Landmark in the Sky:
The History and Preservation of Glacier's Going-to-the-Sun Road

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Acknowledgements

Many superintendents, landscape architects, engineers, historians and other resource specialists have contributed to preserving this historic and experiential treasure. Most have come from the ranks of the National Park Service and the Bureau of Public Roads (Federal Highway Administration), the original agencies responsible for the development, design and construction of the Road.

The visionary work of the Going-to-the-Sun Road that began with Stephen Mather, Thomas Vint, George Goodwin, Frank Kittredge, A.V. Emery and W.G. Peters has been perpetuated with a similar passion by others, notably the late Dennis Holden.

Historical Overview

Glacier National Park was established in 1910. The Great Northern Railway was key to park development and provided access to the park. Beyond the rail lines, however, travel was limited and slow at best. Only a few rough wagon roads existed when park managers, including the Park Service's first Director, Stephen Mather, realized the need for development of travel corridors that would display the park in order to strengthen public support of Glacier National Park and the National Park Service. Mather, Glacier Park's first superintendent, William Logan, and others supported the development of a "transmountain road" through the park and argued that such access would enable people not able to afford the rates the Great Northern Railway charged for guided horse travel and chalet lodging to reach the interior of the park. These advocates argued against local businessmen who claimed the interior alternative through the rugged mountains was foolhardy and an expensive compared to a route following the railway on the park's southeastern border.

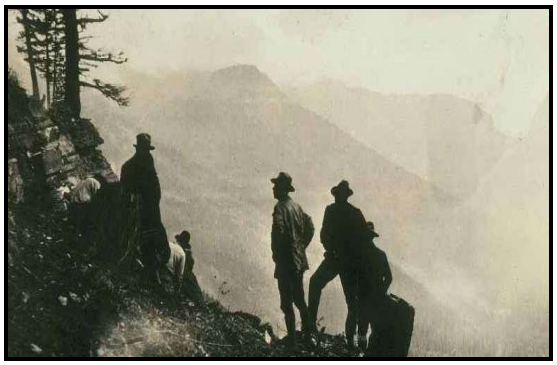
During the summer of 1918, George Goodwin, the park's acting superintendent (later to be the NPS's Chief Engineer) ran a reconnaissance survey of several routes through the park, and promoted a route for the road over that traveled to the top of Trapper Creek Pass (Logan Pass). This proposed route crossed Logan Creek seven times and with a maximum grade of 8%, "by a system of long loops and switchbacks", 15 in all.

Eventually the argument regarding an in-park or boundary route played out in the favor of the park's alternative and construction of what was initially called the "Transmountain Road" began in earnest in 1921, with the opening of bids for grading approximately 10 miles along Lake McDonald. The contract, funded by a congressional grant of $100,000, terminated at Lewis Hotel (now known as Lake McDonald Lodge, also a National Historic Landmark). By 1922 and 1923, Goodwin was overseeing major contracts on both sides of the park.

The 1918 Statement of National Park Service Policy, drafted by Horace Albright (Mather's assistant), stressed the importance of "harmonizing" all park "improvements with the landscape" and the "employment of trained engineers who either possess a knowledge of landscape architecture or have a proper appreciation of the esthetic value of park lands." Within a year, the division of Landscape Engineering was created within the National Park Service, and played a central in park developments from this point on.

The year of 1924 was significant in a number of ways in the development of the Transmountain Road. By then, there were some rumblings, especially by Superintendent Kraebel, about Goodwin's proposed

alignment. Mather, becoming increasingly nervous, asked Thomas Vint, the National Park Service's Assistant Landscape Engineer, to review the proposal. Vint, Goodwin and Mather then met at the park to assess the situation.



Field reconnaissance: background, L to R: Supt. Kraebel, G. Goodwin, T. Vint , S. Mather, Foreground: unknown

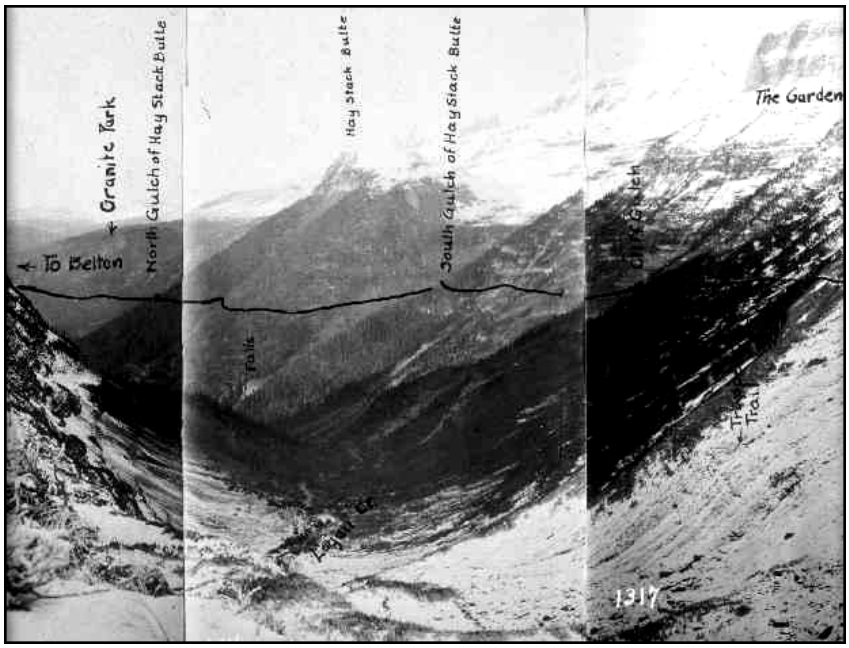
Goodwin's route, in the final analysis, was typical of engineering at the time: fairly scenic, direct and above all, economical. Vint later claimed, while recalling Goodwin's proposed route with fifteen switchbacks, that the road would have looked like mining activity. Vint proposed an alternative route to Mather that would hug the steep slopes along with the continental divide (The Garden Wall), headed towards Logan Pass, which he believed would be more appropriate and less damaging. As the story goes, Mather was not amused and claimed that the project warranted the "best engineer and the best landscape architect in the country" to which Goodwin reportedly replied "there is nobody in the United States that knows as much about road building in mountains as I do." Mather is said to have stalked off alone, rather angry. Vint was to return within a week. Upon his return, he brought, for the first time, a Bureau of Public Roads (BPR) engineer. This introduction marked the beginning of a long partnership between the two agencies and another era in the progression of the Going-to-the-Sun Road.

Mather was evidently impressed with the Bureau and arranged with the chief of the Bureau to have a BPR engineer run the location or layout survey of the proposed alignment. The BPR Chief chose a Senior Highway Engineer by name of Frank Kittredge. Kittredge has been recognized as one of America's leading civil engineers and conservationists. Prior to his assignment to the Transmountain Road, his work included the location and construction of the Alaska Central Railroad and had assisting in developing both Oregon's and Washington's early highway systems. Following his work on the Going-to-the-Sun Road, Kittredge's served as the bureau's Chief Engineer; later he was chief engineer for the Park Service's Engineering Division, and in the early '40's, was Superintendent of Grand Canyon National Park.

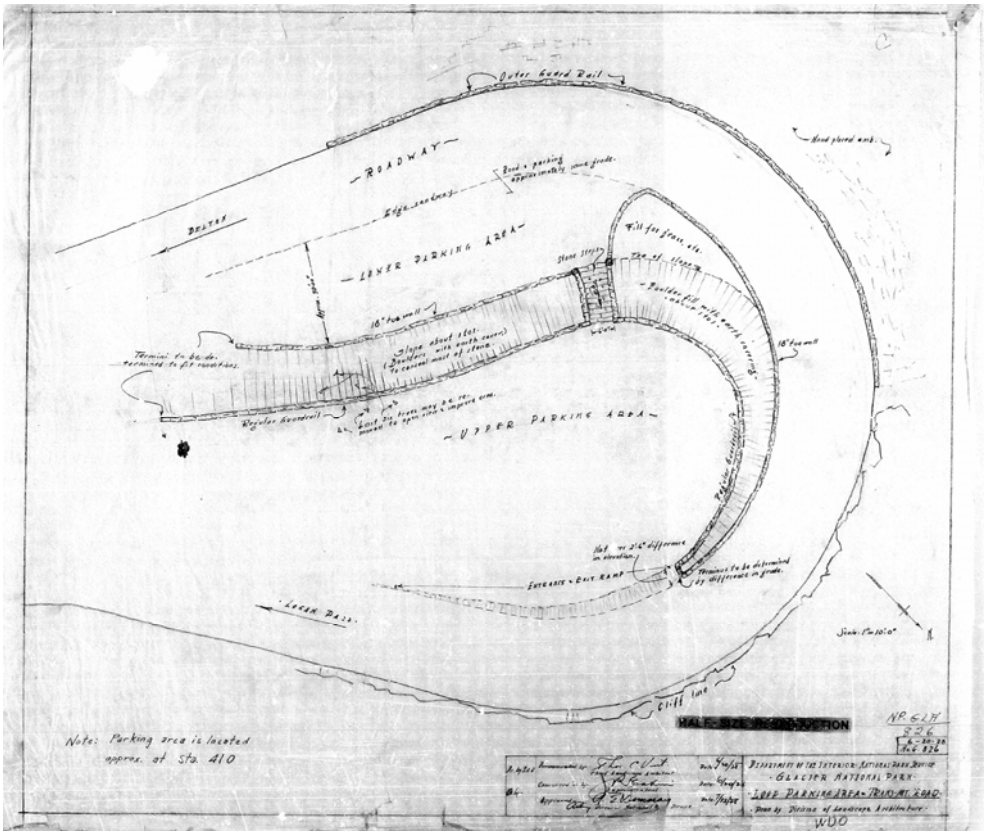
During the summer and into the fall of 1924, Kittredge led survey parties in reconnaissance on the Transmountain Road, preliminary and location (final) surveys, including one last long look at Goodwin's 1918 proposal. The surveying, which began late in September, was grueling. The turnover rate exceeded 300%. At the end of the season, crews had completed the 21 miles of preliminary survey and much of the location survey, which began at the pass and worked down in both directions. The final 21-mile survey push included the section between Logan Creek and Going-to-the-Sun Point, the contentious segment. Kittredge then prepared survey mapping and a report over the winter.

