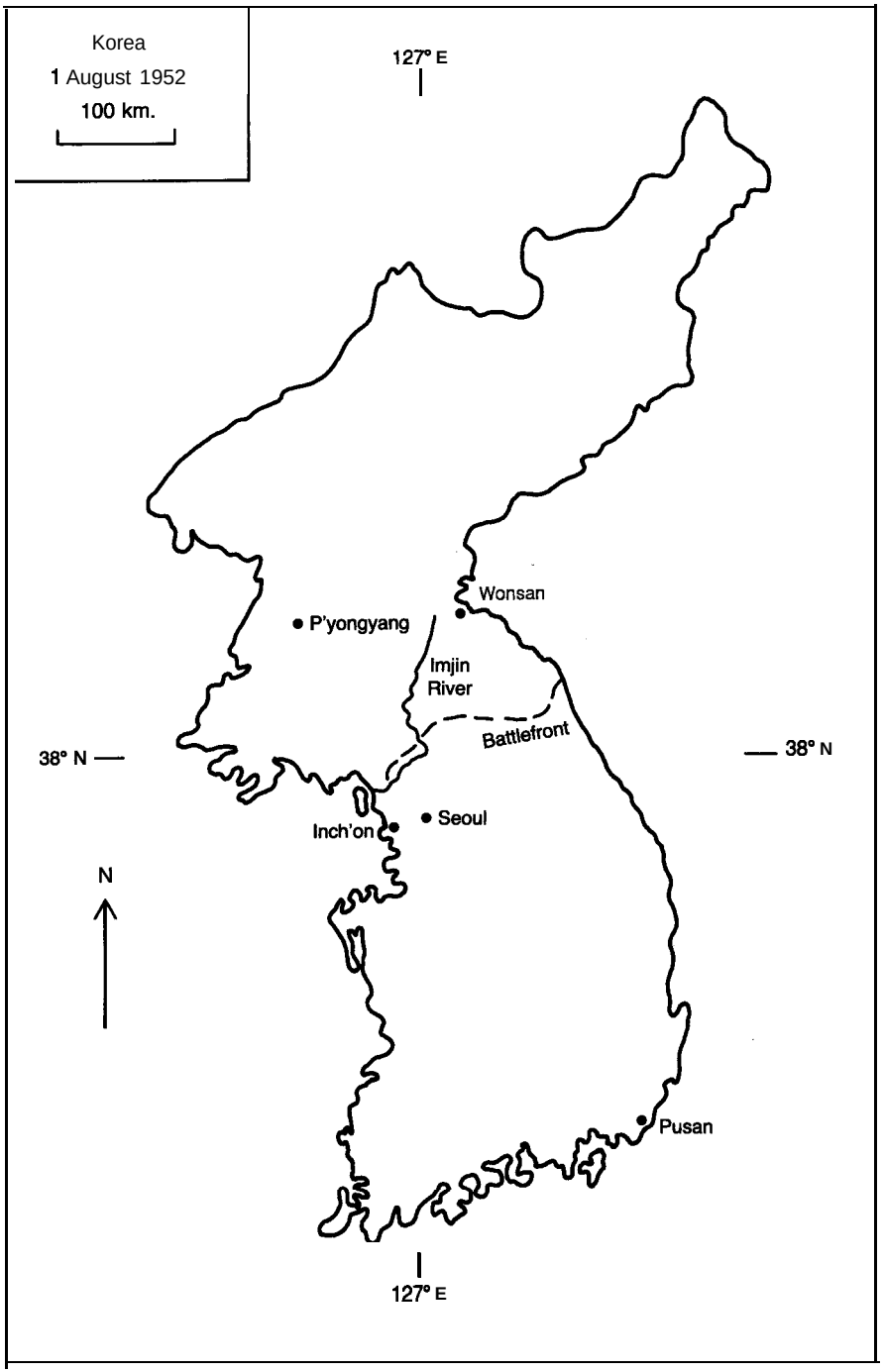
BRIDGING THE IMJIN

CONSTRUCTION OF LIBBY AND TEAL BRIDGES DURING THE KOREAN WAR

(OCTOBER 1952–JULY 1953)


Korea
1 August 1952
100 km.
127° E
Wonsan
P'yongyang
Imjin
River
Battlefront
38° N
38° N
Seoul
Inch'on
N
Pusan
127° E

MAP 1

Introduction

by Charles Hendricks

The Imjin River rises high in the Taebaek range along Korea's eastern coastline. *(Map 1)* Starting its journey less than 20 miles west of the important North Korean port of Wonsan, it flows south through the rugged central portion of the Korean peninsula, gathering with it the waters of the Komit'an, Yokkok, and Hant'an rivers before turning southwest at the 38th parallel to join the Han River as it approaches the Yellow Sea. While the Imjin appears no more than a sluggish stream during much of the year, the monsoon rains that mark the Korean summer regularly transform it into a mighty torrent during July and August.

The lower reach of the Imjin, stretching from the confluence of the Yokkok to the Han, gained considerable military significance during the last two years of the Korean War. In this period the western end of the main battle line between the United Nations and Communist forces stabilized along the plains and hills a few miles west and north of the river. From the crossing of the lower Imjin by American-led U.N. forces in June 1951 until the signing of the armistice on 27 July 1953, the vagaries of the Imjin's summer floods, autumn calms, winter freezes, and spring thaws posed continuous challenges to the Army engineers responsible for maintaining passage across its waters.

