

**FACTUAL SUMMARY OF INTERVIEWS WITH SVERDRUP &  
PARCELL EMPLOYEES**

**WORKING ON I-35 BRIDGE PROJECT IN MINNEAPOLIS**

(12 pages including this cover sheet)



**NATIONAL TRANSPORTATION SAFETY BOARD  
OFFICE OF HIGHWAY SAFETY  
WASHINGTON, D.C. 20594**

**FACTUAL SUMMARY OF INTERVIEWS WITH SVERDRUP &  
PARCELL EMPLOYEES  
WORKING ON I-35 BRIDGE PROJECTS IN MINNEAPOLIS**

---

**A. ACCIDENT**

**NTSB #: HWY-07-MH-024**

Date and Time: August 1, 2007 at 6:05 p.m.

Description: Interstate 35W Bridge collapse

Location: Interstate Highway 35W Bridge over the Mississippi River, Minneapolis, Hennepin County, MN.

Fatalities: 13

Injuries: 145

**B. REPORT GROUP**

David S. Rayburn,

NTSB

624 Six Flags Drive, Suite #150,

[REDACTED]

Highway Specialist

Arlington, TX 76011

Group Chairman

[REDACTED]

**C. ACCIDENT SUMMARY**

About 6:05 p.m. (CDT), on Wednesday, August 1, 2007, the 35W Interstate Highway Bridge over the Mississippi River, in Minneapolis, Minnesota experienced a catastrophic failure in the main span of the deck truss portion of the 1907-foot-long bridge. As a result, approximately 1,000 feet of the deck truss collapsed with about 456 feet of the main span falling into the river. An assessment of the gusset plates within the deck truss revealed that the connections at U10, U10 prime, L11 and L11 prime were under-designed. The bridge was comprised of eight traffic lanes, with four lanes in each direction. At the time of the collapse, a roadway construction project was underway that resulted in the closure of two northbound and two southbound traffic lanes causing traffic queues on the bridge. A total of 111 vehicles were documented as being on the portion of the bridge that collapsed. Of these, 17 vehicles were recovered from the water. As a result of the bridge collapse, 13 people died and 145 people were injured.

## **D. DETAILS OF THE REPORT**

At the request of the NTSB Jacobs Engineering provided a list of all the former Sverdrup and Parcell employees that worked on the design of the truss and gusset plates on the I-35 Bridge in Minneapolis. Jacobs provided the list at the beginning of July 2008. The list had 5 names of engineers, technicians, and draftsman who worked on the design of the bridge. The interviews elicited the name of another engineer who performed the computations on the under-designed gusset plate at node U-10 and L-11. Jacobs provided the contact information for this person during the last week of July. The six employees were interviewed by the NTSB during the last two weeks of July 2008.

The focus of these interviews was to determine if Jacobs or a former employee had records or knowledge about the design and review of the gusset plate design on the truss joints of the I-35 Bridge. Jacobs indicated they had no records of the gusset plate computations, but at the end of July they forwarded a copy of notes that a former employee had recently in his personal possessions.

### **1. INVOLVEMENT WITH THE I-35W BRIDGE (#9340)**

Of the six interviewees, three had direct involvement with the design or checking of the gusset plates on the I-35W Bridge.

1. Collin Reuter
2. William Gaddis
3. Thomas Dillon

### **2. DETAILING OF STRUCTURAL STEEL JOINTS OR GUSSET PLATES**

The interviews showed that an employee/engineer with five months work history at S&P was assigned to detail the gusset plates. This employee was Collin Reuter. Mr. Reuter may have been assisted by Buck Gaddis an engineer with approximately 7 years experience and Mr. Thomas Dillon an engineer with approximately 12 years experience at S&P. According to Mr. Reuter, Mr. Dillon checked his work in April 1964. Mr. Reuter stated he did the initial chord splice calculations but never did the shear force calculations. The preliminary computation sheets did not have shear force calculations and while it had Mr. Reuter's initials as the engineer performing the work, the line for the checking engineer was left blank.