The route preferred by most closely resembled Vint's earlier suggestion. Following the review of Kittredges' final report of 1925, Superintendent Kraebel and Vint were extremely pleased and recommended the alternative to Mather . While three miles longer, this route provided a 6% grade, minimized disturbance to the adjacent landscape, had a more open exposure for views, and, because of aspect, provided for faster snow melt and thus a longer season. Above all, this route had had only one switchback. In his report, Kittredge provided a visual comparison of the alternatives. The technique, in

particular, impressed Vint. Kittredge linked photographs together illustrating in a mosaic the three alignments into a single panoramic view. This technique became a standard for assessing roadway impacts for decades to come.

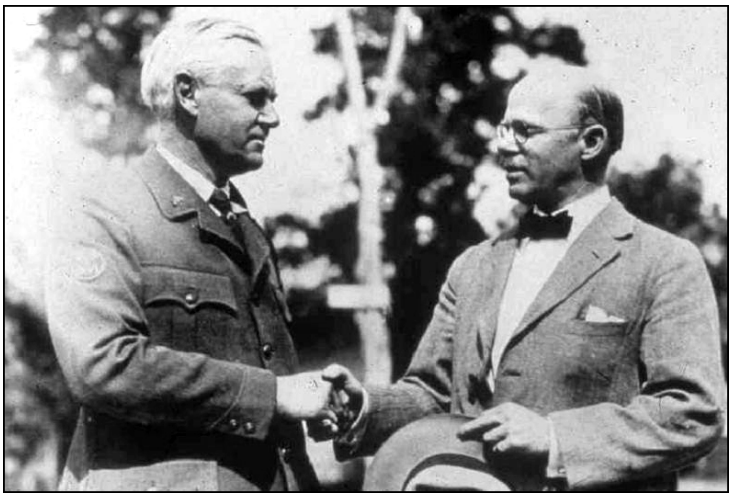


Kittredge's alternative mosaic



Vint's site plan sketch for the Loop switchback

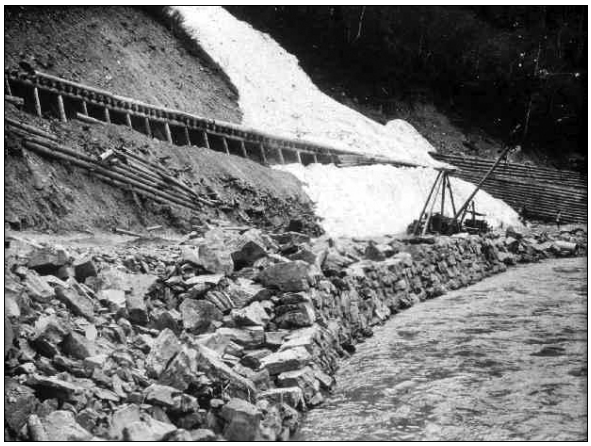
In the end, it was aesthetics and conservation, rather than economy that won the argument in the final location of the road. The relationship between the Park Service and the Bureau appeared to be a success from both perspectives. In 1926, a cooperative agreement was formalized between the two agencies.



Stephen Mather, in uniform at left, and Laurence Hewes (BPR Western Regional Director) confirm 1926 Cooperative Agreement

George Goodwin eventually joined in the approval of Kittredge's overall layout for the Transmountain Road , aside from some details including overall width. In spite of this, Mather was determined to use Kittredge's survey and the Bureau's expertise. It's written that it was this passing of road building expertise to another agency that was the final blow to Goodwin. Following a few final arguments and terse telegrams with the director, in 1925 he left the Park Service following what some have written was an "acceptance of resignation."

By the time the Bureau came on the scene, a number of relatively small contracts had been let on both sides of the park. By August of 1924, construction was ongoing beyond the Avalanche Creek area on the west side, approximately 16 miles from Belton (West Glacier). The most costly portion of this contract was a section approximately 200 yards long near what is called the Red Rock Point, an area frequented by avalanches.



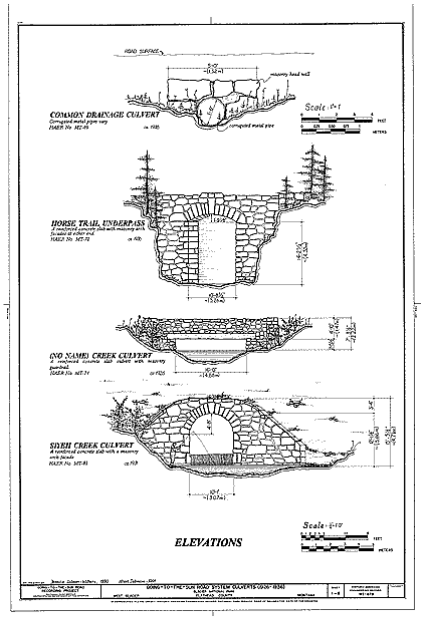
Construction along Red Rock Point, Steven's Brothers Contract to Logan Cr.

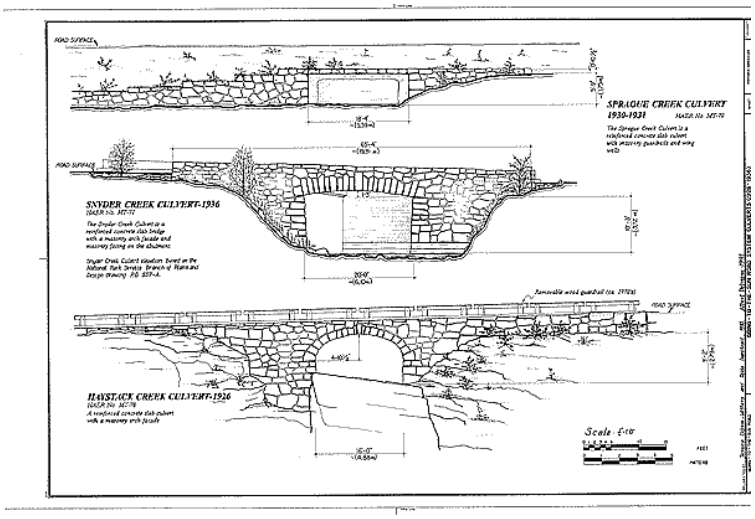
On the east side of the park, contractors were gearing up for an 8 mile section of work terminating approximately two miles east of Going-to-the-Sun Point (Sun Point).

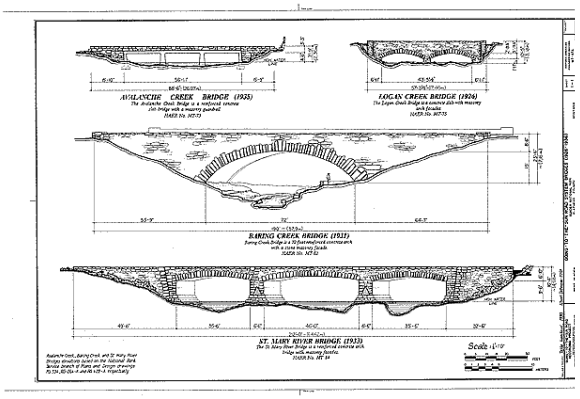
The year of 1924 was also significant in that Glacier received an appropriation of $1,000,000 with almost half of it earmarked for the Transmountain Road. The next year, another $500,000 was guaranteed. For the Park Service, this huge influx of money was completely unprecedented. This meant significant progress could be made on the Transmountain Road. Until this point, the series of small contracts got the road only to the most difficult portion at the base of the long 6% climb in rough terrain and through the heart of the park. Only twenty-nine miles of the 50-mile road had been built.