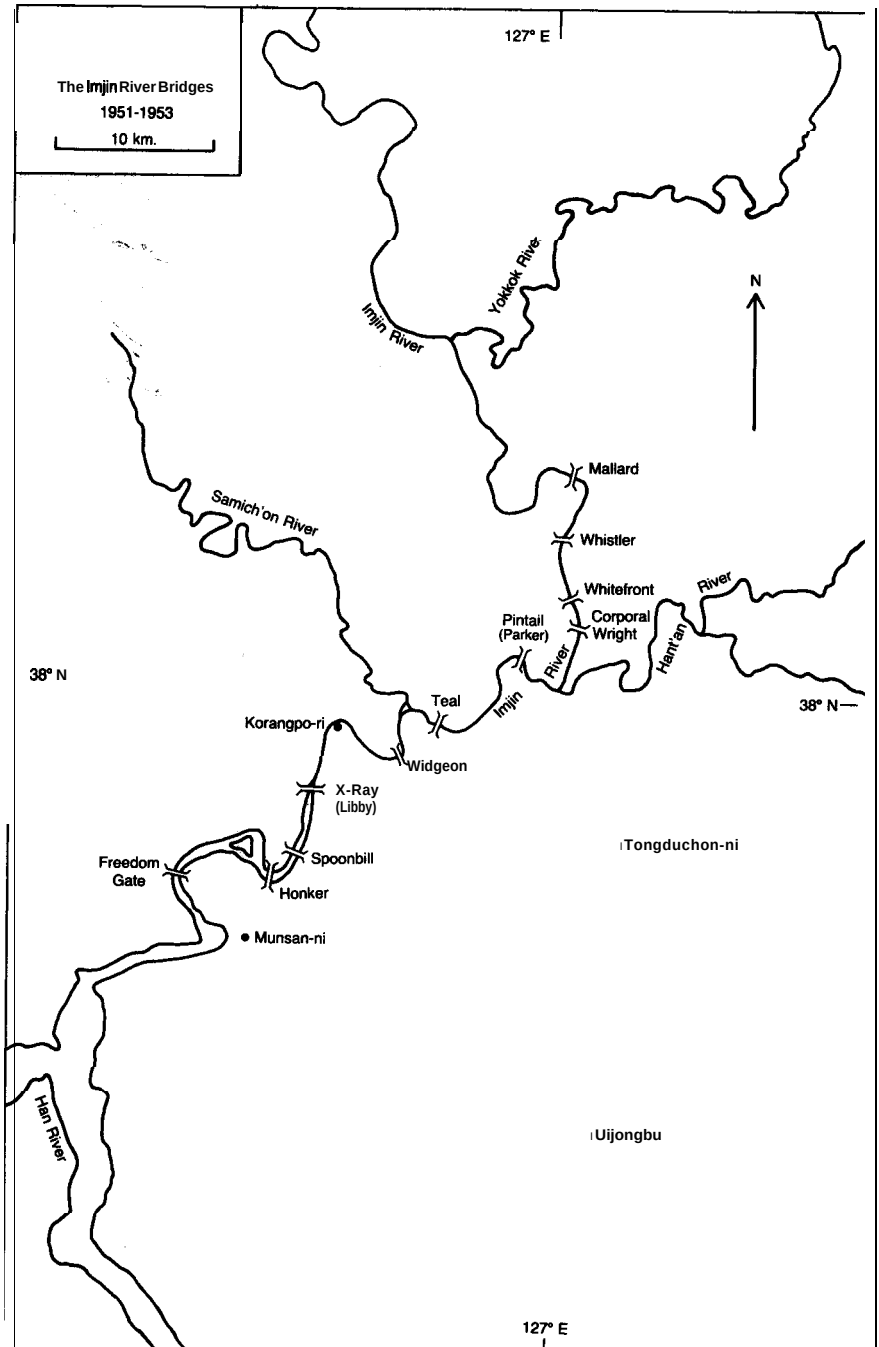
This volume tells the story of the construction during late 1952 and early 1953 of two bridges across the Imjin. Both represented innovative approaches to the problems posed by the river. The modern, high-level Libby highway bridge supported on concrete piers and abutments and the submersible, low-level Teal bridge built on 16-inch steel piles were novel solutions to bridging requirements located so near a battlefront. The building of these bridges climaxed a preliminary 15-month contest between the Army engineers and the Imjin, during which the engineers learned the devastating power of the river and began to devise solutions to its challenges.

The engineer confrontation with the Imjin began after the 1951 Communist spring offensive ground to a halt short of Seoul in May. United Nations forces on the western side of Korea led by Major General Frank W. Milburn, commander of the U.S. Army's I Corps, quickly resumed their advance, retook Uijongbu on 6 May, and reached the Hant'an River on the 25th. Three days later, I Corps' 58th Engineer Treadway Bridge Company bridged the Hant'an near where it flowed into the Imjin. The 408-foot floating bridge built by the company supported the advance of the 1st Cavalry Division.[1]

The same company, aided by elements of I Corps' 1092d Engineer Combat Battalion, began on 6 June to construct a 492-foot M-2 floating treadway bridge across the Imjin roughly 3½ miles to the northwest. Designed to support the drive of the British 28th Independent Brigade, then attached to the 1st Cavalry Division, the bridge's ponton rafts had to be assembled one-half mile downstream from the bridge site and then towed there by amphibious trucks (DUKWs), utility boats, and manpower. Construction was interrupted by enemy mortar fire around dark and was not completed until early the next afternoon. It was named the Corporal Wright bridge in honor of Corporal Theodore Wright of the 58th Engineer Company, who died of wounds received during its construction.[2] *(Figure 1) (Map 2)*

