet is much thinner, having 35% to 40% less oxygen than at sea level. Special passenger carriages are used, and several oxygen factories were built along the railway. At this altitude in these latitudes, water in toilets must be heated to prevent freezing. The Chinese government claimed that no construction worker died during the construction due to altitude sickness related diseases. [13] The railway passes the Kunlun Mountains, an earthquake zone. A magnitude 8.1 earthquake struck in 2001. Dozens of earthquake monitors have been installed along the railway.

Economic impact

With limited industrial capacity in Tibet, the Tibetan economy heavily relies on industrial products from more developed parts of China. Transport of goods in and out of Tibet was mostly through the Qingzang Highway connecting Tibet to the adjacent Qinghai province, which was built in the early 1950s. The length and terrain have limited the capacity of the highway, with less than 1 million tons of goods transported each year. With the construction of the Qingzang railway, the cost of transportation of both passengers and goods should be greatly reduced, allowing for an increase in
volume—the cost per tonne-kilometer will be reduced from 0.38 RMB to 0.12 RMB. It is projected that by 2010 2.8 million tons will be carried to and from Tibet, with over 75% carried by the railway\[14\]. This is expected to boost and transform the Tibetan economy.

Environmental impact

The environmental impact of the new railway is an ongoing concern. The increase in passenger traffic will result in greater tourism and economic activity on the Tibetan Plateau.

Dejectas and junks are collected into two vacuum containers in every car and not chucked on the tracks. They are taken out after arriving at the terminus.\[13\]

Wood is the main fuel source for rural inhabitants in certain regions of Tibet. The damage to the ecosystem caused by cutting trees for fuel takes years to recover due to slow growth caused by Tibet's harsh environmental conditions. The railway would make coal, which is not produced in Tibet, an affordable replacement. However, the increase in fuel combustion due to increased human activity in an already-thin atmosphere may affect the long term health of the local population.\[16\]

The effects of this railway on wild animals such as Tibetan antelope and plants are currently unknown. Thirty-three overpasses were constructed specifically to allow continued animal migration. Here (http://maps.google.com/maps?t=k&ll=35.290258,93.27075&spn=0.004843,0.006416) is the Google Maps satellite image of one such bridge.

Criticism

Opponents of China's Tibet policies claimed that the railway was built to strengthen its political control over Tibet. \[17\]

It is alleged by these opponents that the railway will encourage further immigration from the rest of China, reducing the proportion of Tibetans in the Tibet Autonomous Region. Tibetans find it increasingly difficult to compete in the job market against skilled Han workers (most of the workers on the railway were of the Han ethnicity).\[18\]

Tibetans independence supporters have also expressed concerns that the Chinese government will use the railway to strengthen its military presence in the Tibet Autonomous Region as well as to further exploit Tibet's natural resources and damage its environment. As a result, Bombardier Transportation, a Canadian company, has faced international criticism from some pro-independence organizations for its involvement in constructing rail cars for the project.\[19\][20][21]

Fleet

- 361 Bombardier Sifang Power (Qingdao) Transportation Ltd./Power Corporation of Canada/China South Locomotive and Rolling Stock Industry (Group) Corporation High-Grade Coach - 308 standard cars and 53 special tourist cars
- GE Transportation NJ2 locomotive (78 GE designation C38ACh locomotives were built)
- Qishuyang Locomotive Factory DF8CJ 9000 series locomotive - similar to the Bombardier Transportation-GE Transportation Blue Tiger diesel electric locomotive

References

- ^ Bombardier (25 February 2005). Bombardier Awarded A Contract For High Altitude Passenger Rail Cars In Tibet (http://www.bombardier.com/index.jsp?id=0_0&lang=en&file=en/0/pressrelease.jsp%3Fgroup%3D0%026an%3Den%26action%3Dview%26mode%3Dsearch%26year%3D2005%26id%3D2748%26cat%3D0_1) . Retrieved 25 August 2005.
- ^ News on Chinese government website (in Chinese) (http://news.sina.com.cn/c/2006-07-01/193210306837.shtml) quotes: The vice president of Qinghai Medical University, Dr Gerili, said "Because of proper preventions and treatments, among tens of thousands of workers from low altitude, no one died due to altitude sickness. You cannot deny that it's a miracle."
- ^ News - 旅客“三急”铺排会否熏青藏高原吗？ (http://www.ycwb.com/gb/content/2006-07/01/content_1156528.htm)
External links

- Railway map of China (http://www.johomaps.com/as/china/chinarail.html)
- China Travel Guide - Qinghai-Tibet Railway
- Environmental Protection Along the Qinghai-Tibet Railway (http://www.usembassy-china.org.cn/sandt/ptr/Qingzang-Railway-prt.htm), US Embassy report
- The Guardian, 20 September 2005, "The railway across the roof of the world" (http://www.guardian.co.uk/china/story/0,7369,1573971,00.html)
- Tibet railway construction (http://home.c2i.net/schaefer/tibettrail.html)
- CCTV report regarding the railroad (http://www.cctv.com/english/special/C16259/01/index.shtml)
- "The train to Tibet", The New Yorker, 16 April 2007 (http://www.newyorker.com/reporting/2007/04/16/070416fa_fact_mishra)


Categories: Railway lines in the People's Republic of China | Mountain railways | Rail transport in Tibet

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