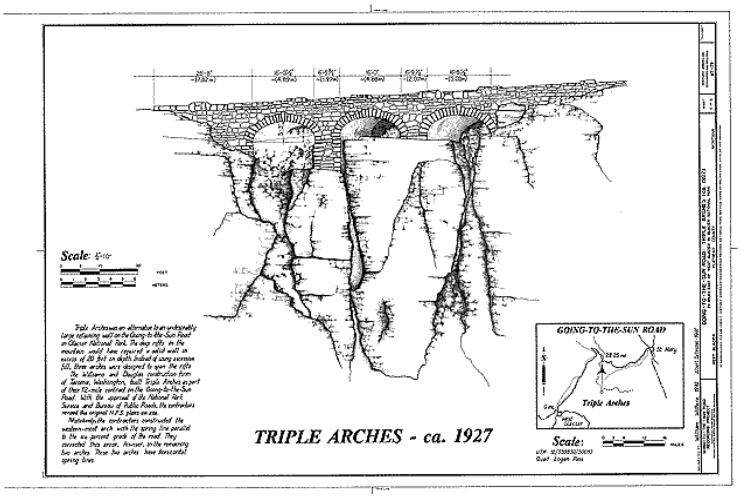
In May 1925, a contract was advertised for the west-side segment beginning at Logan Creek up to the pass, 12.4 miles away. This was the first contract under the administrative and technical engineering expertise of the BPR. While the marriage was not always smooth, it was successful, and this initial 12-mile project set the standard for the remainder of construction of the entire road, including most of the remnant historic character found today.

The preliminary plans for the roadway structures was completed as a collaboration by both the Pack Service's Landscape Engineering Division and Kittredge's BPR Engineering Division. The plans reacted to the alignment and topography of Kittredge's survey by the construction of stone retaining walls and guardwall "where the roadway is along the edge of sheer cliffs." This collaboration between agencies and professionals reflected Vint's vision that "construction details such as bridges, tunnels, retaining walls, parapets, culverts, etc., should not be monumental or stylistic but native, simple in line and retiring."







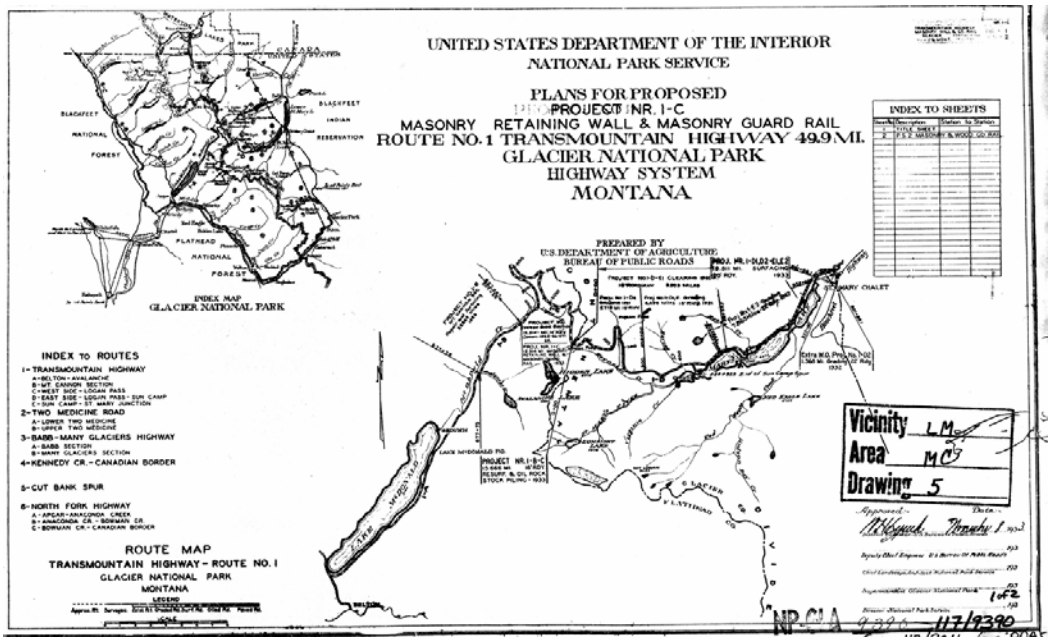


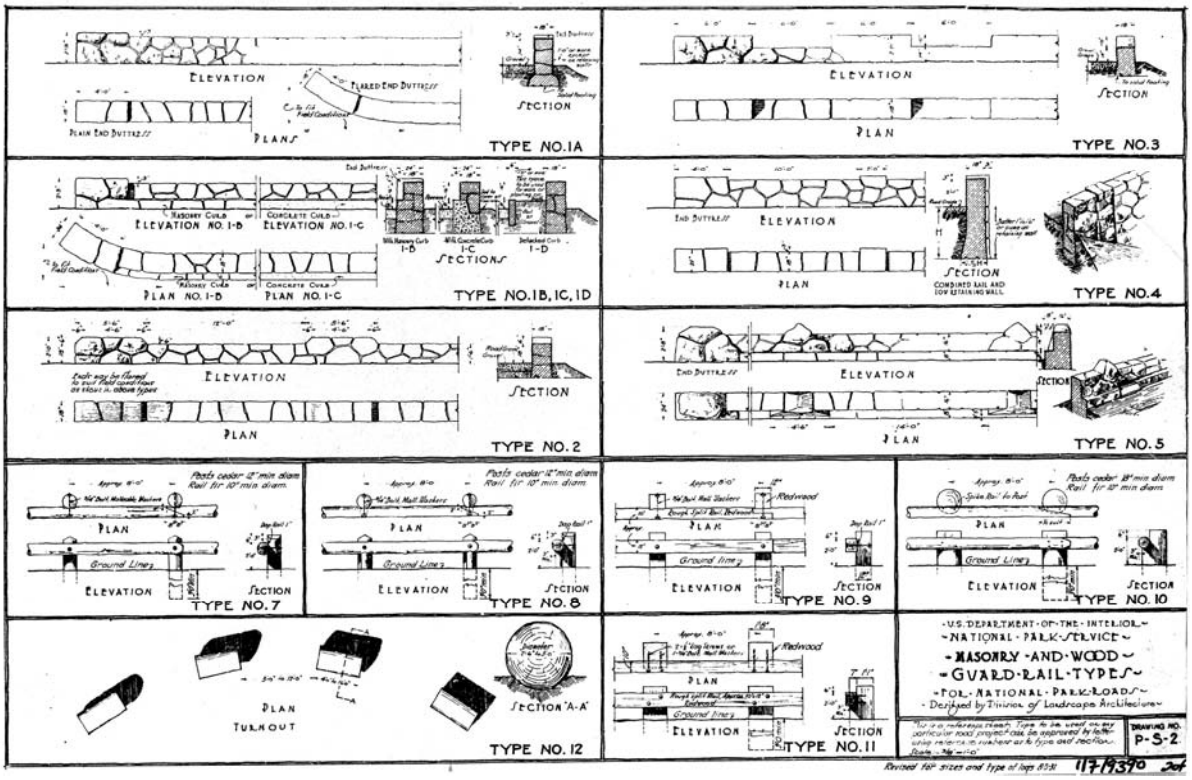
HAER, 2000 Illustrations ***…not monumental or stylistic but native, simple and retiring***

The 1925 contract was awarded to D.A Williams and A.R. Douglas (Williams and Douglas) of Tacoma, Washington. The contract included the most difficult road construction challenge ever attempted in a National Park and was likewise perhaps the most difficult project BPR had administered to date. Included were over 7,000 feet of retaining wall and guardrail, almost 11,000 feet of stand-alone guardrail, and the road's first tunnel. The work required numerous "camps" established essentially in the wilderness, and even getting materials and equipment required "tote" roads to the difficult work sites. It is interesting to note that Williams and Douglas employed subcontractors on 30 different occasions within the 4-season contract. All of this did not help alleviate some difficult times and situations between the two newly collaborators. As stated the marriage between the BPR and NPS was rocky at times to say the least. Challenges with the BPR contractors and sub-contractors tested the rocky marriage between the BPR and NPS.

While the contract specifications reflected the relatively new philosophy of construction being "light handed" in respect to the surrounding scene and landscape, there were many issues. The contract included specifications to use less destructive blasting techniques than were standard for the time. The contract also stipulated that no side-casting was to occur whereby excavation material was dumped over the roadside to the terrain below. In fact, such material was supposed to be dumped in locations designated by park officials, a stiff stipulation for a road contractor.

Stone masonry structures, predominantly guardwalls and retaining walls, were incorporated into the design from recommendations from the NPS Landscape Division. This set a precedent for a "look" that was to follow in other park designs and fulfilled a desire to "render all foreign, man-made works as nearly an inconspicuous, homogeneous part of the natural scenery as is possible." Anyone who has seen the Williams and Douglas masonry structures can attest to the beauty of these walls.





Top: Cover Sheet, Transmountain Road
Bottom: 1928 standard detail sheet by the Landscape Architecture Division

At the time of this contract, many of the treatments were not standard in park projects and the design work had little to draw upon by way of example. The stone and log treatments that evolved in this Williams and Douglas contract and the "lessons learned" became fairly standard in Park Service detailing following the contract. Rubble masonry rails and their profile with its repetitious parapets were selected as "fit" and appropriate in its surroundings. The use rubble masonry also demonstrates economy, as there was an almost endless supply of stone available from the construction efforts.