During June, United Nations troops pressed their advance in the mountains east of the Imjin and north of the Hant'an but undertook only raids and patrols west of the Imjin. In making these raids, the U.N. forces relied upon floating treadway bridges, 50-ton capacity ferries, and footbridges installed at three sites on the lower Imjin. The Corporal Wright bridge was replaced by a ferry and a footbridge on 26 June; another ferry and footbridge were installed 3½ miles north at what would become known as the Whistler site; and during 20-22 June the 58th Engineer Company and Company A, 14th Engineer Combat Battalion, installed a second M-2 steel treadway bridge 16 miles southwest of the Corporal Wright bridge at what the Americans would later call the Honker site. This last bridge stood astride the main road from Munsan-ni to Kaesong, Korea's medieval capital, and it enabled a tank and infantry force of the Republic of Korea's 1st Division to stage a successful raid on Kaesong.[3]

Because of the danger of a new enemy offensive, I Corps engineers removed the Honker bridge only four days after its


The Imjin River Bridges
1951-1953
10 km.
127° E
Yokkok River
Imjin River
N
Mallard
Samich'on River
Whistler
Whitefront
River
Pintail
(Parker)
Corporal
Wright
Hant'an
River
38° N
Teal
Imjin
River
38° N
Korangpo-ri
Widgeon
X-Ray
(Libby)
Tongduchon-ni
Freedom
Gate
Spoonbill
Honker
Munsan-ni
Han River
Uijongbu
127° E

MAP 2

completion and replaced it with a ferry. Even farther downstream, the Korean division in late June blew a 234-foot gap in the Chinese-built railroad bridge on the main rail line from P'yongyang to Seoul. The Koreans acted on the orders of the I Corps engineer, Colonel Emerson C. Itschner, a man who would later become Chief of Engineers. But when the Communists proposed to hold peace talks at Kaesong, the companies that had constructed the June bridge at the Honker site built another floating bridge there on 2 July to accommodate U.N. delegates to the forthcoming conference.(*Figure 2)* This time they employed a mobile crane and a platoon of dump trucks to build up the north shore approach road to protect it from high water.[4]

The United Nations forces were thus operating three crossing points on the Imjin when the 1951 rainy season began in earnest on 19 July. I Corps measured 5.22 inches of rain in the *48* hours beginning at noon that day, and by 21 July the Imjin had risen to 11.8 feet. The 1st Cavalry Division's 8th Engineer Combat Battalion attempted to remove the Whistler footbridge, but began too late and lost one-third of it. The footbridge at the Corporal Wright site washed out completely. One section of footbridge slammed into the ferry at the latter site and sent it a mile downstream. Together with a disabled DUKW and other debris, the runaway footbridge then floated all the way down to the Honker site where it hit and bent the floating bridge, putting it out of service for three days. Colonel Itschner observed, "A lesson learned during this latest period is that no floating equipment is dependable under heavy flood conditions with large quantities of debris."[5]

American engineers constructed a new footbridge and ferry at Whistler in late July, but more high water on 1 August washed them out. Nevertheless, corps engineers began the more ambitious task of building a floating treadway at the Whistler site on the very same day. Although they had to suspend work for a time because of the flood, they managed to complete a 600-foot-long bridge by the morning of 3 August, when tanks of the 1st Cavalry Division rumbled across in an offensive drive. *(Figure 3)* The fate of this bridge was typical of I Corps' problems with the Imjin that August. High water two days later forced the engineers to swing the bridge to shore, and the receding river left it high up on the bank. Rebuilt on 6-7 August, the bridge was finally dismantled on 9 August during a new flood?

The flood of 1 August also swept away the Honker floating

treadway. American engineers rebuilt it over the next two days and then swung it to shore during the floods of 5 and 9 August. But the bridge broke loose from its anchorage at 11 AM on the 9th and floated all the way down to the Yellow Sea, despite the efforts of amphibious engineers to recover it. Eighth Army's 84th Engineer Construction Battalion rebuilt this bridge during 12-16 August but took it down three days later in the face of typhoon warnings. After the storm turned away from Korea, the battalion rebuilt the bridge again on the 26th and 27th. A day after its completion, new floodwaters once more destroyed the bridge.[7]

Fortunately for the engineers, enemy action that summer did not match the ferocity of the river. Observing again that "keeping floating bridges intact during heavy flood periods is an impossible task," Itschner was grateful that "the seriousness of the floods [was] reduced greatly by the quiet tactical situation; during a more active and operational period such floods could have proven disastrous to the UN troops."[8]

Shortly after the 1951 flood season ended in late August, I Corps pushed major elements across the Imjin River. The offensive began 7 September when a battalion of the 1st Commonwealth Division advanced to Chalmul. Two more battalions of this division and elements of the 1st Cavalry Division crossed the river the following day, advancing to a new Line Wyoming that ran west of the Imjin from Korangpo-ri northeast through Chalmul and Kangso-ri.[9]

The 58th Engineer Treadway Bridge Company and the 14th and 1092d Engineer Combat Battalions built three M-2 floating treadways across the Imjin on 8 and 9 September to support this advance. The 396-foot Pintail bridge just 2% miles below the Imjin's confluence with the Hant'an and the 456-foot Teal bridge 4 miles farther southwest supported the advance of the 1st Commonwealth Division. At Whitefront, 1¼ miles north of the old Corporal Wright site and 3 miles northeast of Pintail, the engineers completed a 540-foot floating bridge just before midnight on 9 September. These engineer units built a fourth floating treadway across the Imjin, the Widgeon bridge, on 20 September. While this bridge was only two miles southwest of the Teal bridge, the broad northwesterly bend in the Imjin between Widgeon and Teal jutted so close to Line Wyoming that supplies could not be safely transported on the Imjin's west bank between the two bridges.[10]