### **3. CHECKING OR REVIEW OF DRAWINGS AND CALCULATIONS ON GUSSET PLATES**

Mr. Reuter indicated that Mr. Thomas Dillon checked his calculations in April 1964. Mr. Dillon agreed that this was probably correct. Also, Mr. Reuter related that he never did any shear force calculations and that the notes he provided were preliminary calculations. He went on to say that a more senior engineer probably did the shear force calculations. He indicated that since Mr. Dillon checked the drawings and computations that he was most likely to be the one who did the shear force calculations. However, since Mr. Gaddis indicated that he probably helped Collin detail the joints he may have done the calculations for the diagonals. They both indicated that the project manager, Mr. Earl Manness (Deceased), would also have reviewed the documents for accuracy and correctness. There were no records and no independent memory to suggest that any type of disagreement existed about the size of the plates. If any type of disagreement between the detailer, checker, and project manager existed; the final decision would have been made by Jasper Keeler, the chief bridge engineer at S&P. Mr. Gaddis indicated that after the checking was completed the drawings would have been given to a draftsman for completion and then re-checked again. Mr. Dillon indicated the next step would be for the completed design drawings to be forwarded to MNDOT where the shop drawings were completed. Mr. Dillon was the most experienced detailer at the time of this design. He prepared written procedural documents to accomplish the detailing computations and procedures in 1964. In 1969 he published a procedures manual that was again revised in 1989 and remains in use by Jacobs engineering to this day.

### **4. OTHER BRIDGE PROJECTS**

Mr. Reuter, Mr. Gaddis, and Mr. Dillon also worked on the Crowne Point Bridge, now named the Isaiah Hart Bridge, a truss structure over the St. Johns River in Jacksonville, Florida. Mr. Reuter indicated he only worked on the approach spans design on this project. The State of Florida DOT produced shop drawings without computations sheets for the gusset plates on this structure. Jacobs was unable to provide the computations sheets for the gusset plates on this structure. Several gusset plate drawings showed that Mr. Gaddis did the detailing and Mr. Dillon did the checking on some of the gusset plates on this truss. The State of Florida used the FHWA design adequacy calculations and found that none of the gusset plates were under designed on this truss.

**David S. Rayburn Highway Factors Specialist  
OHS, Investigations Division**

**INTERVIEW SUMMARIES OF RETIRED SVERDRUP & PARCEL  
EMPLOYEES  
ATTACHMENT 1  
BRIDGE 9340 COLLAPSE  
MINNEAPOLIS, MN,;8/1/07  
HWY-07-MH024**

- 1. GERALD J. DEE**
- 2. THOMAS V. DILLON**
- 3. WILLIAM J. GADDIS**
- 4. RICHARD H. HEBENSTREIT**
- 5. HAROLD P. MALONEY**
- 6. COLLIN REUTER**

*Telephone Interview*

*Person Interviewed:*

*Gerald J. Dee*

**Date and Time:**

**7/16/08 2:15-2:30 p.m.**

**Age:**

**70**

**Work History:** Mr. Dee began working for Sverdrup & Parcel in 1958 and retired in 2005 after 42 years. He was a draftsman, designer, engineering technician and in later years was a checker on certain design details but not of the truss details. He indicated that he attended 3 years of College at Washington University but never obtained his engineering degree or professional registration as an engineer. On the I-35 Bridge project he prepared some drawings of the deck and some minor work on one bearing but was not involved in the detailing of the main structural members of the truss or any gusset plates. He added that there was a strong attention to detail on the bridge design with many checks and re-checks of design drawings and calculations, and he was surprised to learn that part of the work was found to be under-designed and the error was somehow not discovered.

He added that one month ago he was interviewed by lawyers that represented Jacobs Engineering. He said he saw a list with about 15 names on it of the people they were interviewing. He said that the only person that he remembered working with that was not on the list was another draftsman by the name of Pete Clark.