Following the completion of the contract in 1928, Kittredge, in what today would be called a post-construction evaluation, pointed out some shortfalls relative to landscape preservation, expressing his dismay with the amount of excavation that, in spite of the contract specification, had been cast over the side at the expense of the vegetation below. Material that could have been used as fill material in gulches had been side-cast, and more walls than stipulated in the original contract were constructed due to this shortfall, raising construction costs.

Overall, however, the project was a huge success story. The Williams and Douglas contract alone constructed five the 14 principal structures identified in the National Historic Landmark Nomination as "contributing" to the significance and historic integrity of the Road, as well as the first of two primary historic types of stone guardwall masonry types and the vast majority of retaining walls still in place today.

Random Rubble Guardwall

The "Loop"

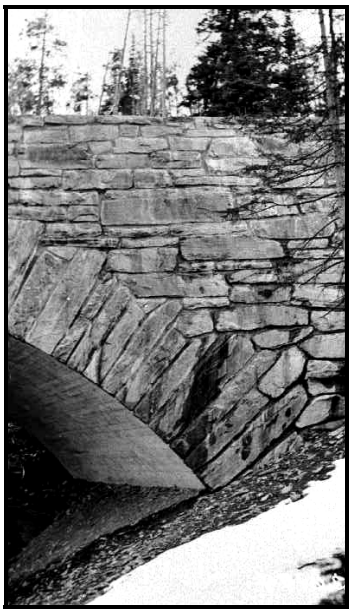
Retaining Wall

Haystack Creek Arch, before

and after

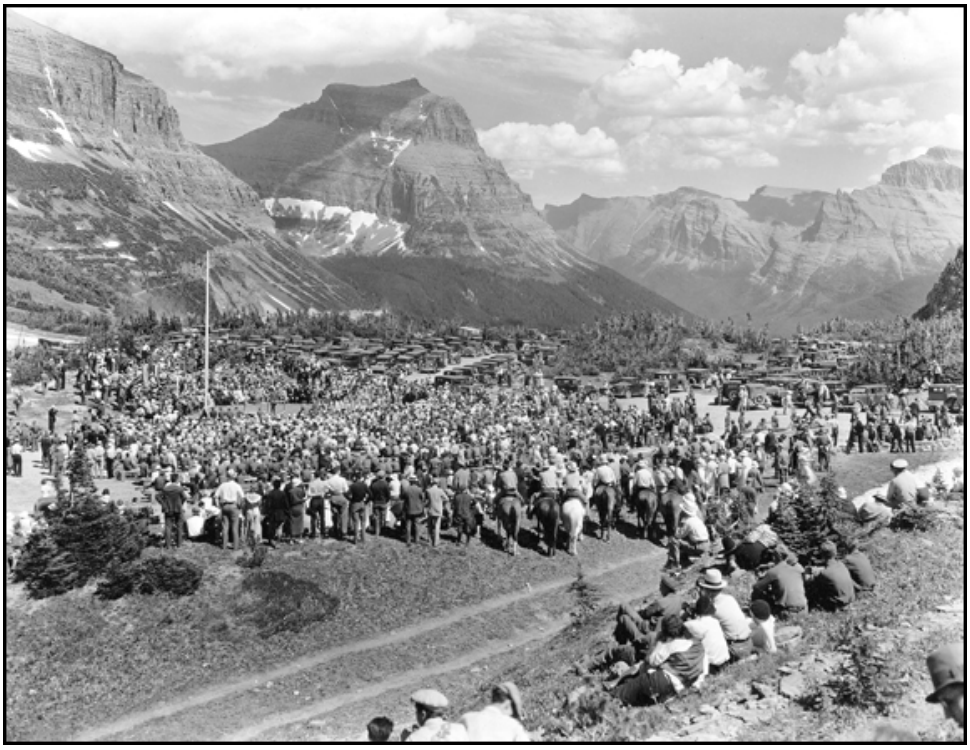
An early "pioneer" cut

Between 1931 and '32, two contractors, the Colonial Building Company of Spokane, Washington and A.R. Guthrie, of Portland, Oregon completed the remaining ten miles of road on the east side of Logan Pass. The most difficult challenge of Colonial's contract was constructing the 405-foot East Side Tunnel. All supplies were hauled from the summit along a trail by a 30 horsepower caterpillar tractor. From this point, the materials were packed on the backs of men down a switchback trail which "in 300 feet of distance lost approximately 100 feet of elevation." From this point, a ladder approximately 100 feet long and nearly vertical dropped to the work bench for the tunnel. It took a well-conditioned man a half hour packing a 50-pound box of dynamite to deliver the materials and return empty-handed ready for another trip. The completion report stated that "On several occasions men employed for tunnel work made a trip to the top of the cliff, looked down the ladder and turned in their resignation saying that they could not stand the elevation." No power equipment could reach the tunnel so laborers carried all the excavated rock out by hand. Access was also a challenge on Guthrie's contract. He floated a power shovel up St. Mary Lake via barge to reach the construction site. Of all the structures constructed in these two contracts, it is the Baring Creek Bridge which best epitomizes the simplistic architectural refinement found along the Road.



By October 8, 1932, after $2.5 million in construction expenditures and three lives, work was sufficiently advanced to allow travel across the road. The big festivities associated with the formal opening of the road did not occur until July 15, 1933, with approximately 4,000 in attendance. At this time the road was

renamed the Going-to-the-Sun Highway. Superintendent Scoyen, who presided over the ceremonies, stated that the road was "the most beautiful piece of mountain road in the world." The superintendent also read a letter from Director Albright " "the major portion of Glacier Park will always be accessible only by trail…Let there be no competition of other roads with the Going-to-the-Sun Highway. It should stand supreme and alone." Mather, instrumental in the road becoming a reality, was not in attendance, having died of a stroke three years earlier.



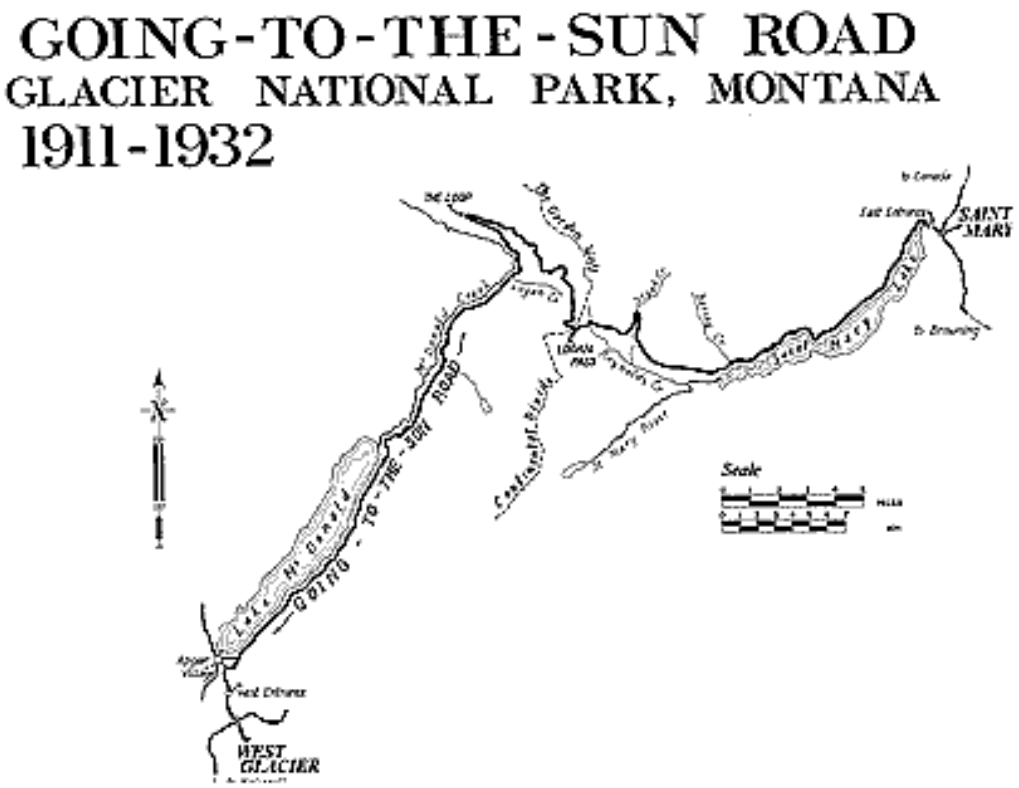
The 1933 Dedication of The Going-to-the-Sun Road at Logan Pass

In spite of the dedication, it was known that, in reality, no portion of the road was truly in a "finished" condition in 1933. Even the most recently completed projects constructed between 1928 and 1933 were scheduled for extensive improvements including widening, gravel surfacing, drainage improvements and roadside clearing, the addition of stone masonry retaining walls, bridges and guardwalls. Most of this work was along the east side of the park in the Golden Stairs and Dead Horse Point area. It was not until 1937 until all of the significant structures were complete. By the end of 1937, the entire road had been constructed or reconstructed by the Bureau of Public Roads and had crushed rock surfacing at a minimum width of 22 feet. Asphalt paving began in 1938 and was not completed until 1952 following a long gap due to World War II.