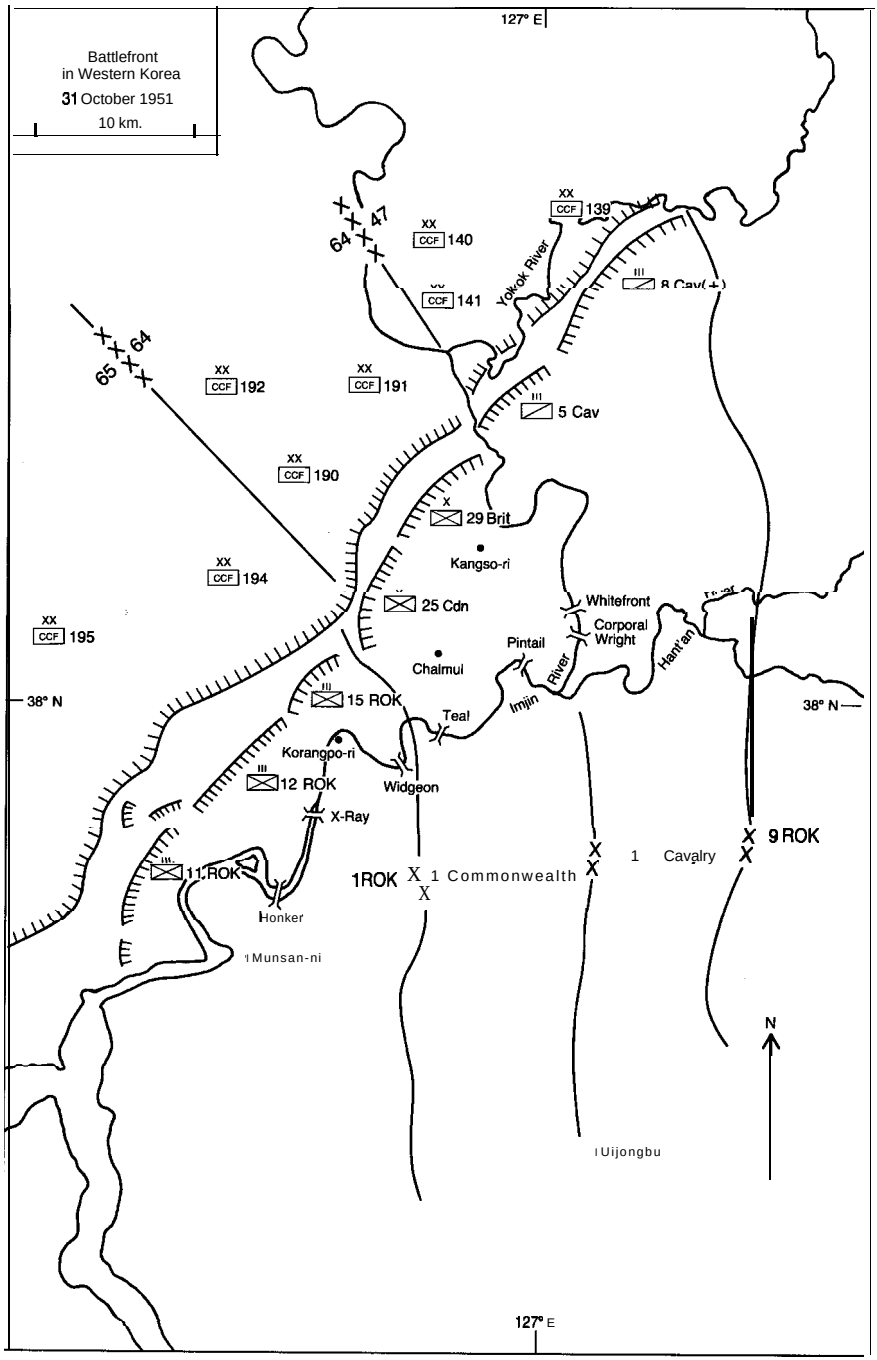
After a brief respite, I Corps pushed its limited advance forward another three to four miles to Line Jamestown in October. (*Map* 3) This new advance moved the Republic of Korea's 1st Infantry Division across the river and pushed the 1st Commonwealth Division comfortably beyond it. The Korean division's movement created a need for more bridges across the lower Imjin. I Corps engineers built a footbridge at Korangpo-ri, three miles downstream from Widgeon, in early October and replaced it with a causeway later in the month. They built a floating treadway at the X-Ray site three miles farther south and a floating footbridge six miles below Korangpo-ri on 18 and 19 October?

On 23 October, two days before the resumption of armistice talks at Panmunjom, the 84th Engineer Construction Battalion rebuilt the Honker floating treadway bridge to facilitate access to the truce talks. The Honker bridge was located just 1% miles below the footbridge that the Republic of Korea's 901st Light Ponton Company had installed 6 miles south of Korangpo-ri. Honker adequately served the area.[12]

As there were no bridges intact downstream from Honker, I Corps ordered the Korean company to remove the footbridge and transport it 3½ miles west of the Honker crossing to what would be called the Freedom Gate site. There, alongside the remains of the low-level railroad bridge that their countrymen had severed in June and the high-level rail crossing that had been broken earlier in the war, the 901st Company at the end of October twice more laid the footbridge across the Imjin. Each time, the powerful currents of a ten-foot tide washed it out. Colonel Edward Daly, the new I Corps engineer, finally conceded the impossibility of maintaining a floating bridge there.[13]

With winter approaching, I Corps engineers considered alternatives to the floating bridges. Beginning in September, they looked for appropriate sites for pile bridges. They knew that "if I Corps was successful in staying across the Imjin River, that these permanent bridges would be required to reduce the danger of flood and ice destroying the M-2 bridges."[14]

Not enough permanent pile bridges could be constructed before ice filled the Imjin, however. So in early November the engineers decided to replace the floating bridges with low-level fixed bridges that could be constructed quickly. In shallow water, rock-filled crib piers would support the span. The engineers would use pile piers where the river was at least three feet deep. In either