*Telephone Interview*

*Person Interviewed:*

*Thomas V. Dillon*

**Time and Date:**

**7/15/08 2-2:45 p.m.**

*Age:*

83

**Work History and Education:**

Mr. Dillon worked 41 years for Sverdrup & Parcel, beginning in April 1951 and ending when he retired in January 1992. Mr. Dillon graduated from the University of Illinois in 1949 with an engineering degree and became a registered professional engineer in 1977. He indicated that during his career he specialized in the detailing and checking of Trusses and other steel joints. While at S & P he authored a 225-page manual, titled, "Detailing Guide for Structural Steel Joints." He said in the manual a 14-step process for how it should be done was described. The manual was completed between 1987-1989. In his career he worked on over 30 bridges and also worked on the space shuttle program. With regard to the I-35 Bridge that failed he said he thought he did the checking on the gusset plates but, he does not remember any details about what the original detailer provided to him to check. He also does not remember meeting with anyone about changes to the types of steel used on the project.

He said in general the original designer or detailer would provide drawings for him to check. Then, if all was okay they would be given to a contractor for shop drawings to be made and then reviewed again by S&P or the State. He indicated in those days Minnesota would have prepared their own shop drawings based on the S&P design instead of having S&P do them or having another contractor do them. He said that the calculations would be checked on the gusset plates during the review. If any disagreements were noted between the detailer and checker the project manager, Mr. Earl Manness, would have rechecked the documents and drawings to ensure correctness and accuracy. He added that he thought Colin Reuter was his detailer for the steel joints on the I-35 Bridge.

*Telephone Interview*

**Person Interviewed:**

**William James Gaddis**

**Date and Time:**

**7/15/08 2:30-3:15 p.m.**

**Age 72**

**Work History and Education:**

Mr. Gaddis said he worked at S&P from 1957 until 1996 when he retired. He was an engineer for the company. He graduated from the University of Missouri in Columbia in 1957. He indicated some layer had found his name on some of the old design plans and had interviewed him about it. He said the lawyers came and talked to him twice. He said he checked some of the design loads on the main span. He said the stress sheets showing all the loads were probably given to him for checking by Earl Manness. He said he also checked some of the joints. After checking the drawings he would have given them to a draftsman for completion and re-checking. He could not remember any changes to the design based on changes to the steel used. He added that Colin Reuter had called him a few months back wanting to know if he was in some kind of trouble. He said he and Colin probably did the calculations on these gusset plates and they would have been re-checked multiple times by other engineers. He said Colin was also an engineer. He said they did not use any rules of thumb to estimate needed Gusset plate size; they always did the calculations and placed them on comp-sheets.

*Telephone Interview*

**Person Interviewed:**

**Richard H. Hebenstreit**



**Date and Time:** 7/15/08 3:30-4:15 p.m.

**Age:** 83

**Work History and Education:**

Mr. Hebenstreit worked at S&P from 1950-1991. He obtained his engineering education from the University of Illinois. He spent his last 19 years in the New York Office. During his career he worked as an engineer and project manager. He managed large projects, such as, the subway station at L'Enfant Plaza in Washington, DC., the Bridge of the Americas in Panama, and the Chesapeake Bay Bridge in Maryland. He was interviewed by the law firm representing Jacobs Engineering because his name was found on two drawings he checked concerning the I-35 Bridge substructure. He had checked the design plans for two piers. The two lawyers were from the Maslon firm in Minneapolis. They were named James O'Connor and Dwayne Bezdell.

When he described the checking process he said everything was checked and re-checked. If checkers found problems the designers did not agree with then the head bridge engineer, Jasper Keeler, would sort out the problem and make final decisions.

**Telephone Interview**

**Person Interviewed:**

**Harold P. Maloney**

**Date and Time:**

**7/15/08 10:30-11:15 a.m.**

**Age:**

**73**

**Work History:**

Mr. Maloney graduated from High School in 1954, got married in 1955, and began working as a surveyor through 1959. In 1960 he began working with S&P. He worked there for 10-12 years. He was still in the learning stages when he worked on the I-35 Bridge Project. He said he started out by tracing engineer's sketches on mylar. He did the plan and elevation drawings of the I-35 Bridge which were more like architectural type drawings in his words. He said all drawings were checked by an engineer and then given back to him where he would make changes and then the drawings would be re-checked and given to a third party for resolution if there were differences of opinion. Later he became a full draftsman and then did some design work. He said he also did some drawings of the walkways on the bottom of the bridge that were used to maintain lighting for the river channel. He said he thought he might have done a drawing of one of the expansion joints but nothing on the truss or gusset plates.