Summary of Significance

The Going-to-the-Sun Road is known as one of the most scenic routes in America, and is documented as perhaps the most significant 20th Century road in the National Park Service. This road, a narrow 50 miles

largely carved out of steep mountainsides affectionately referred to as the “Garden Wall”, poses interesting quandaries relative to maintenance, resource management, safety and visitor use. Almost all of the original structures and route, aside for a two-mile section near West Glacier remains intact with extraordinary integrity to its period of development and construction.



The higher elevation roadside is lined with approximately 43,000 linear feet of stone masonry guardwalls and over 130 stone masonry retaining walls. Stone arches, underpasses, tunnels and drainage features date to a major design and construction effort that occurred between 1922 and 1937. For over seventy winters, age, lack of adequate maintenance, incompatible repairs, increasing traffic demands and the effects of weather and avalanches have wreaked havoc on both the road’s stone masonry structures and the road in general. A rigid application to federal safety “standards” has also threatened, at times, the Road’s historical and experiential character, and has required some interesting solutions.

The Road has been recognized by the Department of Interior and the National Register of Historic Places as significant to American history for its unique quality and historic. In addition to these recent formal nominations, this significance was noted by early landscape architects and civil engineers. In 1924, Thomas Vint, the landscape architect instrumental to the ultimate alignment decision and design treatment, summed up that the proposed road’s alignment should “*…include both the practical means of making its grandeur accessible and its dramatic values in displaying it*.” Furthermore, he wrote that the finished road “ *should minimize the effects of the work of the hand of man (and that) the effects of the work of nature will predominate in the picture*” and that “*construction details such as bridges, tunnels, retaining walls, parapets, culverts, etc. should not be monumental or stylistic but native, simple in line and retiring.*”

Stephen Mather, the first director of the National Park Service, and an instrumental force in the development of the Road, stated in his 1931 annual report that the road was " *one of the outstanding mountain roads in America*" and there was a "*obligation*" to "*open the inner wonders*" of Glacier National Park to not just the public at large but to the "…*mass of people who because of age, physical condition, or other reasons would never have an opportunity to enjoy, close at hand, this marvelous mountain park*." This statement is additionally visionary, as it was written decades before the enactment of accessibility legislation.

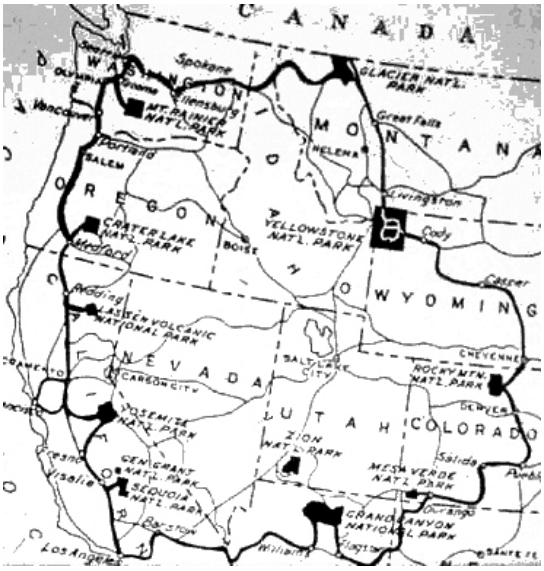
On June 16, 1983, the Going-to-the-Sun Road was listed as a historic district in the National Register of Historic Places. It was listed due to its "contribution" to the broad patterns of American history, its role in park development and its significance as an engineering feat.

In 1985, the American Society of Civil Engineers designated the road as a National Historic Civil Engineering Landmark. This nomination reflected the road's unique status as the first major road designed and constructed by the Bureau of Public Roads "through a mountainous terrain". This designation also recognized the beginning of an interagency relationship between the National Park Service and the Bureau of Public Roads, with the Bureau having responsibility for the construction of roads within National Parks. This partnership remains in place today, seventy-eight years later. In essence, the relationship began in Glacier with the Going-to-the-Sun Road.

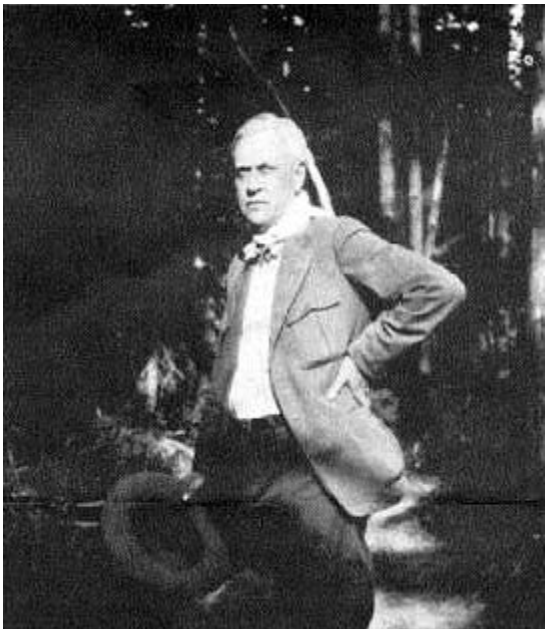
The nomination also noted unique features of the road, and characteristics that set it apart from other civil engineering projects. The characteristics noted in this nomination highlight the road as an unprecedented and unique *scenic mountain* road.

In February 1997, the Going-to-the-Sun Road Historic District was designated a National Historic Landmark by Congress. The finished road is a distinctive example of the blending of the professions of landscape architecture and civil engineering, called, at that time, "landscape engineering." This is perhaps the strongest example of combining design and engineering within the core value of scenic preservation. According to the nomination, "no other road combines the historic associations, the artistic and engineering significance, and the excellent stat of preservation of the Going-to-the-Sun Road."

The district is also nationally significant in the history of transportation because of its unprecedented engineering and its place as a link in the "Park-to-Park Highway" first advocated by Stephen Mather in 1915. The Park-to -Park Highway concept was envisioned as a huge interconnected loop of western parks that were accessible by major highways to the newly emerging automobile traveling public. The completion of this unique park road finalized Mather's dream of a coordinated system of national parks.



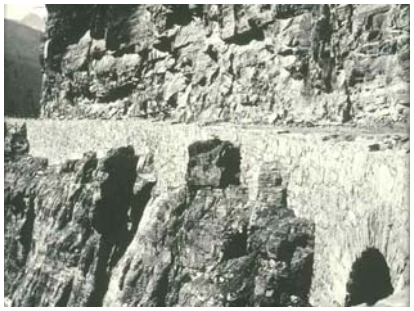
Mather's Park-to-Park Highway and the missing link



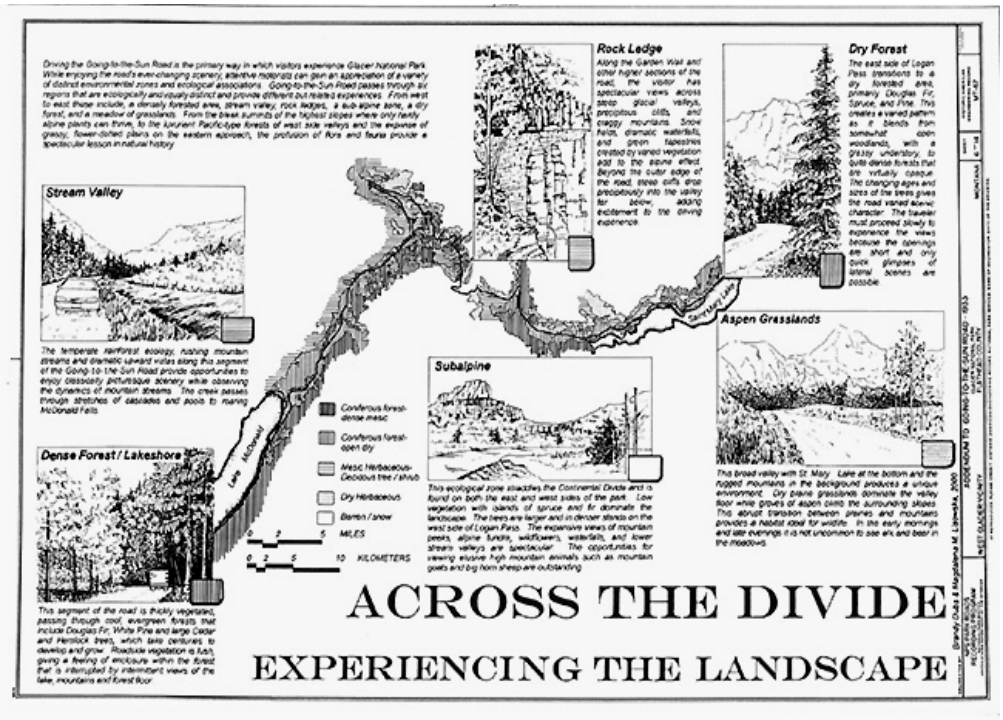
Stephen J. Mather

The Historic American Engineering Record (HAER) completed documentation work in 1990 and 2000. Some of their graphic documentation illustrates this report.

The Landmark nomination described and analyzed the road's contributing resources within the parameters of five categories including spatial organization, circulation, vegetation topography and structures.