Battlefront
in Western Korea
31 October 1951
10 km.
127° E
64
47
XX CCF 140
XX CCF 139
Yokok River
III 8 Cav(-)
141
65
64
XX CCF 192
XX CCF 191
III 5 Cav
XX CCF 190
X 29 Brit
Kangso-ri
XX CCF 194
25 Cdn
Whitefront
Corporal Wright
XX CCF 195
Pintail
River
Hant'an
Chalmul
38° N
III 15 ROK
Teal
Imjin
38° N
Korangpo-ri
III 12 ROK
Widgeon
X-Ray
III 11 ROK
1ROK X 1 Commonwealth
1 Cavalry
9 ROK
Honker
Munsan-ni
N
Uijongbu
127° E

MAP 3

case, the bridges would have a modified M-2 treadway deck suitable for tanks and a minimum clearance of five feet above low water. The approaches might include causeways to reduce the length of the bridge.[15]

The 72d Engineer Combat Company built the first bridge of this type. This five-span, 150-foot crib-pier bridge attached to a longer causeway crossed at the northernmost Whistler site, where only a ferry had operated since the removal of the floating treadway bridge during the flood of 9 August. Corps and army engineers installed other low-level fixed bridges at the Whitefront, X-Ray, and Widgeon sites in late November and December 1951. (*Figures* 5 *and* 6) The 62d Engineer Construction Battalion completed the new X-Ray bridge on 26 December, only five days before ice damaged the floating bridge there and forced its removal.[16]

Spanning the Imjin at the Freedom Gate site closest to its mouth proved to be difficult. After the effort to install a floating footbridge there failed at the end of October, the 1092d Engineer Combat Battalion proposed a suspension bridge connecting diagonally the two high-level railway spans, the central portions of which had been demolished. I Corps instead ordered the battalion to build a 1,450-foot-long and 20-foot-high pile footbridge just upstream from the destroyed railroad bridges. But as Lieutenant Colonel Andrew Inge of the 1092d complained during construction, "The design [of this footbridge] had been cut to the bone to reduce the number of piles and materials. . . . This resulted in practically no safety factor."[17]

Work on this pile footbridge proceeded slowly during November until an embarrassing mishap interrupted construction on the 30th. That evening a work crew left a raft, bearing a crawler crane that it used as a pile driver, anchored in shallow water. The receding tide beached the raft on the sloping riverbed, and the crane, which was not securely fastened, slid off into the muck. A five-day recovery effort, assisted by Navy divers, retrieved a virtually useless piece of equipment. Work resumed under stricter operating procedures on 10 December with a crawler rig borrowed from Eighth Army, and the footbridge was completed on 2.1 December. By then ice had begun to appear on the Imjin, and on 4 January heavy floes carried by a strong tide destroyed a 160-foot section of the bridge?

A week before the destruction of the Freedom Gate footbridge,

ice had broken the Honker floating treadway in two. The two losses left a considerable stretch of the lower Imjin without a bridge and provoked a flurry of activity among corps and army engineers. The I Corps engineer immediately had a 400-pound expedient cableway installed at the Freedom Gate site and ordered the 14th Engineer Combat Battalion to build a diagonal quarter-ton capacity suspension bridge between the broken high-level railway spans there. The Eighth Army engineer ordered his 84th Engineer Battalion to construct a low-level steel- and timber-pile bridge nearby. The bridge would stand on 30 steel bents in the main river channel and 66 timber bents on the river's edges and tidal flats. The battalion was required to build a deck suitable for both highway and rail traffic.[19]

Assigning two companies and devoting over 140,000 man-hours to this project, the battalion made rapid progress and was able to open the bridge on 15 February. (*Figure* 7) Six days later friendly aircraft mistakenly bombed the bridge and damaged seven bents. The 84th replaced all of the damaged bents except one which stood dangerously close to an unexploded 1,000-pound bomb that could not be removed. That area was spanned by a 36-inch I-beam supported on specially braced bents.[20]

The bridge-building success of the 84th at Freedom Gate led the I Corps engineer to suspend work on the light suspension bridge there on 4 February 1952, when it was 61 percent complete. Toward the end of that month, I Corps built one more bridge across the Imjin farther north than the other available crossings. This was a 168-foot-long rock-crib bridge three miles north of the Whistler bridge at the Mallard site.[21]

Although well suited for the river's ice, neither the low-level bridges on rock-crib piers nor the one atop pile piers at the old Freedom Gate railway crossing could be expected to withstand the Imjin's summer floods. The September 1951 surveys had been designed to locate sites for permanent high-level crossings, and by the end of October, planning had advanced sufficiently to permit the 84th Engineer Construction Battalion to begin work at Pintail on a timber-bent bridge supported on pile piers that would stand 43 feet above mean low water. The river was only about 420 feet wide at this point, but the bridge was designed to have a length of about 1,000 feet to connect the river's banks at its own height.[22]

After the 58th and 72d Engineer Companies moved the Pin-

tail floating treadway to make way for the new high-level crossing, the 84th Engineer Battalion found that the rocky river bottom there prevented the sinking of timber or steel piles. Seeking a secure crossing of the Imjin without delay, Eighth Army engineer officers quickly ordered the battalion to construct at the Teal site a bridge very similar to the one planned for Pintail. The Teal bridge was a one-way, 50-ton-capacity timber-trestle bridge that was 1,175 feet long and 48 feet high. (*Figure 8*) Timber piles supported the ten southernmost bents while steel piles carried the weight of the three bents to the north. The battalion finished the bridge on the last day of 1951, after investing 137,000 man-hours in its construction.[23]

In order to prepare more adequately for the summer floods, Eighth Army in February 1952 assigned its 62d Engineer Construction Battalion to widen and raise the X-Ray bridge and to build a new high-level bridge on concrete foundations at Pintail, where the 84th's earlier efforts had been aborted. Company C of the 62d undertook both assignments in March after the river's ice melted. Driving new piles and constructing timber bents, the company made rapid progress at the X-Ray site. In mid-April it installed the 24-inch I-beams that would carry the decking. The bridge opened to traffic on the 27th.[24]