He indicated he did not know about any changes in the steel but in later years when he went to work at Monsanto, he said they had problems with high-strength bolts

**Telephone Interview:**

**Person Interviewed: Collin Reuter**

**Interviewers: David Rayburn**

**Jim Wildey  
Carl Schultheisz**

**Date and Time: July 30, 2008 6:30-7:20 CDT**

**Summary:**

Mr. Reuter was age 69 at the time of the interview. He said he graduated from Iowa State University with a civil engineering degree in 1961 and took a job at the naval shipyards in Pearl Harbor until June 1963 when he began working for Sverdrup and Parcells Engineering. He indicated the normal process was to work as a draftsman for 4 years before you graduated to doing design work. He recalled that in November 1963 he was assigned to detail the joints on the truss of the I-35 bridge over the Mississippi river in Minneapolis. Prior to this interview he had been interviewed by a law firm out of Minneapolis that had been engaged by Jacobs Engineering to find all of the old S&P employees that had worked on the bridge. He said they identified him from several drawings he had done on the truss members. He indicated that he found several pages of old computations he had done when he was detailing the joints. They were found in the basement of his home in Colorado.

Mr. Reuter said he worked for S&P for 2 ½ years and in January 1966 he went to work for Stearns and Rogers in Denver where he retired in 2002 after 36 years.

At S&P he was a young engineer in training and did not receive his professional registration until February 1966 after he left S&P. When describing the process of detailing the joints he said he would have received the load designs and begun figuring out the rivet pattern, performing calculations for the rivet pitch found in AASHTO Code Article 1.6.22 and 1.6.23. These two codes dealt with the rivet stitching and sealing. He said he worked on detailing the joints on the I35W bridge, used member loads to determine rivet layout pattern, including determining the spacing between rivet rows. He did preliminary calculations to determine approximate thickness of the gusset plates, apparently using the chord splice (load carried across the upper or lower chord) to determine the thickness. He never used any shear calculations to determine the thickness of the gusset plates. He recognized that if final calculations to determine the thickness of the plates required the use of thicker plates, the rivet layout pattern of the thinner plate could be retained because a thicker plate would only require fewer rivets, with wider spacing of the rows. He determined rivet stitching (spacing between rows) and sealing (how close to the edge the rivets needed to be to ensure that the plate

"sealed" against the member. In summary his main job was to calculate the number of rivets necessary and start figuring out a rivet pattern, which would govern the in-plane size of the gusset plates. He also did some preliminary sizing of the gusset plate thickness based on the transfer of forces in the chord members. However, he seemed unfamiliar with the calculations necessary to size the gusset plates for transfer of forces between the chord members and the verticals and diagonals, and he assumed that was done by a more senior person after his work was done (possibly Dillon or Gaddis).

He discussed how U6 might have been similar to U10 because each was equidistant from the pier (node 8). His notes for joint 10 indicated that by inspection it should have been the same as joint 6. However, the notes showed that a 5/8inch thick QT steel gusset should have been used at U6, but on U10 and L-11 the material specified was A441 steel and 1/2-inch-thick gusset plates were noted.

Mr. Reuter indicated that when he needed assistance he would have Tom Dillon or Buck Gaddis assist him. He thought that the person most likely to have done the final gusset plat sizing was Tom Dillon because he was the resident expert in detailing of structural steel joints. When asked about any material steel changes he said he was not involved in that and could not remember having to change any calculations based on changes in materials. He said he remembered that the MNDOT personnel had some involvement in the revisions or design change process. He thought that Tom Dillon had waited to about April 1964 to check his calculations. He doesn't remember anything about what was said during the check.

When asked about his involvement in other projects he said he worked on the Daniel Boone Expressway Poplar Street Bridge in St; Louis, which was a plate girder bridge. He worked on a truss bridge in Jacksonville, Florida. On that bridge he said he worked on the approach spans but not on the truss. The only other project he could remember working on was a single span truss over the Chicago or Illinois River in Chicago that they did for the Nickel Plate Railroad.