The historic district includes the entire road and 14 principal structures, and all are part of one contributing resource category called *structures.* It is curious and worthy of mentioning that the Loop, as a structure that actually "defines" the road's final location, is not identified in the listing of principal structures. Of the five categories, this is the most visible and obvious to the visiting public with miles of walls and numerous other structures all dating back to the original construction period, for masonry structures, ending in 1937. In addition to these features, bridges, arches, tunnels, underpasses and almost countless stone masonry headwalls and other water conveyances make up the balance of the significant structures found within the Landmark boundary.



The different landscape types experienced while crossing the Going-to-the-Sun Road as a response to topography and spatial sequence. (HAER, 2000 illustration)

Topography, when combined with the structural response to topography, makes this perhaps the single most important factor in the alignment, location, and ultimate experience of the Road. The single most important decision regarding alignment and grade was Stephen Mather's support of Vint and Kitredge's proposal to bench the road along the Garden Wall formation with one switchback (called the "Loop") rather than scar the valley up to the continental divide with 15 switchbacks and numerous crossings of Logan Creek.

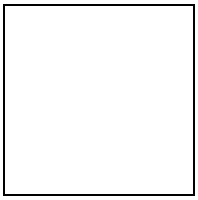
The response to *vegetation*, including the initial removal, preservation, retention and subsequent manipulation of roadside trees and shrubs was a significant concern both then and now in that vegetation is not static. It was this response that permitted for the provision of scenic views.

The importance of the automotive link relative to *circulation* was noted as significant. Circulation refers to both an internal and external response. Externally, the Road finally provided for Stephen Mather's vision of a "Park-to-park Highway", or a system whereby visitors could travel a scenic route between Yellowstone Park and the other great western parks in Washington, Oregon, California and Arizona, thereby completing a grand "loop" drive. The road, from an internal perspective, actually defines the park's basic circulation pattern. As the only cross-park road, the alignment also provided the visiting public a cross-sectional view and experience of the park. Spatial Organization is directly associated with topography in its' relationship with the final location of the road and the sequence of views and changes in spatial character as the road climbs to its pinnacle and then descends on the other side. In spite of numerous different dates celebrated for road completion and beginning, the period of significance, recognized in the landmark nomination is between 1921 and 1952, when the paving was finally completed.

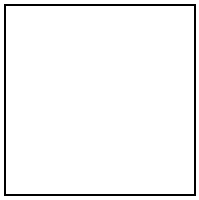
Preservation and innovation

The roughly 70 years following the dedication has had its effect on the contributing structures and the road in general. Avalanches, rock fall, frost heave and spring openings, with heavy equipment nervously feeling their way along the road, have all taken a toll on the road. Constant reaction to rigid national highway standards hasn't helped, nor have in-house repairs and contracts awarded where the "fixes" were less than appropriate. Much of this latter situation is due to either insufficient training of maintenance staff and difficulty in procuring an adequate supply of appropriate stone. This has been an ongoing challenge, even today, as has been finding qualified masons.

The original wall design of choice was an 18-inch high wall included a pilaster, or parapet, 10 inches high and rectangular in shape. These parapets were placed consistent distances along the top of the wall. Apparently the BPR project staff was not too amused when the NPS Landscape Division decided, following the construction of a few sections on the roadside, that they were not totally pleased with the design choice and forced a change lowering the typical parapet 4 inches with more of an angle. Due to the lowering and broadening of the parapet, the spacing between them changed from 13 to 15 feet.

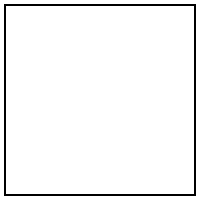


Early parapet, per contract design



1927 change by Landscape Division

There were other changes associated with the design and construction of roadside stone masonry guardwalls following the 1925 Williams and Douglas contract. Many aspects of masonry design treatments were actually finalized in the field during construction, as were the changes to the parapets. In fact, it is interesting to note that this was the intent of Thomas Vint, and that he recognized that there would be a need to allow flexibility until and when "actual conditions are known". One of the most notable examples of this is the Triple Arches structure, which was changed as it appears today *after* construction had begun.

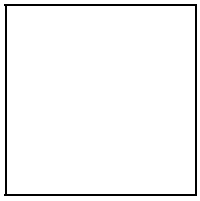


Prior to 1982, funding for Glacier roads was minimal and came entirely from the park's annual operating budget. Then, in 1982, Congress passed the Surface Transportation Assistance Act, which provided much needed funding for federal road reconstruction projects. Thereafter, the National Park Service, in partnership with the Federal Highway Administration, established the Park Roads Improvement Program. Since this time, approximately $28 million has been spent in rehabilitating the lower sections of the road.

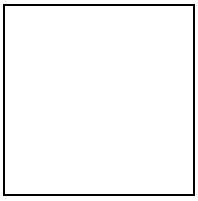
In the most recent years, efforts have focused on the major structural needs associated primarily with the retaining walls. Many of the examples and design application strategies below have been incorporated into the most recent contracts in order to perpetuate the historic character of the road.

The masonry guardwalls constructed during the Williams and Douglas contract were of a random rubble nature where a specific character was defined by angled and large flagstone at the lead and end of parapets. The remainder of the stonework was "rubble" stone of various size and shapes including thin veneer on both vertical and horizontal surfaces. Another highly distinctive character is a longitudinal and transverse top jointing due to stones purposely not being full width.

Following the Logan Pass contract and the construction of the random rubble masonry walls, subsequent contractors (Colonial, and Gutjhrie & Co. 1931 – 1933; Lawkor, 1934-1935; Yonlick, 1934 – 1936 and Wunderlick, 1936-1937) built and entirely different type of wall in regard to masonry character. Overall, however, the silhouette remained the same. It was the use of large, full width 18- inch stone that characterized the principal change. This more "formal" style also eliminated the longitudinal top jointing. By the time the east side construction began in 1931, comprehensive specifications were incorporated into the contracts calling out this new style of masonry. This newer style was considerably more difficult to construct since the stone now was required to be dressed to an 18 inch overall width. The old random rubble style accommodated a much broader array of stone, with much of it coming from common roadway excavation. This new style required an actual quarry operation to supply suitable stone and also required more skilled craftsmen. This change complicated subsequent projects even to this date.



Example of contributing random-rubble guardwall

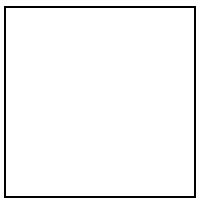


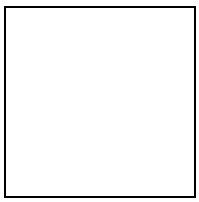
Example of contributing ashlar guardwall

The changes to masonry over time, and primarily the change from random rubble to an ashlar style explains why today these two styles are found typically next to one another over the expanse of the present-day roadside. These two types of masonry are the two primary types of masonry found along the roadside and still make up the majority of walls. Today, there are approximately 36,000 linear feet of these primary types of historic walls that remain in good condition.

In the Morrison-Knudson rework of much of the west side the contract included the installation of removable rail, paving and repairing stone masonry structures. As a part of this contract, the historic design standard of an 18-inch high wall, with its 6-inch parapet, was determined to not meet new highway standards due to an "insufficient height" application. Any replacement of the guardwalls were now required to meet the new "standard" of 24 inches, thereby requiring raising the entire wall section to the original height of the parapet. This non-parapet wall, at 24 inches high introduced a third typical type of wall construction now found along the road. Again, it was all constructed of ashlar. Due to stone source difficulties, to add insult to injury, many of the new wall sections were constructed of Minnesota granite.

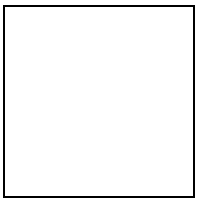
The use and import of this foreign stone graphically illustrated the source problem partially due to the closure of the old roadside quarried earlier used for the provision of stone. Perhaps beginning in the 1950's, incompatible walls of non-historic character became noticeable along the road. These were obvious departures in the color, type, profile and type of construction.





Approximately 2800 linear feet of guardwalls have been assessed as having integrity lost due to the use of non-indigenous imported stone. It is not only the materials source, but also the use of a concrete core with a stone veneer that compounds the issue of incompatibility in repaired sections of guardwall, as well as some retaining walls. As illustrated in the above right-hand photograph, the introduction of a capstone, placed on top of the reinforced concrete core, created another character departure.

Over recent years, Glacier has been pressured to some extent to embrace the use of newly introduced technology in order to get around the stone source issue. Through the use of concrete, formed and colored to appear like stone walls, many other agencies and parks have been able to provide an artificial stone masonry substitute. Contractors use a formliner to replicate actual types of masonry of choice. The form is later filled with concrete and stained to replicate a true stone type once the form is removed. In 1993, Glacier Park and the Federal Highway Administration teamed up to contract for a demonstration project utilizing the formliner technique. Two 50-foot sections of guardwall were prepared, delivered and installed along the roadside near the West Tunnel.



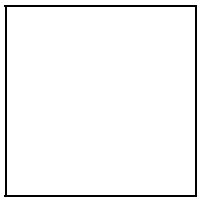
"Formliner" demo sections, ashlar type. Note faded color

Not being completely satisfied with the product, the two demonstration segments are all that exists to date of artificial concrete on the Going-to-the-Sun Road.