The Pintail bridge progressed more slowly. Company C of the 62d poured the concrete foundations in late April and installed the steel pile and reinforcing rods in early May. The company launched the bridge's 48-inch I-beams in late May and June and poured the concrete decking in July. The bridge opened on 24 July, just days before the disastrous flood of 30 July 1952. Like the X-Ray bridge, Pintail was designed to have a 50-ton capacity as a two-way bridge or to support 80 tons one way.[25] ***(Figure 9)***

As the 62d began work on the new X-Ray and Pintail bridges, the 84th Engineer Construction Battalion began a high-level bridge of similar capacity at the Whitefront site. The bridge was 1,184 feet long and stood 44 feet above low water on 13 timber trestle bents supported by steel piles. (*Figure 10*) Timber piling was tried, but it would not penetrate adequately even when a pile shoe was used. Company B of the 84th completed the bridge by the end of May, investing 111,000 man-hours in its construction.[26]

After reopening the low-level railway bridge at the Freedom Gate site, the 84th also began building a high-level Imjin crossing adjacent to it. The new bridge utilized the remains of the more

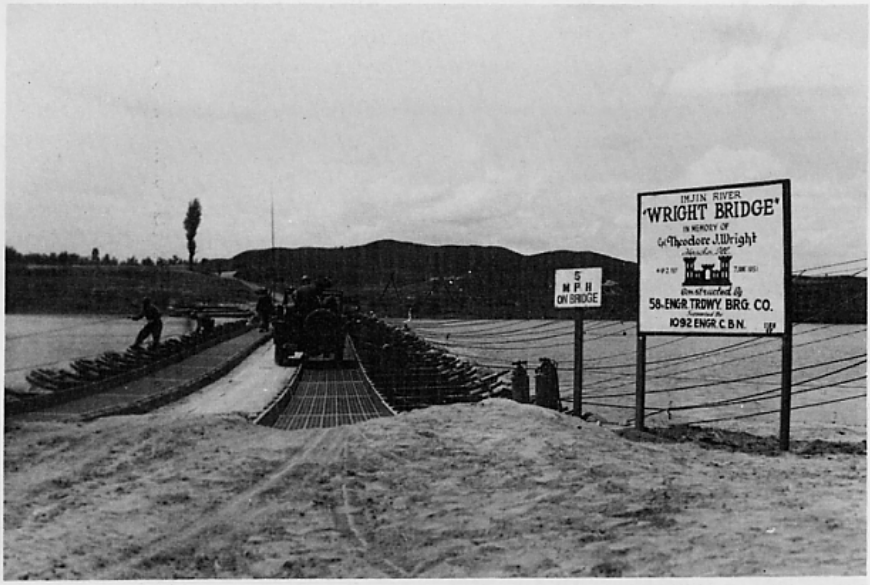
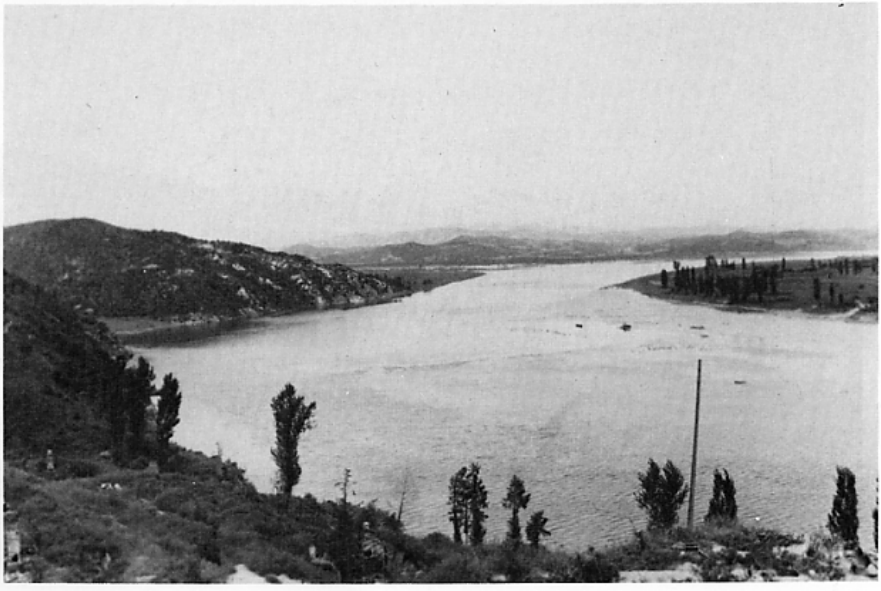


Figure 1. Jeep crossing the Corporal Wright ponton bridge on 13 June 1951.

Figure 2. U.N. delegates and newsmen crossing Honker ponton bridge on 15 July 1951 en route to an early peace conference session at Kaesong.

Figure 3. Artillerymen of the 1st Cavalry Division crossing the floating treadway bridge at the Whistler site in early August 1951.

Figure 4. High water on 6 September 1951 covering the site of the Honker ponton bridge, which had been washed away in a flood nine days earlier.



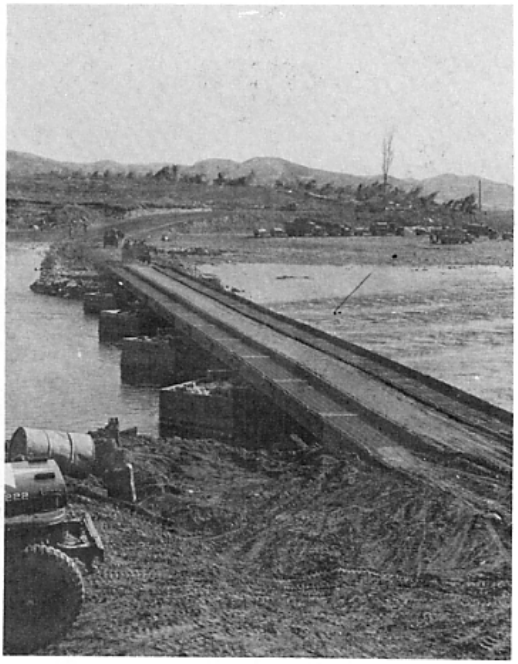


Figure 5. Jeeps crossing the M–2 treadway bridge that the 72d Engineer Combat Company built on rock-filled crib piers at the Whistler site in November 1951.

Figure 6. Construction of the Whitefront rock-filled crib-pier bridge in November 1951.

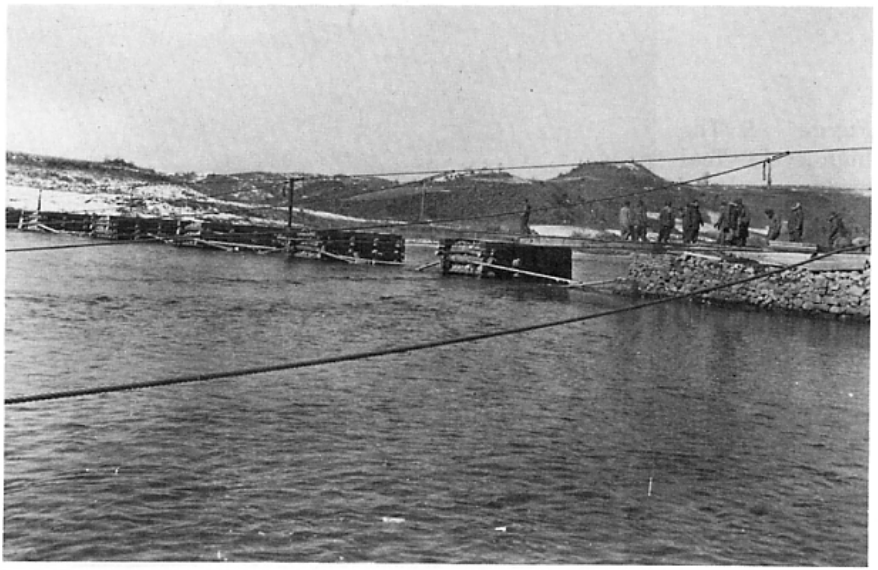


Figure 7. The low-level pile bridge at the Freedom Gate site that the 84th Engineer Construction Battalion erected in January–February 1952 between two destroyed railway spans. The shadow cast by the more southerly of the railway bridges, which the 84th would reopen in July 1952, is visible at the right of this 10 March 1952 photo.

Figure 8. The high-level Teal bridge, photographed on 27 July 1952.

Figure 9. The high-level Pintail bridge on 27 July 1952, just three days after the 62d Engineer Construction Battalion had opened it.

Figure 10. The high-level Whitefront bridge on 27 July 1952.

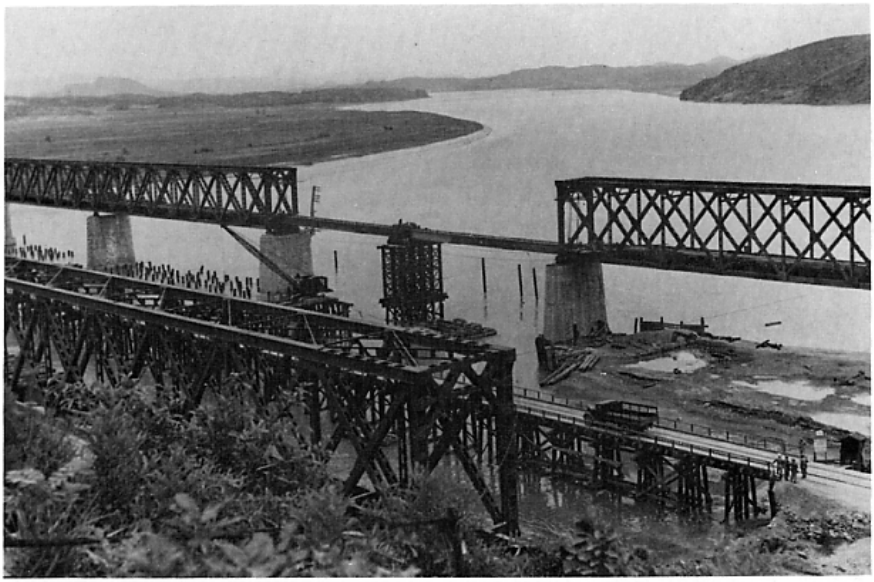


Figure 11. Construction under way to reopen the more southerly railroad bridge at the Freedom Gate site. The low-level pile bridge is visible at the right of this 9 July 1952 photo.

Figure 12. The high-level Teal bridge collapsing under the pressure of floodwater on 30 July 1952.

Figure 13. Pier from the collapsed high-level Teal bridge lodged against protective fender piles at the reopened span of the Freedom Gate bridge on 30 July 1952.

Figure 14. The high-level Teal bridge in early August 1952, showing damage done by floodwater on 30 July.

Figure 15. The high-level Teal bridge after the flood of 24–25 August 1952.

Figure 16. A survivor: the high-level Whitefront timber-pile bridge in September 1952 with damage largely limited to the fender piles.

Figure 17. Spoonbill bridge on 20 June 1953.