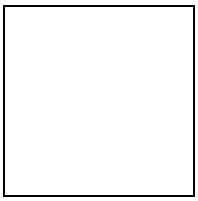
In spite of a vehicle never having crashed *through* a guardwall, things came to a head between the National Park Service, the Montana State Historic Preservation Office, Montana congressional office and the Federal Highway Administration regarding, once again, the height of the roadside guardwalls.

By 1990, in an effort by the Federal Highway Administration to apply national "standard road design" to the Going-to-the-Sun Road, the Park Service was essentially put on notice that they had no other recourse in their requirement to provide for public safety than to virtually replace the historic guardwalls with what the Montana State Historic Preservation Office referred to as "bad look-alikes". This was needed, according to FHWA officials, in order to comply with a standard 36-inch height. This 36-inch height rail was the only crash-tested approved height approved for use of Federal Lands Highway Program funds at the time. The issue escalated to the point where the FHWA stated that if this standards were not adopted, that they would not participate in any more reconstruction efforts on the road**.**

The stalemate actually began while both agencies were preparing for the completion of a section of repair located in the vicinity of the landmark Triple Arches. The wall in question was in the foreground of the primary view of the Arches. The wall was the top of an extensive repair to a retaining wall where a new concrete face was poured in front of a historic stone masonry wall that FHWA engineers considered in jeopardy. The concrete stabilized the historic wall behind; however, it also destroyed, from an integrity viewpoint, about 375 linear feet of historic fabric.



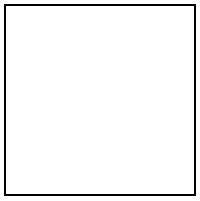
Concrete corewall toward Triple Arches



View from Triple Arch area toward wall face
Note contributing random-rubble in foreground

Now that the core wall was in place, plans were being made to face the core with stone veneer. At this point, the disagreement ensued. Beyond the issue over a non-characteristic height blocking views, which attracted visitors to the roadway experience, there was also an issue relative to the compounding incompatibility through the placement of non-typical capstone to the top of the wall. The Park Service as well as the Federal Highway Administration saw long-term issues associated with this one specific wall.

Following a long period of heated discussion and studies conducted as to the actual and average driving habits of the visiting public on the road, the issue finally advanced following agreement that a wall of historic dimensions would be crash-tested at speeds, angles (20-25 degree) and with vehicles similar to actual Going-to-the-Sun Road conditions. Furthermore, the wall, in order to satisfy a structural integrity requirement, was reinforced with bar placed within the "cavity". Glacier Park landscape architects recommended that language be included in the specifications stressing "non-conventional methods of wall construction" are necessary to provide the desired (historic) appearance standard.

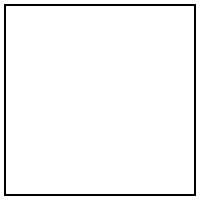


While the "cavity fill" design was certainly non-conventional and provided a means of utilizing random-width stones while minimizing the need for quarrying for the provision of a uniform width (veneer) stone. It also, perhaps more importantly provided a means to not end up with an undesired capstone effect.

Another breakthrough resolution reached by both agencies was an agreement that if the design passed the crash-test, this new reinforced "cavity fill" guardwall design emulating the historic random rubble style, would be the replacement for any Federal Lands Highway Program contract on the road where *replacement* of defective guardwalls was necessary. This would be in cases where either the wall was too low or structurally unsound. This all was a significant breakthrough in the partnership between the Park Service and Federal Highway Administration which dated back to 1926.

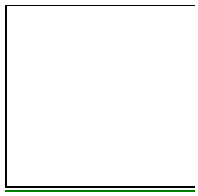
Siyeh Limestone gathered at the park was transported to San Antonio, Texas for construction of the prototype test wall. Two tests were run in spring 1994 by the Southwest Research Institute. The test was began with a vehicle impacting the wall at 25 mph. If successful, testing incrementally increased by 5 mph and, as applied to the road's posted speed limits, was to end at speeds of 35 mph. To the pleasure of all, the wall passed the 25 mph test, however failed at higher speeds. Due to this, in order to meet the needs of the Federal Highway Administration and further protect the historic fabric of the road, the park regulated a lower speed limit for the road at the currently posted 25 mph throughout the majority of the Alpine section of the road. With recent focus on structural repairs, the wall near Triple Arches, that began the controversy, remains to this day yet uncompleted.

The cavity-fill technique has been very successful in the past decade that it has been utilized in rehabilitation projects. Its success, however, is directly attributed to both the availability of stone and the crafting abilities of contracted masons.



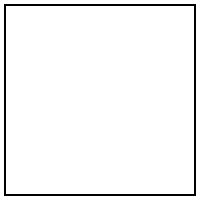
A recently completed section of reconstructed random rubble guardwall

Around this same period of time as the crash-testing of the masonry guardwall, vehicle size restrictions were also phased in. Over the years, it was obvious to patrol rangers and painfully apparent to many oversized vehicle owners that the historic 22 foot travel width was not conducive to the ever increasing sizes of vehicles permitted on public roads. It was almost a daily occurrence that vehicles would be involved in sideswipes with other vehicles or roadside features like guardwalls and unforgiving road-cuts. Mirrors and fender parts were almost always found along the edge of some of the tightest sections of the road. None of this was helping protect historic stone masonry features.



The above standards were enforced for on vehicles traveling the upper reaches of the road between Avalanche Campground on the west and Sun Point on the east side of Logan pass.

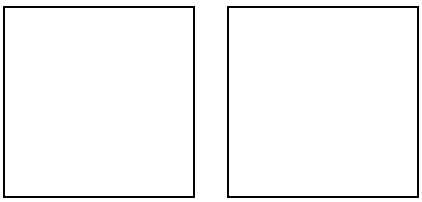
In 1928, standard details were developed for park roads by the Landscape Division utilizing stone and log in the “Rustic” character. One of the log barrier types was the “type 7” post and rail system used extensively in lower St. Mary and Lake McDonald sections.



1939 Lake McDonald segment

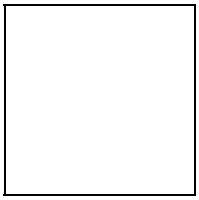
The use of log rails came about partially due to difficulties experienced with the supply, finishing and construction associated with stonemasonry rails. In fact, dating back to the early 1930’s, there was substantial effort applied by the BPR to utilize the type 7 log railing and isolated guard stones in place of stone masonry. This was rejected at least by Superintendent Scoyen and most likely by Vint and others in the Landscape Engineering Division. Following this, during the Wonderlich contract (1936-37) not as much log rail was constructed as originally planned. This was done partially to provide for an “added sense of security” at cliff-side areas along Upper McDonald Creek. Over time, with the railing rotting out and not replaced, they soon disappeared from the historic scene. During the rehabilitation of the Lake McDonald section in the late 1990’s, the use of log detailing was reintroduced to the roadside. While it

was not a continuous roadside rail, as in the photograph above, it was used to denote more notable areas, especially at turnouts and parking areas. Subsequent projects have incorporated log detailing into the scene including the St Mary section, Rising Sun, Upper McDonald Creek/Avalanche, and the Logan Pass section.

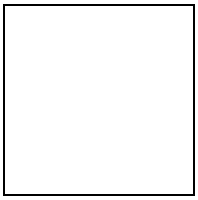


Details from the 1990 Lake McDonald segment contract

Historically, the recurring annual repair of damaged masonry became an ongoing problem. Much of this was due to the rockfall and avalanche activity. In 1948, the Public Roads Administration (formerly BPR) proposed that the NPS designers consider a “removable type of guardrail.” For the times, this was innovative thinking, however, it reflected a continual dilemma frustrating engineers, landscape architects and maintenance staff since the early years in trying to deal with over 60 avalanche chutes along the roadway. Some believed that this new rail system should become a wholesale replacement of the old masonry design; however the NPS did not support this idea and only wanted to try the concept on a limited basis in areas of reoccurring and severe avalanche and drainage problems.

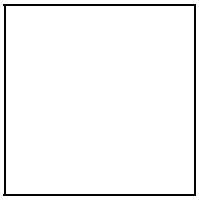


2003 avalanche impacting roadway at Haystack area.

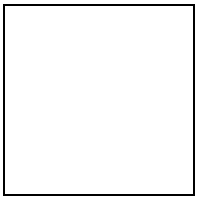


Damaged site following avalanche and temporary Jersey rail

As a part of the Morrison-Knudson contract, there was 1,600 linear feet of the “new” railing placed within avalanche areas. This standard was used until questions arose as to the design’s performance as a safety barrier in that, for one thing, a vehicle could breach the top and the pinning method was not substantial enough to perform more than just “guide”.

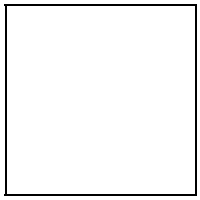


Minnesota granite and early removable rail

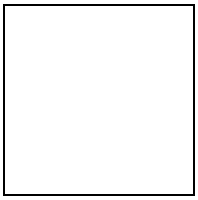


Detail elevation In background

In 1968 an steel I-beam leg and square timber rail was introduced to the roadside of the Going-to-the-Sun Road and became the new standard for a removable rail. This newer design not only diverged from the rounded, more “rustic” log appearance, but also introduced a concrete curb section and vertical steel designed to accommodate and “improved” pinning method.