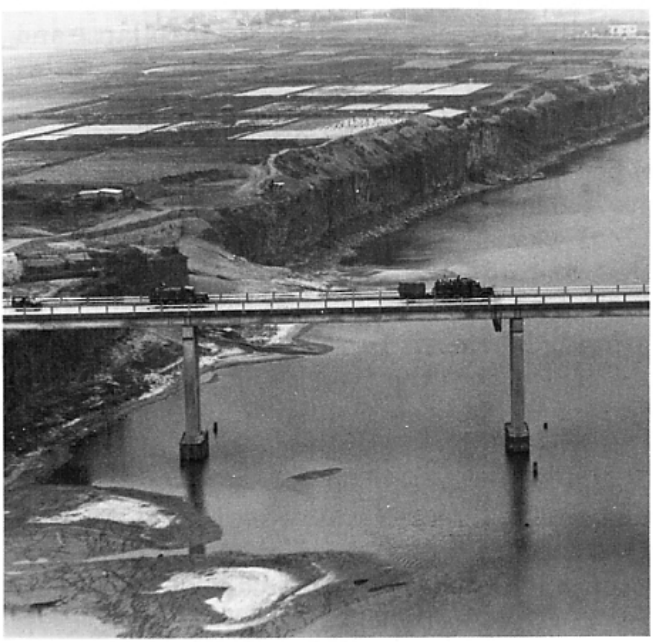


Figure 18. South Korean artillery convoy crossing Libby bridge on 23 May 1983.

southerly of the two earlier railway bridges at the site. One of the concrete piers of this bridge had been destroyed, and the battalion had to replace it with a pier comprised of a wooden-pile bent cluster and prefabricated steel trestle. In addition the westernmost span had to be replaced and another span jacked and rebraced. The engineers contracted with the Korean National Railway to assist in the work. On 5 July the battalion launched a 206-foot-long, 48-inch I-beam across the new pier from one original concrete pier to another. (*Figure 11*) Completed soon after, this second high-level bridge was opened and dedicated on 17 July, just before the start of the 1952 flood season.[27]

After their exertions of the previous months, the engineers were shocked by the destructive intensity of the 1952 floods. The flood season began early as April precipitation exceeded that recorded in the fourth month of any of the previous 30 years. Floodwaters on 13 April wrecked the northerly Mallard and Whistler rock-crib pier bridges, and nearly topped the low-level Widgeon bridge well downstream. I Corps engineer troops replaced the Mallard crossing with a new 300-foot-long bridge that was six feet higher than the old. They raised the Widgeon bridge by four feet and drove railroad rails above it for an upstream fender and anchor system.[28]

Heavy rains at the end of July raised the level of the Imjin by 13 feet on 27 July, causing the new Mallard bridge to collapse and forcing the removal of the Honker floating treadway. The rains continued for the next three days, and by 30 July the Imjin at Pintail had risen 38 feet. At noon that day, after river currents as fast as 15 to 20 feet per second had exposed the base of some of the piles supporting the Teal bridge, two of the bridge's spans washed out. Debris from Teal washed downstream to X-Ray, where it struck a bridge that had already been moved about four feet downstream by the floodwaters. Two piers of the X-Ray bridge failed at 1:30 PM. (*Figure* 12) Debris also lodged against the high-level Freedom Gate bridge near the river's mouth, leading the engineers to close it for four hours on 31 July while they removed the debris with a crane.[29] (*Figure* 13)

The low-level Widgeon bridge submerged on 27 July and remained intact under some 20 feet of water. It reappeared on 3 August after the floodwaters passed, requiring only minor repairs. The success of the Widgeon bridge impressed Colonel Mer-

row Sorley, I Corps engineer, who concluded that "this type of bridge has future potentialities. ... [It] is not an equal substitute for a permanent high-level bridge over which traffic at all seasons will be as assured as it is tactically indispensable; but as a relatively cheap bridge, which may prove usable much of the year with only minor periodic damage and repair, it appears from this recent test to have demonstrated value as a supplemental bridge."[30] This lesson was instrumental in determining the design of the submersible Teal bridge constructed that autumn.

An even greater flood roared down the Imjin on 24 and 25 August, fed largely by rains that fell in North Korea. Raising the Imjin 40.5 feet in ten hours at Pintail, these waters destroyed the Widgeon bridge and swept away additional piers of the Teal and X-Ray bridges. ***(Figure 15)*** This was the year's last significant flood on the Imjin. At the end of the 1952 flood season, the I Corps engineer observed with some satisfaction that three high-level bridges-at Whitefront, Pintail, and Freedom Gate-had survived the summer unscathed, and each supported a different division across the river. ***(Figure 16)*** But more than 16 miles separated the Freedom Gate and Pintail bridges, and this stretch of open river could have threatened the U.N. forces if the enemy had launched a serious offensive in August 1952.[31]

The need for bridges in that reach of the Imjin led I Corps to install new floating treadway bridges at the X-Ray and Teal sites in September and to build a rock-crib pier bridge at the naturally defiladed Spoonbill site three miles south of the X-Ray crossing. ***(Figure 17)*** With its piers strengthened by piles made from railway rails, the Spoonbill bridge opened to traffic on 30 October.[32] But these bridges too would be temporary, and the need to construct permanent bridges to replace the two high-level crossings that had been destroyed by the summer floods of 1952 remained. Eighth Army's 84th Engineer Construction Battalion undertook the job, constructing a submersible, low-level bridge at the Teal site and the high-level, steel and concrete Libby bridge at the X-Ray site. Standing 49 feet above mean low water, the Libby bridge remains in use today. ***(Figure 18)*** The Teal bridge provided eight years of useful service before it was removed in late 1961. It was replaced the following spring by a new low-level bridge made of reinforced concrete. These superb wartime bridges were responses to a river-crossing problem that had faced the American

engineers for more than a year. Enriched by their experience, they finally resolved that problem in the last months of the war. For two years the Imjin proved itself a worthy opponent to the American military engineers.