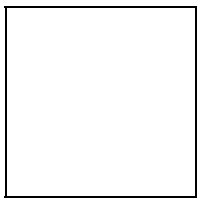
Post 1968 removable railing system



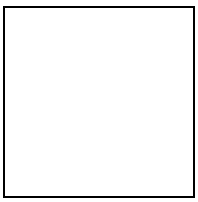
Detail section

This current rail system is, of course, non-contributing and is in need of replacement from a number of standpoints. Again, like with the past removable rail system, this rail acts more as a “guide” than a true crash barrier.

Since the placement of this existing rail system, there have been two crash-tests of a proposed replacement designed to be more of a barrier. The first system, again with a rectangular rail, passed the crash-test, however there still lingered a dissatisfaction, primarily with the landscape architects, due to its’ design treatment. There is a need to replace approximately 1,200 linear feet of existing removable rail with another 660 linear feet of concrete Jersey rail as a temporary safety provision where avalanches and rock-fall have demolished guardwall. In total, therefore, there is close to a mile of potential placement of removable rail. Because of this, disagreements ensued between the structural engineers in charge of the testing design and the landscape architects, who pushed for another series of tests of a more historically compatible rail system with a rounded rail.



Prototype of the steel-backed rounded rail at San Antonio testing facility

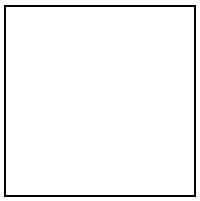


Detail isometric

In May, 2003 the rounded rail was finally tested and passed. This new design will replace the earlier 1968 version. Installation of the system is scheduled for the summer of 2004.

Vistas were a part of the original design intent of the road and were discussed at length with Mather, as well as its’ principal designers including Kittredge and Vint. In the initial layout and construction of the road, many vistas, of course, were created while still trying to minimize disturbance. Tom Vint, commenting on the 1924 survey stated the “purpose of the road is primarily for the use of tourists and is a means to display to them the park scenery.” In spite of this, vegetation management and the provision for views, has only intermittently been done along the roadway.

In 1951, plans were prepared, and approved for vista cutting along Lake McDonald. Later, in 1992, a revision of these plans was prepared by landscape architect, Jot Carpenter. Draft plans have been prepared for the approval to maintain vistas along the remainder of the road. The plan prescribes treatments at various locations for both a dynamic as well as a static viewpoint and utilizes GPS for accuracy as well as for future monitoring and management. It is anticipated that following approval the plan will be implemented beginning in 2004. The plan contains map sheets (below) and note sheets with prescriptions.

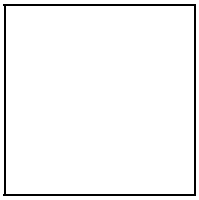


Typical sheet, 2004 draft vista management plans

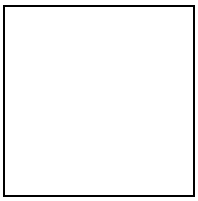
It is important to note that the Landmark Nomination of 1997 identifies vegetation as a contributing resource. The nomination states that if views are impaired that this "could profoundly alter the experience of park scenery."

Recent Efforts

In the mid 1990s, it became apparent to FHWA geotechnical engineers that there were significant problems associated with the structural integrity of the road's numerous retaining walls. To the knowledge of all involved in recent rehabilitation and reconstruction projects, there had never been a comprehensive assessment of the walls and other structures along the road. For decades the Western Federal Lands Highway Division (WFLHD) in Vancouver, Washington had taken the lead for FHWA in providing engineering design and construction administration for Glacier's road projects. WFLHD had developed an inventory in 1994 of the road's retaining walls. For each wall segment, information was gathered pertaining to the wall location, surrounding geology, plan, profile and cross-section, avalanche probability, aspect, water source location, wall and roadway distress and finally, a visual wall condition assessment. One hundred and six individual walls were photographed by helicopter flight. Examples of the photography are below.



M. P. 23.93 (Loop) retaining wall



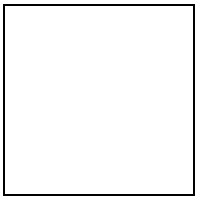
M. P. 23.93 field inspection report

During the Fall of 1997 an informal agreement was reached between Glacier and the WFLHD office to develop a wall management process expanding on the earlier system. The primary difference is the new inventory and assessment was to be on going. The program utilized a set of established criteria that is used annually in actual field inspections. The database is generated utilizing Microsoft Access©. This allows managers to electronically sort, query and print part of all of the data as needed. The program allows for a "priority rating" which provides a determination of prioritized "at risk" walls.

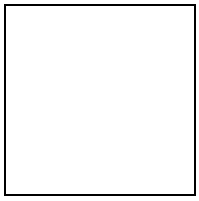
The wall management system database tracks assessments and conditions of retaining walls, which have been the primary focus of rehabilitation in recent years. The need to provide for a comprehensive condition survey and means of monitoring other significant historic structures, like the miles of guardwalls and numerous drainage features, was recognized. To this end, a two-volume Cultural Landscape Report was produced between June 2002 and April 2003. The reports were prepared by Renewable Technologies, Incorporated (RTI) under contract with the National Park Service.
In volume I, the Report addressed the following primary topics:

- The history of the Road and the corridor through which it travels
- The "landscape" setting and the interaction between the road and its natural and cultural environment
- The landscape and setting of primary developed areas the road passes through
- The historic features directly associated with the road including guardwalls, retaining walls, bridges tunnels and other structures

This report focused on the significance and character of the road within the context of its setting.

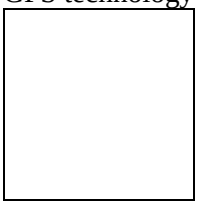


Volume I

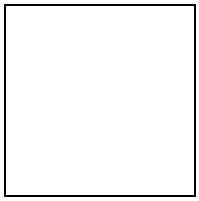


Volume II

Volume II includes the Cultural Landscape Inventory (CLI) and its 2003 update includes highly detailed and broad-based accounting of the structures and a cultural evaluation of the fabric of these structures. The field evaluation was conducted during the years of 2000 through 2002. The bases mapping utilized GPS technology and well over 1,300 individual structural features were surveyed.



The key map



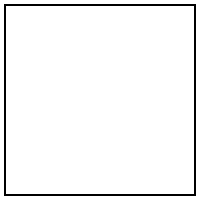
Detailed map

The guardwalls and retaining walls were assessed and referenced in the "notes" portion of the document according to an "integrity" classification. The following assessments relative to individual integrity were assigned to primary structures:

- *Retained:* the feature retains most, if not all of its historic appearance
- *Diminished:* the feature retains most of its historic appearance, however modern changes are obvious
- *Lost:* the feature has lost its visual historic associations, however some historic fabric remains
- *Modern:* no historic association remains and there is obvious reconstruction with modern technique and materials

Beyond the integrity classification, the assessment also separates structures into "contributing" or not to the historic status in a hypothetical National Register of Historic Places evaluation of the resource. Since

the Register establishes 1952 as the ending period of Going-to-the-Sun Road's significance, all features built before this time may be assumed to *contribute* to the historic status of the road unless they have lost integrity to the period.



Example of CLI notes M.P. 23.93

All the notes relative to retaining walls are referenced with FHWA mileposts keyed to the Retaining Wall Management System. As with the Vegetation Plan, and the Retaining Wall Management System, the Cultural Landscape Report and Inventory are dynamic, in the sense that they are on-going projects.

The mapping and evaluations of both the Retaining Wall Management System as well as the Cultural Landscape Inventory, with the evaluations, mapping and photographs have proven invaluable in project planning.

The Next Chapter

Planning is currently underway for a monumental rehabilitation program for the road. The beginning of this unprecedented effort began around 1999 following rising concerns raised by FHWA officials as to the condition of not only the retaining walls, that had pretty much been neglected since initial construction back in the '20 and '30s, but of the road in general. The rehabilitation of the road became the focal point of the 1999 General Management Plan and generated the majority of public comment. Due to this, a separate assessment and public review process was begun focusing solely on the Going-to-the-Sun Road.

What followed was a series of interconnected efforts in order to determine a means of progressing with the rehabilitation. These efforts included:

- an engineering analysis, including a condition assessment, rehabilitation priorities and alternatives
- a socioeconomic analysis that included visitor use and business surveys;
- a transportation and visitor use study
- the cultural landscape assessments
- and a federally appointed advisory council that were charged with soliciting public input and providing guidance, based on the above analysis, to the National Park Service.

All of the above analysis and input was wrapped into the final Rehabilitation Plan/Environmental Impact Statement of 2003. The Shared Use with Extended Rehabilitation Season, preferred alternative identifies

a 7 to 8 year rehabilitation duration in order to rehabilitate the road back to a condition where it meets the primary objectives of *preserving its historic character and significance while minimizing its effects on all resources, surrounding economies and visitor experience.*

The National Park Service and the Federal Highway Administration are currently focused on this challenge.